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Designing Proactive Public Services

REGINA ERLENHEIM

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TALLINN UNIVERSITY OF TECHNOLOGY
School of Information Technologies
Department of Software Science
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Supervisor: Kuldar Taveter, PhD
School of Information Technologies
Tallinn University of Technology
Tallinn, Estonia

Co-supervisor: Leon Sterling, PhD
Faculty of Science, Engineering and Technology
Swinburne University of Technology
Melbourne, Australia

Opponents: Prof Josef Küng, PhD
Institute for Application Oriented Knowledge Processing
Johannes Kepler University
Linz, Austria

Prof Eusebio Scornavacca, PhD
Department of Information Systems and Decision Science
University of Baltimore
Maryland, United States

Defence of the thesis: 15/11/2019, Tallinn

Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Regina Erlenheim

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signature

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Contents

List of Publications

The list of author's publications, on the basis of which the thesis has been prepared:

I Sirendi, R. (2016). Designing proactive public services as sociotechnical systems by using agent-oriented modelling. *Proceedings of the 16th European Conference on e-Government (ECEG): Ljubljana, Slovenia, 16-17 June 2016.* Ed. Decman, M.; Jukic, T. Reading, UK: Academic Conferences and Publishing International Limited, 308−316.

II Sirendi, R. and Taveter, K. (2016). Bringing service design thinking into the public sector to create proactive and user-friendly public services. *HCI in Business, Government, and Organizations: Information Systems: Third International Conference, HCIBGO 2016, Held as Part of HCI International 2016, Toronto, Canada, July 17-22, 2016, Proceedings, Part II.* Ed. Nah, F. F.-H.; Tan, C.-H. Springer, 221−230. (Lecture Notes in Computer Science; 9752).

III Sirendi, R., Mendoza, A., Barrier, M., Taveter, K., and Sterling, L. (2018) A conceptual framework for effective appropriation of proactive public e-services. *Proceedings of the European Conference on e-Government, ECEG*. Academic Conferences and Publishing International Limited. 2018, Vol. 2018-October, pp. 213-221.

IV Kõrge, H., Erlenheim, R. and Draheim, D. (2019) Designing Proactive Business Event Services: A Case Study of the Estonian Company Registration Portal. *Proceedings of EGOV 2019* - the 18th IFIP WG 8.5 International Conference on Electronic Government, LNCS, Springer, 2019.

V Petriv, J., Erlenheim, R., Tsap, V., Pappel, I. and Draheim, D. (2019) Designing Effective Chatbot Solutions for the Public Sector: a Case Study from Ukraine. *To be presented at the EGOSE: Electronic Governance and Open Society: Challenges in Eurasia, in Saint Petersburg, Russia, November 2019.*

VI Lemke, F., Taveter, K., Erlenheim, R., Pappel, I., Draheim, D. and Janssen, M. (2019) Stage Models for Moving from e-Government to Smart Government. *To be presented at the EGOSE: Electronic Governance and Open Society: Challenges in Eurasia, in Saint Petersburg, Russia, November 2019.*

Author's Contribution to the Publications

Contribution to the papers in this thesis are:

I First author. The goal of this article was to introduce the concept of proactive services in the context of public sector in a doctoral research session at the European Conference of Electronic Governance in Ljubljana, Slovenia in June 2016.

II First author. The goal of the article was to extend the doctoral research paper through a human-computer interaction perspective with the focus on introducing proactive services in public sector context at an International Human Computer Interaction conference in Toronto, Canada in July 2016.

III First author. The goal of the article was to exemplify and extend the concept of proactive services in two contexts. Firstly, in Estonia, through a case study on providing services to disabled children's parents that was initially submitted as a master's thesis by the main author's supervisee (and defended to grade 5). Secondly, in Australia, through a case study on providing homelessness services. The article was presented at the European Conference on Digital Governance in Santiago de Compostela, Spain in October 2018.

IV Second author. The article was initially submitted as a master's thesis (supervised by Regina Erlenheim) by the first author (and defended to grade 5). The article version of this thesis was supervised, edited, and complemented by the author of this dissertation. Regina Erlenheim presented the article in San Benedetto Del Tronto, Italy in September 2019.

V Second author. The article was initially submitted as a master's thesis in 2019 by the first author and was supervised by Regina Erlenheim. The thesis was defended to grade 5. The article version was supervised and complemented by the author of this dissertation. The presentation of the article takes place in November 2019 in Saint Petersburg, Russia by the third author.

VI Third author. The article was initially submitted as a master's thesis in 2018 by the first author and was supervised by Kuldar Taveter (second author). The article version was commented and edited by the author of this dissertation. The presentation of the article takes place in November 2019 in Saint Petersburg, Russia by the first author.

Introduction

The aim of this research is to look into how to design proactive public services. It is a relevant topic in the development of governance practices globally and comparing to the beginning of this doctoral research five years ago, an increase in the frequency of this topic being researched, published, and debated can be witnessed both nationally and internationally, in mainstream media and in scientific publishing. Through this multiple case study approach and by analysing four main case studies both from the public and non-profit sectors, and two complementary case studies on technological and ethical requirements for proactive public services, it will be possible to provide a theoretical framework with the scope and design possibilities, and a conceptual meta-model for the notion of proactive and reactive services. Through the lessons learned from both analysing the case studies and building the meta-model, a checklist, guidelines and recommendations for designing such services would be provided. In the following sub-sections, the background of the study, problem statement, the aims of dissertation, research questions together with the methodological approach, and the outline of the dissertation will be provided. While the focus of this dissertation is on designing proactive public services, the eventual contribution is aimed to be beneficial to all sectors and stakeholders alike. The novelty of this doctoral research lies on the analysis based on the observation that there is an increasing interest from the governments to pursue the development and implementation of proactive (electronic) services, but currently only a limited number of research studies on this area exist. The dissertation suggests that proactive public services would make the daily lives of people simpler, and less time would be spent on dealing with everyday bureaucracy. The expected benefits of proactive public services stem from their nature of being citizen-centric, seamless, and efficient.

In the light of the growing importance of technology in society, it has become increasingly important to understand how to provide and implement ICT-driven services efficiently. Furthermore, the recent trends have shown that governments are increasingly focusing on developing e-governance and digital transformation initiatives. More concretely, the relevance of proactive public e-services has grown in the recent years. From a legislative perspective, proactive public e-services are such services that are provided by the government on their own initiative in accordance with the presumed will of persons and based on the data in the databases belonging to the state information system. Estonian government has taken a step further towards proactive services but defining these as such that are provided automatically or with the consent of a person (State Gazette, 2018). However, proactive services, if addressed through the lens of socio-technical systems, involve the aspects of both technological and human qualities. From a social aspect proactivity addresses the concepts of prevention, prediction, and assumption about a certain life situation of a person or a business entity in the present or future. Also, the notion of ethicality of proactive services needs to be addressed. However, based on the technological standpoint, it involves the concepts such as multi-functional agents, predictable work patterns, and information infrastructures that allow pushing and listening of published messages. Here, the technological requirements of proactive services need to be clarified.

A growing number of services and benefits are provided online, and increasingly more data is available through different databases. It could be argued that governments are pushed to run as private companies to maintain the competitive edge and relevance in

the society. Governments are learning from private sector how to involve citizens in service design, development, and feedback mechanisms to ensure that the actual needs of citizens are addressed through innovative and inclusive activities. Digital technologies are radically shifting how organisations, both private and public, are providing services, and thus it is possible to witness the blurring of lines between government, business, and civil society. In this kind of new world, the government could be seen as a platform that is acting as an intermediary: facilitating collaboration, collecting people and service providers on a integrated ecosystem, and coordinating disruptive and innovative public service delivery models (Accenture, 2018). Overall, the direction many governments are taking is to provide citizen-centric public services. Even more so, governments in the Digital 9 (D9, previously D5 and D7) countries (the founding members: Estonia, United Kingdom, South Korea, Israel, New Zealand, and added members Uruguay, Canada, Portugal, and Mexico), and elsewhere as in Taiwan (Linders, et al., 2015), Malta, Finland, and Austria (Wauters, 2006) among others are looking into how to provide public services proactively.

Although quickly gaining traction in the interest, proactivity as a concept is still not widely discussed nor analysed in the context of public service provision. However, now an increasing number of authors (see Wauters, 2006; Linders, et al., 2015; Scholta, et al., 2017, Scholta, et al., 2019, Kõrge, 2019), organisations (see European commission, 2017a; European Commission, 2017b), and (groups of) governments (Digital 9, as above) have started to explore the premise. Proactivity, as mentioned above, illustrates a service provision model where the initiative of providing a particular service comes from the government agency. The model is described by Linders, et al. (2015) as moving from "*pull*" to "*push*". However, it is possible to develop the metaphor even further by claiming that from a citizen-centric perspective where services are pushed towards citizens, the essence of proactive service narrative should be coined as "*from pull to pushed*" (Kõrge, Erlenheim and Draheim, 2019).

The concept of proactivity proposes that a public organisation is approaching a situation or the activity of providing services from a creative and suggestive position rather than responding to a situation after it has occurred. Furthermore, proactivity in the public sector context suggests that a public organisation takes initiative in providing public services to a person based on the presumed will and on its own initiative, thus initiating the "*push"*. In contrast, it is possible to argue that in circumstances where a public organisation responds to a situation after its occurrence, the perspective of the government could be seen as reactive. Also, by looking at a person's life through a life-cycle theory it is possible to assume that a person goes through a number of life events that often, but not always follows a similar logical path. In essence, we are talking about a person's life from birth to death, and about everything that is in between. Here, the introduction of the concept of business events is necessary, as it is possible to differentiate between distinctive stages in businesses' life-cycles as well.

The novelty of proactivity in the public sector context could be defined as follows. By taking into consideration the principles of service design, such as a citizen-centric viewpoint that emanates primarily from the actual needs and wants of the person, and by reflecting on the established bureaucratic procedures of public sector and the ever-continuing demand for efficiency, it would be possible to provide proactive public services to persons (and businesses) in order to make their day-to-day life less complicated and free up time that would otherwise be spent on needless bureaucratic activities. Furthermore, the notion of proactivity assumes that the already existing

information that governments possess about people living and businesses running in their jurisdiction should be used to provide people with seamless services that, ideally, would function invisibly in the background.

As said, governments are increasingly focusing on providing better and more efficient services to their citizens and businesses. However, the knowledge of how services are designed and implemented in the public sector context is still complex and disparate. There is a lack of understanding what methodologies for service design should be used, how to make governments more proactive, and why are not more governments focusing on proactivity. Also, it is an increasing research interest of how proactivity in service provision help would bring governments closer to their citizens and simplify processes behind service delivery. However, the recent trends of including service designers in the development and innovation practices is growing. A good example can be brought from the United Kingdom and the Government Digital Service (GDS) that focuses very concretely on bringing public services closer to the citizen by involving a diverse range of stakeholders in the decision-making and design processes. Another novel example is the Service Design Network (SDN) that has chapters all around the globe from Finland to Brazil. Their expertise is also focusing around educating stakeholders both from the public and private sectors regarding designing and providing better services.

The current dissertation makes a claim that providing proactive public services brings governments closer to their citizens. The already available information the public sector possesses, and the existing information infrastructure would make it possible to assume that proactive services are easy to provide. However, there appears to be a set of limitations to why the provision of proactive public services has not been actuated. Consequently, the current dissertation makes a novel inquiry into the notions of socio-technical systems, e-government stage models, and service design methodologies, and through the examples of four case studies and two complementary analyses, seeks to address a possible solution for designing proactive public services.

As mentioned above, the aim of this research is to explore how to design proactive public services. Consequently, the contribution of this dissertation is the following. Firstly, a meta-model for proactive services will be provided as an incremental development based on the Sterling and Taveter (2009) approach to proactivity through their book The Art of Agent-Oriented Modelling. This will draw upon the previously published literature and through case studies gathered data. Secondly, proactivity in relation to reactivity in the context of public service delivery will be touched upon and presented as reactive-proactive conceptual space for service delivery in the public sector. Thirdly, a set of guidelines for designing proactive services together with a developed questionnaire will be provided in order to assist public sector organisations self-assess their current service delivery position and direct them towards proactive service delivery through detailed inquiry into their service ideology. And lastly, the dissertation looks at the notion of proactivity and seeks to build an entirely novel concept of the Reactivity-Proactivity Spectrum (RPS), which main goal is to distinguish between the different levels of proactivity.

One of the main values of this dissertation lies in integrating an interdisciplinary research approach from analysing the concepts of socio-technical systems, the needs and wants of people, and proactivity to providing both novel academic contribution into the wider understanding in public service development to generating real-life guidelines for designing and developing proactive public services. This research fields borrows from a wide range of disciplines, such as political science, sociology, and software engineering,

and, thus, raises awareness of the possibilities in designing such services from all these angles.

For the current doctoral dissertation interdisciplinary case study research methods are used. The embedded, multiple case, and inductive research (Runeson, et al., 2012; Yin, 2014) is supported by qualitative research methods such as interviews, questionnaires, and literature research. Agent-oriented modelling as proposed by Sterling and Taveter (2009) is considered as a complimentary service design tool. The current dissertation is not only exploratory by addressing a novel concept of proactivity in the public sector, but also descriptive as the qualities of this research seek to address and describe the phenomenon from an array of before-mentioned viewpoints. Multiple case studies are conducted in order to exclude bias of the proactivity topic. At the same time, the dissertation is not focusing on the comparative aspect of the research, as each of the chosen case studies will provide a valuable insight on their own.

Based on the previously mentioned aim of the dissertation the following research questions are developed. The main research question is:

Research Question (RQ): How to design proactive services?

The overall question throughout this dissertation is focusing on the essence and qualities of proactive public services. Based on the knowledge accrued through desk research and conducting case studies, it will be possible to visualise the process of proactive service design. The third contribution of this dissertation serves the purpose of answering to the main research question. To allow a more detailed analysis of the dissertation, the main research question is divided into and assisted by more concrete sub-questions.

Sub-Question 1 (SQ1): What is the current state of service provision?

The purpose of this sub-question is to find out what the pain-points and opportunities in the current service ecosystem are. Also, the results of this sub-research question are directly linked to the fourth contribution of the dissertation, Reactivity-Proactivity Spectrum.

SQ2: How to define the concept of proactivity?

Through this sub-question the essence and characteristics of proactivity are defined and analysed. The results of this sub-research question are linked to the fourth contribution of the dissertation, Reactivity-Proactivity Spectrum and will be complemented by the desk research that will be done on government stage models and proactivity as a novel concept in service delivery in the public sector.

SQ3: What are the prerequisites for proactive citizen-centric services?

To answer this sub-question the concept of socio-technical systems will be analysed. As an extension of the discussion on socio-technical systems both human and technological factors will be mapped out to describe certain attributes that could affect the outcome of proactive service design. The results of this sub-research question are

linked to the third contribution of the dissertation, the set of guidelines for designing proactive services.

SQ4. What approaches or service design methodologies could be beneficial to consider when designing and developing proactive public services?

The purpose of this sub-question is to determine if there are a number of expected steps or approaches that could aid the development of proactive public services. The results of this sub-research question are linked to the third contribution of the dissertation, the set of guidelines for designing proactive services.

SQ5: How to utilise this knowledge in the real world?

Lastly, this sub-question aims to centralise the gathered information and helps to make an academic and a real-world setting. The final sub-research question serves the purpose of collocating the results of the sub-questions one to four.

The outline of the dissertation is as follows. The dissertation is comprised of five sections. In the current, high-level introduction, the background information and motivation for the current research were given in the field of proactive services, the chosen research approach was explained, research questions discussed, and the relation to the four main contributions of the dissertation introduced.

The first section on related work presents the existing body of connected research and examples in the areas of socio-technical systems, e-governance, its metrics and stage models, the essence of services and service provision, the concept of proactivity, and service design approaches.

The second section is focused on the research methodology, where research design, data collecting procedures, and research limitations are brought out among other issues. This section provides the reader with an overview of aspects that need to be considered when judging the dissertation's research rigour.

The third section is devoted to the case studies. For the analysis of this dissertation four main case studies and two complementary analyses were analysed. Examples were chosen from a range of services and sectors, as case studies cover the issues of birth and family service provision, service provision for disabled children's parents, services for the homeless, and life and business event service provision. The two complementary analyses focus on the technological and ethical/legal requirements for designing proactive public services. The necessity for the complementary analyses derived from the need to focus on technological and ethical/legal requirements in proactive service delivery in more detail. Here, the necessity of including these two aspects are stressed. In this section the case studies are described, and results presented. The latter of the section describes the discussion based on the of the case studies in relation to the research questions presented in the introduction and theoretical concepts brought out in the first section on related works.

The fourth section focuses on the discussion and contributions of the dissertation. In the first part of the section main conclusions from the research are presented, the research questions are answered, and main theoretical concepts of socio-technical systems, e-government stage models, and service design methodologies are analysed.

The second part of the section is divided into four main contributions that are the result of the case study analysis, theoretical reviews, and the section on discussion.

The dissertation ends with concluding remarks and directions and potential for future research together with 9 appendices.

Abbreviations

AOM	Agent-oriented modelling
D9	Digital 9 (Previously Digital 5 and Digital 7) Union of digitally advanced countries: Estonia, Israel, United Kingdom, New Zealand, South Korea (D5), Canada, Uruguay (D7), Portugal, Mexico (D9)
EISA	Estonian Information Systems Authority
GDS	Government Digital Service (United Kingdom)
ICT	Information Communication Technology
LBE	Life and Business Event (Services)
MEAC	Ministry of Economics and Communication of Estonia
SDN	Service Design Network
STS	Socio-technical systems

1 Related work

This chapter describes the main concepts that form the framework of this dissertation to provide a more detailed understanding of the domain. The work reported in this dissertation is divided into sub-sections and relates to three distinct areas of prior work and a range of approaches such as socio-technical systems, e-governance, and service design. The subsections below discuss related work in these three areas respectively.

1.1 Socio-technical systems

One of the main ideas shaping the subject area is the concept of socio-technical systems (STS). Socio-technical systems are systems where human, social, and organisational factors, as well as technical factors are considered together. Socio-technical systems design should be a process that takes into account both social and technical factors that influence the functionality and usage of computer-based systems (Baxter & Sommerville, 2011). One observable example of such a system is an e-governance system that comprises both factors within its domain. Adopting socio-technical approach to system development can lead to systems that could be more acceptable to end users and provide better value to stakeholders (Baxter & Sommerville, 2011).

1.1.1 Background

The theory of socio-technical systems first occurred in conjunction with a number of projects that were undertaken by the Tavistock Institute in the British coal mining industry after Second World War (Trist, 1981). One of the projects focused on group dynamic and relations within all levels in a single organisation. The second project was concerned with spreading innovative work practices and organisational activities to grow productivity. In the first project the organisation, an engineering company in the private sector, was approached as a social system, while the other project included both technical and social system in the factors to be considered (Trist, 1981). During the research it was found that both technical and social aspects need to be considered and the relationships between these two parts of a system can be perceived as a new field of research. The theory, thus, explicitly focuses on a connection between the technical and social sub-systems, which together make up an organisation. Consequently, it was argued that successful systems require a simultaneous configuration of technical, organisational, and social aspects of the system (Bostrom and Heinen, 1977).

1980s and 1990s were met with a renewed interest in the socio-technical theory. Practitioners confirmed that even the most advanced technologies will work efficiently if social components in the process are addressed. For instance, the highest productivity and quality in the automotive industry was achieved at factories where flexible automation and flexible work systems were integrated and supported by human resource practices (Kochan and Gershenfeld, 2000; MacDuffie and Pil, 1997).

Socio-technical systems are often characterised by stability (Cooper, et al., 2017). Such established systems can be stabilised by roles, routines, and ways of thinking and doing (Geels, 2004; Geels, 2002; Kemp, 1994) and by legally binding contracts (Walker, 2000). Baxter and Sommerville (2011) claim that it is widely acknowledged that adopting a socio-technical approach to systems development could lead to systems that are more acceptable to end users and deliver better value to stakeholders. Even though it is now understood that socio-technical factors are relevant, socio-technical design methods are seldom used (Baxter and Sommerville, 2011). The methods consider the human, social,

and organisational factors in addition to technological components in organisational systems' design. The reason for the low usage of socio-technical design methods, they argue, could be that there are difficulties in using and understanding technical systems. This could be due to the issues with technology engagement. That, in turn, may contribute to a situation where technological systems cannot meet the expected requirements of fulfilling the goals of an organisation (Baxter and Sommerville, 2011).

The basis for socio-technical systems thinking is that the design of a system should be a process that considers both social and technical factors that influence the functionality and usage of computer-based systems (Baxter and Sommerville, 2011). It is argued, that there is a need for a pragmatic approach to introducing socio-technical considerations into software procurement and development processes gradually and step-by-step (Baxter and Sommerville, 2011).

However, it is possible to witness a change from traditional socio-technical systems thinking towards a digital socio-technical systems' thinking. Winby and Mohrman (2018) present a comparison (Figure 1), which illustrates the move from focusing on a segment of an organisation or an organisation to the full network of agents and ecosystems. The authors argue that the introduction of digital technologies has further acted as a catalyser for fundamental change in societal norms, behaviours and expectations. Furthermore, digital technologies have enabled changes in how organisations operate, as the processes can now be characterised by horizontal organisation and increasingly virtual relationships to citizens or customers and to other stakeholders. Currently, the trends are moving towards building work systems that increasingly more often include robotics, artificial intelligence (AI), and machine learning (Winby and Mohrman, 2018). These tools enable information processing and exchange on an unprecedented scale.

The level of intelligence of these smart machines is increasing, and that, in turn, guides towards greater autonomy in decision making. The move is from machines that require highly structured and detailed context to those, which are capable of understanding and reading a more complex context (Davenport and Kirby, 2016).

Dimension	From: Traditional STS	To: Digital STS design
Era and time	Industrial and Computer: 1950-2010	Digital Era: 2011–current–future
Technology	Mechanical and computer	Digital, machine leaning/AI
What leads to high performance	The organization's social and technical work system optimization and fit. Absorption of uncertainty.	Social (stakeholder motivations), Technical (work processes), digital technology, and information optimization and fit. Agility in face of uncertainty and variation.
Unit of analysis for design	The organization and its work units	Ecosystem
Technical system	Internal focus, linear, routine, production/office processes	Internal and external focus, network of activity, nonlinear, uncertain, e.g., customer user journey
Social system	Workers, work processes, and management	Ecosystem/network
Work system	Work units—jobs, roles, teams, and workflow regulation. Interpersonal deliberations and iterations.	Operating model—Smart teams with digital system central to coordination, integration, and learning. Work systems that cut across organizations and include stakeholders and members of the relevant ecosystem.
Cybernetic system	Self-regulation	Artificial intelligence, decision criteria and support built into digital system, continuous learning system
Approach to design	Design project by project: Implementation, assessment and iteration	Continuous design: research, accelerated design and build, measure, learn, and iterate. Automated data and feedback providing ongoing sensing of problems and opportunities and trigger redesign.

Figure 1 From traditional socio-technical systems to digital socio-technical systems (Winby and Mohrman, 2018)

Socio-technical factors vary across research areas. However, here is presented a non-exhaustive list of human and technological factors in the context of socio-technical systems (according to Cooper, et al., 2017; Geels, 2012; Geels and Kemp, 2007, Carayon, 2006) are listed in Table 1 below:

Table 1 Socio-technical systems factors

Human factors	Technological factors
Cognitive routines, habits, heuristics (Geels, 2012)	Repetition, inertia, incremental change along predictable trajectories (Geels and Kemp, 2007)
Investments, contracts, standards, expectations (Geels and Kemp, 2007)	Devices, tools, techniques (transforming inputs into outputs) (Khan, et al., 2010)
Awareness training, quality, safety and security, behaviours (Carayon, 2006)	Technical requirements, systems life-cycle (Baxter and Sommerville, 2011)
Workforce, knowledge, skills, attitudes, values, needs, rewards system, culture, processes (Khan, et al., 2010)	Conditions of physical artefacts (Davis, et al., 2014)

1.1.2 E-governance as an example of a socio-technical system

Socio-technical systems design (STSD) methods enable designing systems that consider human, social, organisational, and technological factors in the design of organisational systems (Baxter and Sommerville, 2011). For the purpose of this doctoral dissertation socio-technical systems design is considered in the context of e-governance research. Socio-technical theory is broadly regarded as one of the keys to information systems success (Bostrom and Heinen, 1997). Kling and Lamb (1999) claim that the high failure rate in many information systems' development is that often information technology is considered as a tool instead of a socio-technical system. Socio-technical systems research applies to e-government as an institution with one-way communication, and e-governance as a transactional, two-way communication between people, organisations, and technologies (Khan, et al., 2010). The concept is especially relevant in the context of e-governance development as the underlying premise of socio-technical thinking is that systems design should be a process that considers both technical and social factors that influence the functionality of computer-based systems (Baxter & Sommerville, 2011). According to Carayon (2006) the design of socio-technical systems that involve input and work across different spheres requires better integration of different sub-disciplines or components of human factors and ergonomics (HFE), e.g. how humans and other elements of a system interact. Moreover, increased cooperation with other disciplines is needed for providing expertise about the domain or about different concepts that could enrich the system's design (Carayon, 2006).

The ICTs and society are converging, and new types of socio-technical systems are increasingly more observable. ICTs have enabled the creation of new types of products, services, organisational models, and other objects that could be seen as the result of the interconnected application of both social and technological factors (Winby and Mohrman, 2018). One of the examples of such new socio-technical systems is the concept of digitalisation. For instance, a digitalised organisation, a socio-technical system, relies heavily on ICTs in its core activities and operations contrary to companies where IT is used as a complementary tool. However, digital organisation needs social components to be more productive, as both industrial processes and service delivery are increasingly dependent on marketing, ergonomics, and project management among others. Digital platforms such as Amazon, Facebook or Uber, and digital organisations often in general, have fundamentally changed the human relationships firstly with companies and public organisations, and secondly, with technology overall (Winby and Mohrman, 2018).

The notion, socio-technical system, is a reminder, that technology is always developed, designed, and used within social systems (Liker et al., 1999). Technology enters into relationships with organisational structures and motivates values that are producing and shaping cultures that are fluid, yet coherent (Jolly et al., 2006). Social requirements are shaping technologies, but it is increasingly easy to witness the emergence of techno-social systems in which technological processes will be shaping society. Digital platforms are influential enablers of the communication, coordination, and knowledge transferring and generation with the influence spanning over various areas (Winby and Mohrman, 2018). This includes transforming social, financial, and public institutions according to advanced technologies, such as e-governance systems or artificial intelligence. It is possible to argue the development of these spheres is dependent on emerging and disrupting technologies. Additionally, the customers or users of these new systems and services have enormous power to contribute to co-creation of them (Carayon, 2006).

E-governance is primarily concerned with two different perspectives. Firstly, a technological or IT perspective, where the main question is how to apply ICTs best for public sector's purposes. Second is the public administration or societal perspective, where the main questions address how to govern individual citizens, groups of people, and locations through the application of ICTs. The challenge is to consider the functionality, efficiency, and effectiveness of digital work systems, such as is e-government, and its design (Winby and Mohrman, 2018).

1.2 E-governance

The constantly changing role of the state ensures that people's expectations in public services are shifting and more services need to be delivered in an increasingly efficient manner (Sirendi, 2012). Electronic government "also e-government, digital government), a concept that initially emerged in the public administration of industrial countries (Schuppan, 2009), developed as a reaction to these expectations. E-government has become increasingly prevailing in delivering services and public value efficiently and in a timely manner. There is an increasing demand on countries to make use of the allocated resources in a progressively efficient manner (Lindgren & Jansson, 2013). People work and live across organisational, geographical, cultural, and temporal boundaries in world that is "flattening" (Friedmann, 2005), and thus, the public sector is expected to respond to the changed needs of people.

1.2.1 The development of e-governance

It is possible to divide the concept of applying information and communication technology (ICT) for information exchange, government service delivery, and systems integration among others into two separate notions. The term "electronic government" was first coined by the US National Performance Review in 1993, and the term "e-government" gained more traction from 1997 (Heeks and Bailur, 2007; Meyerhoff Nielsen, 2016). Often e-government and e-governance are discussed interchangeably (Guida & Crow, 2009), however they are representing two entirely different but connected concepts. E-government as a concept is commonly used to describe service delivery via ICTs to citizens, businesses, and governments (Guida & Crow, 2009), thus representing the provision of one-way communication options. It is more often associated with particular government services, such as e-tax, e-transportation or e-health (Sheridan & Riley, 2010). E-governance, in turn, is a broader topic that is used

primarily in this doctoral dissertation in regards to the whole spectrum of issues (Sheridan & Riley, 2010) with the transformation of the relationship between governments and citizens in information society as a whole (Guida & Crow, 2009), and thus, representing a two-way communication between the stakeholders (Scholta, et al., 2017).

In the early days, e-government was largely concerned with digitising traditional government functions. The approach to the traditional functions of government would be to digitise them to improve convenience to citizens and cost to government (Linders, et al., 2015). This process was aided by government stage or maturity models, which looked at the development of governance through a sequence of potential steps of stages. These models (by Layne and Lee, 2001; Reddick, 2004; World Bank, 2003 and others and discussed more thoroughly below) often see the end of the stage or the highest stage for government a unified, customisable online portal as the stage of "full maturity" (Linders, et al., 2015).

Today, many advanced governments have reached or are about to achieve this final milestone of implementing a comprehensive and increasingly mature e-government portal (e.g. USA.gov, Gov.UK, eesti.ee in Estonia, and eCitizen Portal in Singapore among others). While many countries are still thriving towards that "Holy Grail", many stakeholders are now asking: "What's next?" (Linders, et al., 2015). This dissertation seeks to address the gap in knowledge of how proactive service delivery or proactive e-governance could be the agreed-upon next stage in the government stage models. The fourth contribution of Reactive-Proactive Spectrum seeks to answer to this aim.

1.2.2 Metrics

Different indices have been developed to assess the development and status of e-government and e-governance practices. One of the more widely known overviews is the United Nation's Department of Economic and Social Affairs' (UNDESA) survey dating back to 2001 (UNDESA, 2017). Such indices include a number of indicators and points of comparison to illustrate the development and progress United Nation's (UN) countries have made in implementing e-government services. The most recent UN E-Government Survey (2018) indicators include such as "the adequacy of telecommunication infrastructure, the ability of human resources to promote and use ICT, and the availability of online services and content" (UNDESA, 2018, pp xx). The progress of e-government development is tracked through the E-Government Development Index (EGDI) that is comprised of the averages of three following indices: Telecommunications Infrastructure Index (TII), Human Capital Index (HCI), and Online Service Index (OSI). EGDI measures e-government progress on the national level where as the data for the three measured indices, TII, HCI, and OSI, are respectively provided by the International Telecommunications Union (ITU), United Nations Educational, Scientific and Cultural Organization (UNESCO), and independent survey questionnaire that measures the presence of all United Nations Member States separately. The features that are assessed are related to online service delivery, multi-channel service delivery, mobile services, usage up-take, digital divide, and innovative partnerships through the use of ICTs (UNDESA, 2018). Additionally, the EGDI is used to measure the readiness and capacity of national administrations to use ICTs to deliver public services. As seen in Figure 2 the top 20 countries in e-government development in 2018 are as follows.

Country Name	Region	OSI	HCI	TII	EGDI	2016 Rank	2018 Rank
Denmark	Europe	1.0000	0.9472	0.7978	0.9150	9	1
Australia	Oceania	0.9722	1.0000	0.7436	0.9053	2	2
Republic of Korea	Asia	0.9792	0.8743	0.8496	0.9010	3	3
United Kingdom of Great Britain and Northern Ireland	Europe	0.9792	0.9200	0.8004	0.8999	1	4
Sweden	Europe	0.9444	0.9366	0.7835	0.8882	6	5
Finland	Europe	0.9653	0.9509	0.7284	0.8815	5	6
Singapore	Asia	0.9861	0.8557	0.8019	0.8812	4	7
New Zealand	Oceania	0.9514	0.9450	0.7455	0.8806	8	8
France	Europe	0.9792	0.8598	0.7979	0.8790	10	9
Japan	Asia	0.9514	0.8428	0.8406	0.8783	11	10
United States of America	Americas	0.9861	0.8883	0.7564	0.8769	12	11
Germany	Europe	0.9306	0.9036	0.7952	0.8765	15	12
Netherlands	Europe	0.9306	0.9206	0.7758	0.8757	7	13
Norway	Europe	0.9514	0.9025	0.7131	0.8557	18	14
Switzerland	Europe	0.8472	0.8660	0.8428	0.8520	28	15
Estonia	Europe	0.9028	0.8818	0.7613	0.8486	13	16
Spain	Europe	0.9375	0.8885	0.6986	0.8415	17	17
Luxembourg	Europe	0.9236	0.7803	0.7964	0.8334	25	18
Iceland	Europe	0.7292	0.9365	0.8292	0.8316	27	19
Austria	Europe	0.8681	0.8505	0.7716	0.8301	16	20

Figure 2 E-Government Development Index 2018 from the UN E-Government Survey 2018

The United Nations E-Government Survey is not constructed to illustrate the development of e-government on an absolute scale, but rather to provide an indicative picture of the diffusion of ICTs in the public sector context (Kash, 2016). The argument is supported by the fact that, frequently, indices can be rather specialised and fail to give a holistic overview of countries' e-government and e-service development (Kitsing, 2010).

In addition to the United Nations e-government indices, a number of other approaches to assessing e-government development can be brought out. For instance, Kunstelj and Vintar (2004) assessed the development with a monitoring approach based on available government stage models and by focusing on evaluating integrated e-services. Their model included four dimensions: environment maturity, back-office, front-office, and impact-related qualities. The overview of the model is presented in Figure 3 below.

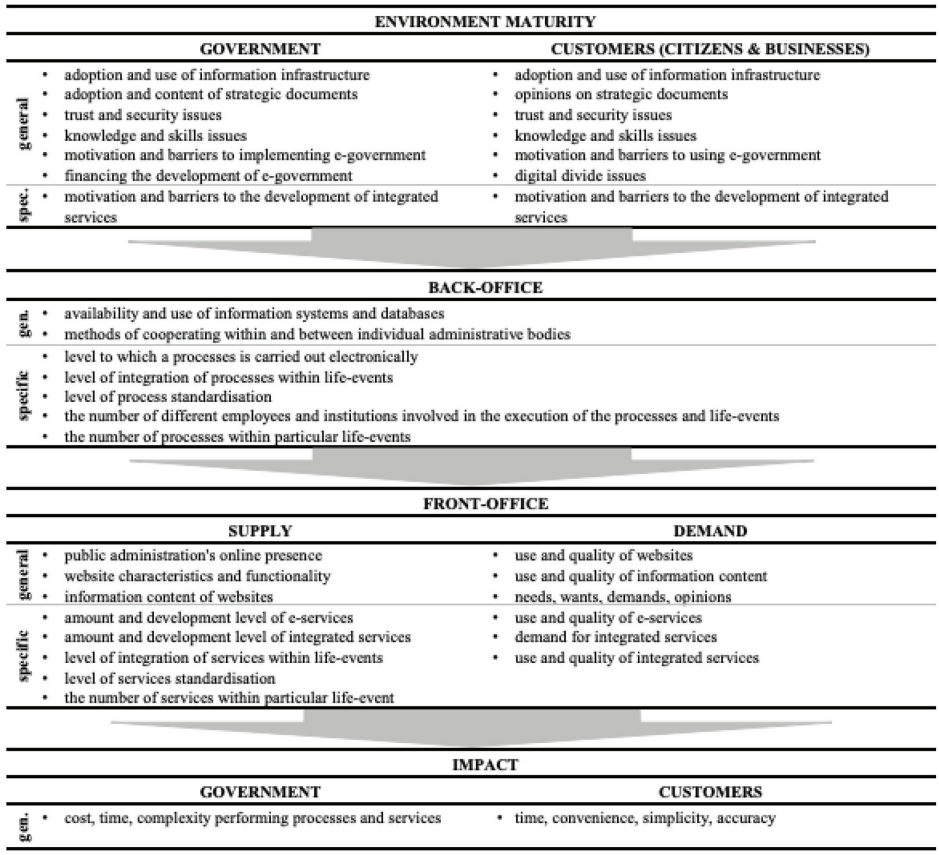

Figure 3 A holistic approach for monitoring the development of e-government focusing on evaluating integrated e-services (Kunstelj and Vintar, 2004, p. 144)

It can be assumed that the relevance of the model will grow, as it provides valuable information both for quantitative and qualitative data analysis. The approach provides a holistic overview of the qualities that need to be considered when assessing the development level of a government. Surprisingly, the model even includes the notion of life events, which according to the author of the dissertation sets the foundation for proactive service-oriented thinking.

The hype of e-government has created an image, which claims it to be a silver bullet for modernising public administration (Becker et al., 2004). However, the experiences of individual countries are rarely homogeneous. The success or failure of e-government initiatives depends on a wide variety of factors. Becker et al. (2004) propose a number of success factors:

- Up-to date information,
- Better customer service,
- Advanced reachability,
- Optimisation of business processes,
- Flexibility,
- Cost reduction,
- Enlargement of procurement market,
- Service externalisation.

The evolution and diffusion of technology more generally, and ICTs particularly, have ensured a revolution in how people live and work. Growing possibilities in enhancing public administration are no exception. Some of the first examples of providing public information and services online first began already appearing in the mid-1990s. Now, an increasing number of countries are pursuing to transform the way in which citizens are catered and services provided.

The number of research papers has increased tremendously over the last decade. More countries and governments see implementing e-governance as a next step for modernising administrative processes, increasing transparency, and advancing civic society through technology (Rose and Grant, 2010; Khan, et al., 2010; Yildiz, 2007). The technological capabilities of individual countries and institutions within them are increasing and are being put into use to optimise governmental procedures (UNDESA, 2018). Interestingly, early students of technology regarded technological issues in government as a marginal concern rather than a central management function (Yildiz, 2007). This viewpoint, however, has been refuted, as technology, more specifically ICTs, are recognised to have tremendous administrative potential (see Yildiz, 2007; Bhuiyan, 2011; Fatile, 2012; Khan, 2018). ICT's could help create a "networked structure for interconnectivity" (McClure, 2000 in Yildiz, 2007), aid in providing more dynamic and relevant channels and ways for providing services depending on the technological capabilities and literacy of a society, efficiency and effectiveness, decentralization, transparency, and accountability.

1.2.3 Government stage models

Since the emerging of the Nolan's "stages of growth" model (Nolan, 1973) a number of maturity or stage models have been developed to describe the evolutions of computing in organisations (Lindgren and Jansson, 2013). Nolan claimed that stage theories are based on the premise that elements or components in systems move through a set of distinct stages or levels over a period of time and that these stages can be described. Kuznets (1965) stated two guidelines for a stage theory. Firstly, the characteristics of each stage should be distinct and empirically testable, and secondly, the analytical relationship of any stage to its predecessor or successor should be well defined. Thus, it must be possible to determine what causes a component or element in the stage model to move from one to the next (Nolan, 1973). In Nolan's context, a stage model for the use of computers in an organisation, the stage model consisted of four stages (that were later supplemented by two extra stages). Stage one, initiation, which is brought about by the introduction of the computer in an organisation. Stage two, contagion, is characterised by a managerial concern to encourage the alienated users to investigate the potential of computing. Stage three, control, is met as a result of a crisis where an increasing number of expenses are going on computer systems. In this stage the computer-related work processes are organised. Lastly, stage four, integration, is marked by the refinement of the control tasks and the elimination of the more arbitrary ones (Nolan, 1973). Nolan extended the model in 1979 by adding the fifth stage, data administration, and sixth stage, maturity (King and Kraemer, 1984; DeBri and Bannister, 2015).

Similar models have been developed to predict and describe the perceived phases of government (see Layne and Lee, 2001; Reddick, 2004; Andersen and Henriksen, 2006; Lee, 2010). These models, describing the development of e-governance, allow us to make some general estimations by dividing the development into four general categories: cataloguing – governments focusing on establishing their online presence; transactions, where a government's focus is on connecting "the internal government system to online

interfaces and allowing citizens to transact with government electronically" (Layne and Lee, 2001), vertical integration, which refers to the connectedness on a local, state, and federal level; and horizontal integration, where integration takes place across and between different functions and services (Layne and Lee, 2001). Although these models may explain e-governance development in many countries and may cover the basic features of e-governance growth, these do not explain the potential phases conclusively.

Since the first stage models of e-government were developed in the beginning of 2000s at least 15 variants have been published in the academic and professional literature (DeBri and Bannister, 2015). Table 2 below shows the overview of the stage models.

Table 2 Government stage models as represented in DeBri and Bannister, 2015 and Lindgren and Jansson, 2013

Author(s)	Stage one	Stage two	Stage three	Stage four	Stage five
Layne and Lee (2001)	Catalogue	Transaction	Vertical integration	Horizontal integration	X
Hiller and Belanger (2001)	Information	Two-way communication	Transaction	Integration	Political participation
Moon (2002)	Information dissemination	Two-way communication	Service and financial transactions	Vertical and horizontal integration	Political participation
World Bank (2003)	Publishing	Interactivity	Completing transactions	Delivery	X
United Nations (2003)	Presence	Enhanced (dynamic information)	Interaction	Transactional	Seamless and full integration of e-services across boundaries
Reddick (2004)	Cataloguing information	Transactions	X	X	X
Siau and Long (2005)	Web presence	Interaction	Transaction	Transformation	E-democracy
Janssen and Van Veenstra (2005)	No integration	One-to-one messaging or transactional services	Centralised repository among government agencies	Message broker to deliver real-time services	More integrated and seamless services to citizens using orchestrated broker architecture
Andersen and Henriksen (2006)	Cultivation	Extension	Maturity	Revolution (ownership of data is transferred to customers)	X

Klievenk and Janssen (2008)	Stove-piped applications	Integrated organisation	Nation-wide portal	Inter-organisational integration	Demand-driven, joined-up government
Gottschalk (2009)	Computer interoperability	Process interoperability	Knowledge interoperability	Value interoperability	Goal interoperability
Lee (2010)	Presenting	Assimilating	Reforming	Morphing	e-Governance
Valdes et al. (2011)	Initial capability	Developing capability	Defined capability	Managed capability	Integrated capability

DeBri and Bannister (2015) claim that e-government stage models are hybrids, which are positioned between behavioural science models and design science models, i.e. many of the models' initial stages have been witnessed empirically, however, the later stages are aspirational. However, Meyerhoff Nielsen (2016) argues that in addition to the previously distinguished stages, the maturity models in general can be divided into three types of stage models:

1. Governmental models, which are developed by governments, consultants, and academic in order to help authorities define and improve their level of maturity;
2. Holistic approach models, which are designed to help authorities in project implementation and determining its potential success;
3. Evolutionary e-government maturity models, which focus on the sequential evolutionary steps, for instance from immature to mature e-government (Concha, et al., 2012; Fath-Allah, et al., 2014).

In the context of the current dissertation, the focus will be on the third group, evolutionary e-government maturity models.

In 2017, Gartner provided an additional rendition of e-government stage models that assessed the digital government maturity by the extent of how efficiently data is used in organisations in order to redesign services and deliver new ones (Gartner, 2017). The stages provided by Gartner included the following: Level 1 – Initial stage, e-government, where the focus is moving on services online for user convenience and cost saving. Level 2 – Developing stage, open governance, which is claimed to be not necessarily subsequent to level 1. Here transparency, citizen engagement, and data economy are promoted through open governance. Level 3 – Defined, data-centric governance, where the focus of the government shifts from simply listening to the needs of citizens to proactively exploring new ways to strategically collect and leverage data. Level 4 – Managed, fully digital governance, where the preferred approach to innovation is based on open data principles, freely flowing data, and the increase in service delivery quality. Lastly, Level 5 – Optimising, smart governance, is where the process of digital innovation using open data is embedded deeply across the entire government. Here, the innovation process is predictable, repeatable, and capable of responding to unforeseeable situations (Gartner, 2017). The author of this thesis deems this model to serve as an especially beneficial input for the development of the fourth contribution of the dissertation, the Reactivity-Proactivity Spectrum.

1.2.4 The essence of services

Multiple authors have covered the essence of services in general, and e-services in particular, (see Persson and Goldkuhl, 2005; Cromer, 2009; Lindgren and Jansson, 2013; Jansen and Olnes, 2016) over the last decades. However, the authors of e-services and

e-government have a different understanding of how a public service could be defined. Although discussed here interchangeably, the main focus of the dissertation is on the provision of public e-services. Such services are provided by or on behalf of public organisations, and the provision of such services is carried out through different channels, including the electronic means. It can also be defined as "an execution of the instantiation of an activity generating, an artefact and/or a stage change of the artefact or the input agent, consuming entities (capacity to serve) grouped in resources, inputs and controls; attempting to satisfy customer needs" (Badja, et al., 2010, p 622). They defined the service as an execution activity, which can be seen as the instantiation of an activity done by affecting a value to the activity, resources, inputs, controls, and outputs.

The word "service" can refer to the action of process of serving, an act of assistance, and a system supplying a public need (Lindgren and Jansson, 2013). As also seen in the previous examples, the service can be seen as an activity (Grönroos, 2008) that has a set of agreed characteristics. These characteristics, used initially by the marketeers of services in the beginning of the 1990s to separate these from products, are: intangible, heterogeneous, inseparable, and perishable – often referred to as "IHIP" characteristics (Parry, et al., 2011). Intangible means the immateriality or the characteristic on being untouchable. The service has intangible results. Heterogeneous refers to the service being an activity instantiation where every instance is different and varying according to the content (Parry, et al., 2011) with a common base such as a service activity description (Badja, et al., 2010). Inseparability in services refers to their linkage with customers in terms of production and consumption. In contrast, a manufacturing company can still produce and deliver services through channels even without knowing the end user. And lastly, perishability means that the services will perish in the very instant of its performance, thus not being a stock or a fixed asset that can be stored in inventories (Parry, et al., 2011).

Although "IHIP" characteristics have been recognised as being able to represent the core essence of services and by providing a comparative aspect in regard to products, the characteristics have been subjected to criticism. The growing number of occurring exceptions in distinguishing services from products have resulted in substantial criticism. The initial development of "IHIP" characteristics looked primarily at personal, low-tech, and high-touch services (Moeller, 2010). However, the concept of service marketing has now changed since the beginning of 1990s and the inclusion of ICTs in service provision has changed the essence of services dramatically (Lovelock and Gummesson, 2004).

E-service is broadly used for almost any type of electronic communication between governments and their people (Lee, 2010; Lindgren and Jansson, 2013). However, there is little consensus in the exact meaning of the concept of e-service, as literature is full of similar, almost synonymous, terms such as digital service, e-government service, online service, or electronic service among others. (Lindgren and Jansson, 2013). This contributes towards difficulties in carrying out benchmarking activities, which would allow assessing the quality of services against other countries' provision (Jansen and Olnes, 2016). Although the concept of e-services is very rich in content of definitions (see Ebbers, et al., 2008; Jansen, de Vries and can Schaik, 2010; Karlsson, et al., 2012; Jansen and Olnes, 2016), there is some agreement on the essence of it being a multi-dimensional construct. It addresses a concept that is intangible in nature, provided through electronic means, and serves the purpose of people living in country or municipality's jurisdiction.

As discussed above, different authors have seen services as a sum of activities that realise a public authority's commitment to make available to businesses, individuals, or other public organisations something they need (Badja, et al., 2010; Guarino, 2017). Furthermore, service provision is an activity that results from the aggregation of multiple service actions for the benefit of a single customer, and service is an aggregation of service provisions that could possibly involve multiple customers (Guarino, 2017) and other stakeholders. Figure 4 illustrates the public service as proposed by Guarino (2017).

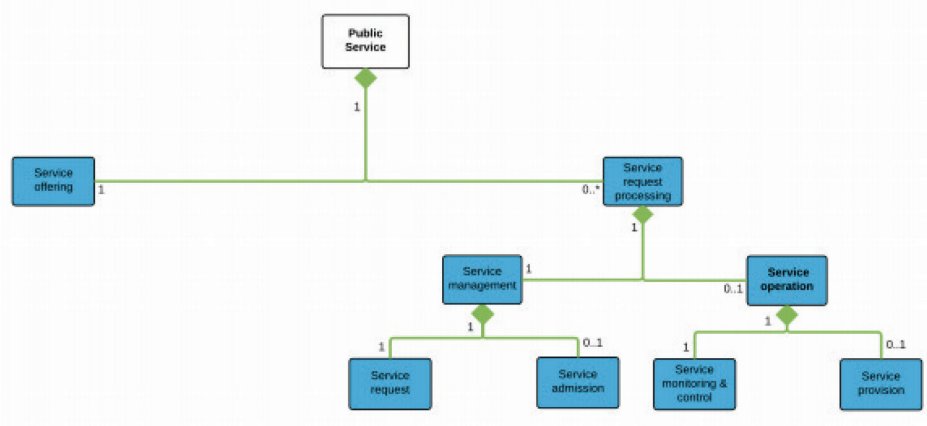

Figure 4 Public service as a sum of activities (Guarino, 2017)

Unlike a product, service components are often not physical entities, but rather a combination of processes, skills, and resources, that must be integrated properly in order to result in the planned and designed services (Goldstein et al., 2002). When re-designing services, managers, designers, community members, and other stakeholders must make decisions about each component of the service. This way numerous decisions are made even for the simplest services as the involved processes are continuously on-going (Goldstein et al., 2002). The variety of stakeholders and their changing missions leave public agencies unable to conclusively achieve efficiency in their operations (Karwan and Markland, 2006).

1.2.5 Life and business event services

Services based on life events are becoming increasingly prevalent. This is also shown by the recent focus of the European Commission to promote across Europe electronic services based on life events (European Commission, 2018a; European Commission, 2017a).

Based on a life-cycle theory, which is discussed thoroughly in regards to the fields of economics and marketing (see Modigliani and Brumberg, 1954; Deaton, 2005), it is suggested that individuals plan their actions and behaviour over their life(-cycle) and take into account their needs and demands at various ages (Deaton, 2005) among other things (Meier and Massberg, 2004). This theory helps to make predictions of the relationship between wealth levels and retirement plans in the economy (Kõrge, 2019). Additionally, Wimmer and Tambours (2002) argue that life events (such as getting married or divorced, buying a new home or selling an old one, or giving birth) are situations where people require public services. Business events are situations where companies or self-employed citizens interact with public services or public authorities (such as in the cases of declaring taxes or applying for permits) (Kõrge, 2019).

However, the concept of life and business events is continuing to evolve over time, as now, the notion refers to a situation where multiple organisations provide services in collaboration in order to provide the citizen with a holistic service experience (Sirendi, et al., 2018). European Commission (2017a; 2018b) has presented the CPSV-AP (Core Public Service Vocabulary Application Profile 2.2.) as the first step towards creating a model for describing public services related to business and life events in order to aid the creation of (potentially) holistic public service catalogues across the European Union. The business events that are considered in CPSV-AP's context are starting a business (including registering a company, financing a company), doing business (e.g. participating in public procurement, starting a new activity) or closing a business. The life events include but are not limited to having a child, becoming a social caretaker, looking for a new job or changing a relationship status (European Commission, 2018b).

The CPSV-AP has also caught traction in Japan through cooperation between Tallinn University of Technology (with participation of the author of the current dissertation), Asukoe Partners and Ministry of Economics and Communications of Estonia (Rozov, 2018). Asukoe Partners Ltd. have created a concept of Universal Menu DataBase to categorise and standardise public service information, while creating public service identification numbers that would enable streamlining the updating process of government (Universalmenu.org, 2019).

1.2.6 Proactivity

Proactivity in public administration and service provision context is not researched broadly (Sirendi and Taveter, 2016; Kroonmäe, 2017; Kõrge, 2019). However, it is possible to bring out a few studies, which focus on the concept of proactive service delivery in the public sector. One of the earlier studies by Callen and Hasanain (2011) focuses on the Punjab Government's initiative to gather feedback from citizens in order to prevent corruption by monitoring officials through service beneficiary feedback, through empowering direct citizen engagement, and by improving service delivery by allowing the reporting of problems. This approach is defined as proactive governance, as the purpose of it is to proactively engage the citizen through asking feedback via SMS messages, rather than waiting for problems to arise (Callen and Hasanain, 2011). The proactive engagement has the potential of revealing to citizens that the government is serious about addressing and forestalling their problems, and about making sure that the citizens receive satisfactory services.

One of the later perspectives on proactivity has shown that governments are increasingly requested to "push" services towards citizens, instead of getting citizens to "pull" services from the government. Such a phenomenon is now noted as proactive e-government. The citizen must not seek information or services from government, but the government proactively and seamlessly delivers services to the citizen (Linders, et al. 2015). For instance, a proactive service can be triggered upon the occurrence of a life event, e.g. a marriage, childbirth, or starting a new business. Thus, the concepts of life-cycles, and life and business event services comprise additional importance. Linders, et al. (2015) present three cases from Taiwan and bring forth three pillars of Taiwan's proactive e-government strategy: service excellence, operational efficiency, and digital inclusion. The case studies illustrate a move towards proactive, integrated service and information delivery coupled with data-driven personalisation. The first case focuses on service excellence through an "e-HouseKeeper" project, which pushes information and services to citizens based on life events, eligibility triggers, personal preferences, and location via freely chosen channels. The second case, "Taipei 1999" focuses on

operational efficiency through improving government responsiveness by empowering call centre representatives proactively pre-empt and satisfy citizens' needs. And lastly, digital inclusion is addressed through a "Door-to-Door e-Services" initiative, which utilises frontline civil servants to use mobile connectivity to more proactively service vulnerable groups of citizens and bridge the digital divide by physically delivering virtual services (Linders, et al., 2015).

Excluding the examples of proactive e-governance, the notion of proactivity in an academic setting itself is not a new one. It dates back to 1980s and the field gained widespread recognition only in mid-1990s (Wooldridge, 2002). According to Leo Mõtus, proactive systems and proactive technologies in a more formal and academic setting are multi-agent systems, where the agent is no longer just only reactive and interactive, but also with its own goal, and it responds and acts according to the probability of the success potential of its goal (Mõtus, 2009). It has been widely recognised that interaction is probably the most important single characteristic of complex system. Wooldridge (2002) argues that agents, that have their goals, have three distinct features. Firstly, reactivity is where intelligent agents are able to perceive their environment and respond to changes on time in order to satisfy their design objectives. Secondly, proactivity is witnessed when intelligent agents are able to exhibit goal-directed behaviour by taking the initiative in order to satisfy their design objectives. And thirdly, social ability, which is characterised by the agents' capability of interacting with other agents in order to satisfy their design objectives (Wooldridge, 2002).

One of the challenges with proactive systems is how to limit the activities of the proactive systems according to what is allowed by the creators or users of the system. Once we are designing a system, we have to decide, what will be the limits in which the system has to operate in. There could be different levels of abstractions possible within a system. Together with the system, the designers will also need to design the systems of control, as we can never fully comprehend where could the limits between a suitable and not suitable behaviour lie. These issues are addressed in a complementary case study on the legal and ethical requirements of proactive services.

1.2.7 Proactive and reactive services

Proactive e-government is becoming increasingly relevant, as the rapid uptake of mobile technologies, i.e. smart phones, tablets, and wearable technology, will create a possibility for the government to communicate with its citizens more efficiently. The social and technical aspects in providing technology appropriation have been widely studied before (Davis, 1989; Rogers, 1995; Mendoza, Carroll and Stern, 2010). However, the concept of proactive services and its appropriation in a society is only scarcely studied (Sirendi, et al., 2018).

Proactivity in essence and by definition means "preventative" or "forward-looking", while its antonym reactivity refers to reacting or responding to something (Kroonmaa, 2017). Proactive service, however, is not so well-defined nor fixed, as the concepts itself has not been researched widely in the public sector setting. However, Estonia has taken a step further in introducing proactive services in the public sector setting by defining the concept as a State Regulation: Principles for Managing Services and Governing Information (State Gazette, 2018). Still, taking into consideration the interpretations of proactive government and e-government above, it can be commonly agreed upon that a proactive service or stakeholder (e.g. government more generally or service provider more specifically) reaches out or "pushes" out to the customer or citizen instead of responding to or "pulling" citizens when a need or problem arises.

It is possible to differentiate between a service, an e-service, and a proactive service. A service is any act or performance one party can offer to another. Essentially, it is intangible and does not result in the ownership of anything. The production of the service may or may not be tied to a physical product. Also, manufacturers, retailers, and distributors are providing value-added services, or simply customer service, to differentiate them from other providers (Kotler and Keller, 2012). A public e-service is a service that an organisation provides through any communication channel for a person to give the right to fulfil their legal obligations of for using their legal rights. And finally, a proactive service is described as a service that is activated by a trigger, e.g. organisation's initiative, it presumes the will of the person, and uses the state information system data collections. A proactive service is provided automatically or if the permission for the person is asked (State Gazette, 2018). Furthermore, as can be seen in Annex 5 of the dissertation, the author of the thesis has presented a conceptual model for differentiating between the potential service routes both for proactive and reactive services. The more detailed overview is presented in the contributions' chapter.

Fundamentally, proactive e-services and e-governance are citizen-centred. Services are orchestrated in a way so that the user does not need to be aware of them or navigate through extensive bureaucratic structures. The citizen only has to react at key points or access points (Linders, et al., 2015). Ideally, automated workflows take care of the sequencing of agency request and actions. Such services would be classified as proactive and automatic services. Here, the future role of artificial intelligence (AI) and machine learning are expected to increase dramatically. Once the information to provide a specific public service exists in the state information system and it is assumed that the person would benefit or like to take advantage of the service, the organisation develops a proactive service together with the authority, which is managing the database. The information about the services would have to be easily accessible and released, for example in the state portal or any other relevant self-service portal. Here a once-only principle would apply, as the citizen should not have to submit data repeatedly, but there should be an option to renew the data. The organisation also gives information about the progression and the deadline of the service.

The arguments supporting the development of proactive services stem from the problems that "ordinary" e-services may encounter. Firstly, the person who is eligible for a service or a benefit or has obligations against the state may not know about the existence of it. Secondly, the person may refuse a service because of fear of being labelled for using it in the society. Thirdly, the person may refuse a service because applying for it involved too much bureaucracy. Fourthly, the administrative costs associated with non-proactive e-services can be higher (MEAC, 2017).

According to MEAC (2017), the essence of proactive services would include the following.

- There will be specified knowledge about who needs what kind of service, information, and to what extent and form. The needs of users will be reckoned with;
- Only the relevant data will be collected, and the existing data will be re-used;
- Data will be stored and preserved only until the allowed preservation limit;
- Data exchange is preferred to document exchange, electronic documents are preferred to paper documents;
- Abandoning what is no longer needed, such as signatures or double exemplars of documents;

- Guaranteeing the security of the data and data exchange methods;
- Assuring the transparency of data.

Kroonmäe (2017) presents a generalisation of the proactive functions of government and illustrates the concept with three phases: offering, informing, and acting. The first phase takes services closer to the citizen by providing a variety of service channels, self-service portals, kiosks, and other solutions. The second phase is illustrated by the government's initiative in sending out notifications to citizens about road conditions, threats, expiry of permits and documentations, etc. The third phase includes providing full services to citizens on government's own initiative and without needing the input or expressed will from the citizen (Kroonmäe, 2017). The goal of proactive services it to bother the citizen as seldom and little as possible, but at the same time to make sure that the citizen gets all services and benefits they are entitled to.

To some extent all services that have not explicitly stated as proactive are reactive services. Reactive in essence, as briefly discussed above, refers to something that is done in response to a situation rather than creating or controlling (proactivity) it. A limited number of academic articles on reactive-proactive services have been covered previously in the public sector context (see Ayachi, et al., 2016; Scholta, et al., 2017). Ayachi, et al. (2016) provides a reactive and proactive recommendation engine for e-government services. While the former offers e-services based on a set of interactive questions and answers, the latter suggests services without the initiation from the citizen, i.e. without any request. The reactive services are provided to citizens after request. Although the two concepts have not been discussed too broadly in the literature before, the author of the dissertation seeks to incorporate the two concepts in a public service delivery context.

Furthermore, an initiative that could potentially aid the development of proactive services is "Kratt", a national artificial intelligence system, which is an initiative of the Estonian Government and is founded on a software-based algorithm. The algorithm is autonomous and self-learning and is assigned tasks that are traditionally done by a person. A "Kratt" expert group was brought into existence in order to research more thoroughly, how artificial intelligence could be implemented in the private sector more widely.

Areas where "Kratt's" can be used are commonly:

- Generating recommendations;
- Targeted and specified activities;
- Optimisation and prioritisation;
- Discovery (of services, data sets, information);
- Recognition (face, video, picture);
- Communication bots (both text and speech);
- Predicting and forecasting;
- Robotic machines (automating a physical task) (Kratt, 2019).

In June 2019, a national "Kratt", an AI strategy was published, which aims to provide a framework for promoting AI development and acceleration in public and private sectors as well as in research and education (E-Estonia, 2019). The future goal is to increase the number of services that use AI in the work processes up to 50 by 2021 from the current 16 that are already available or in development (MEAC, 2019).

1.3 Service design

The term "service design" was coined by Lynn Shostack in 1982 (Interaction Design, 2019a). Shostack (1982) considered service design to be a responsibility of the management and the marketing department. A "service blueprint" was introduced that details the processes within a company. Now, however, its use has become wider, as this tool is also utilised for managing operational efficiency (Interaction Design, 2019a). Over time service design gained acceptance among academics and professionals, and a network for design discipline was established in 1991 by Professor Dr. Michael Erlhoff of Kohn International School of Design. A systematic approach to the discipline was provided:

- Meeting service organisations' need to be competitive;
- Meeting customers' rising expectations of choice and quality;
- Making use of the technologies' revolution, that multiplies the possibilities for creating, delivering and consuming services;
- Answering the pressing environmental, social and economic challenges to sustainability;
- Fostering innovative social models and behaviours;
- Sharing knowledge & learning (Interaction Design, 2019a)

Building upon that, it is possible to witness a change that recent couple of decades have brought insight into the changing concept of service design (Shostack, 1982; Shostack, 1984; Scheuing and Johnson, 1989; Gummesson, 1990; Hollins, 1993; Kimbell, 2011). Service design uses techniques and research methods of different fields: ethnography, interaction design, and information science (Stickdorn and Schneider, 2010), to name a few. The field seeks to understand and design methodologies for both the front and back office of an organisation in order to create better, more user-friendly, more usable, and appropriate services (Smith and Fischbacker, 2002). Effective service design involves developing a service concept (discussed in more detailed below) that appeals to end-users while reflecting on operational limitations (Dixon and Verma, 2013). The notion of a "service concept" as initially described by Sasser et al. (1978) in (Karwan and Markland, 2006) could be described as a "bundle of goods and services sold to the customer and the relative importance of each component to the consumer" (p. 14).

The last years have shown increasing focus on the needs of users and growing interest in user-centric services even though little attention is paid to understanding users' preferences (Venkatesh, et al. 2012; Jansen and Olnes, 2016; European Commission, 2017b). Firstly, service design is user-centred as it sets the customer at the centre of the design process and expects genuine understanding of the customer beyond merely describing the statistical descriptions and empirical analyses of their needs. Secondly, it is co-creative as it asks how we can integrate the stakeholders of a service into the process of designing it. Service design expects service designers to consciously generate an environment that facilitates the generation and evaluation of ideas within heterogeneous stakeholder groups. Thirdly, the principle of sequencing addresses the stages of getting in touch with a service, the actual service period, and the subsequent post-service period. A superior service should keep a sense of expectation without exacting strain upon the customer, holding customer's interest with a good narrative. Fourthly, it includes evidencing as physical artefacts continue to enhance customers' perceptions of the service they have received. Furthermore, service evidence can prolong service experiences beyond the mere service period far into the post-service

period, adding a tangible component to intangible services. And lastly, it is holistic for at the centre of the design process it prioritises keeping the big picture, to see the wider context where a service project takes place (Stickdorn and Schneider, 2010).

These principles unveil the main qualities of service design. The essence of itdesign lies in the notion of focusing on the customer's needs. Public organisations are increasingly more often involving specialised service design companies in increasing the efficiency and usability of their services. Constant and strong pressure on public expenditure sets a demand to keep on finding ways to increase productivity, while at the same time addressing the needs of the citizens (Karwan and Markland, 2006). There is an increasing demand on countries to make use of the allocated resources in a progressively efficient manner (Lindgren and Jansson, 2013). The importance of service design in the public sector has arisen. Many service managers must design and re-design services in order to keep their offerings competitive, fresh, and desirable for customers. After each re-design, staff must re-learn to use a modified service system to deliver a high-quality customer experience (Heim and Ketzenberg, 2011). Effective service design requires careful attention on different factors such as costs, service levels, efficiency, sales, profits (Narasimhan et al., 2005), and human aspects, such as emotions, preferences, needs, and wants (see Miller, et al., 2018, Burrows, et al., 2018). In the context of the current dissertation, service design is seen as a methodology for delivering citizen-centric services that enable governments re-position and re-define themselves within the larger evolutionary e-government stage models. Therefore, the framework of service design is seen as a key attribute for developing and designing proactive public services.

The design of user-centric e-government services will continue to be a challenging task, as citizens' demands and needs change (Venkatesh, et al. 2012). Service design could be explained as a sequence of activities such as planning and organising people, communication, material components and infrastructure related to a service. The goal of service design is to improve the quality of services, communication, and interaction between service providers and their customers, and users' experiences (Steen, et al., 2011). Service design can be discussed more often in the context of interaction design as it is possible to look at services as a series of interactions between customers and the service system through many different and diverse touch-points during the customer journey (Stickdorn and Schneider, 2010).

Furthermore, service design is looking at the emotional and functional characteristics of desirability, utility, usability, and pleasurability of providing and consuming a service. The researchers in software engineering and requirements elicitation (Miller, et al., 2015; Burrows, et al., 2018; Sherkat, et al., 2018) have also looked at a similar concept of emotional-led goal modelling. Goal models can be used throughout the design process to lead the exploration, experimentation, and evaluation strategies (Lopez-Lorca, et al., 2014). Burrows (et al., 2018) argue that emotion-led goal modelling is often overlooked during the service development process, as technology developers often focus on the functional goals (i.e. what the solution does) as opposed to the quality and emotional functionality (i.e. the feel and pleasurability of the technological solution). They continue that emotional aspects are not thoroughly understood, and the stakeholders are blamed for the lack of engagement instead.

1.3.1 Design approaches

Service design allows creativity. For that reason, it is possible to distinguish between different methodologies and techniques for service design. However, as Marquez and Downey (2015) argue, three basic stages in service design can be distinguished:

- Observation;
- Understanding/thinking;
- Implementing.

The Design Council in the UK has claimed that their mission is to build design capabilities in the public sector by introducing new tools into policy development and creating more effective and people-centred services. They are suggestions the following:

- Taking a people-centric point of view;
- Reducing risk through frequent testing;
- Communicating clearly and visually;
- And thinking systematically while retaining detail (Design Council, 2019b)

On a more practical scale, the British Design Council has developed a Double Diamond methodology (Design Council UK, 2007) that divides the design process into four distinguishable phases:

- Discovery – understanding and gathering insights;
- Defining – making sense of the possibilities that were identified in the Discovery stage;
- Developing – creating, prototyping, testing, and iterating concepts or solutions;
- Delivering – project is finalised, produced and launched (Design Council, 2019a; Design Council, n.d).

This methodology is one of the more widely used approaches to service design currently (Yu and Sangiorgi, 2014).

The Government to New Zealand has recently published a Digital Service Design Standard (Government of New Zealand, 2019b), which includes the principles for designing user-centred public services.

- Identify your users and understand their on-going needs – Holistic research needs to be conducted on the real needs of users from their point of view and what that means for the design of the service.
- Be clear about what you are trying to change and why – The drivers for change and the desired intended outcomes need to be identified.
- Integrate security and privacy proportionate to risk from the outset – User and business context are to be considered and data and information processed through the digital service identified.
- Be inclusive, and provide ethical and equitable services – Services should be fair and equitable, and take into consideration the unique news of individuals and communities.
- Design and resource for the full lifetime of the service – The changing needs of users and continuous development should be planned for.
- Create and empower an interdisciplinary team – It is vital to bring together a diverse group of people with beneficial and expert set of skills.

- Work in the open – Share evidence, knowledge, research, and process in order to ensure integrity.
- Collaborate widely, reuse and enable reuse by others – collaborate with organisations and people who are a natural part of the service landscape.
- Designs for unique constitutional and cultural environment – Designers are encouraged to co-design and co-create for the inclusion of different groups in the community.
- Use digital technologies to enhance service delivery – Technology should be used as an enabler for well-designed services. It should be used to deliver greater efficiency and cost-effectiveness, not as the purpose or driver.
- Be a good data and information steward – Data should be collected only once to avoid duplication, and should be governed well across repositories, platforms, and custodians.
- Be transparent and accountable to the public – Activities, effectiveness, value, and consequences should be measured and monitored throughout the service lifetime.

Each principle was accompanied by a set of guidelines of why this principle mattered, how to achieve and meet the principle, and different handbooks and online materials for guidance (Government of New Zealand, 2019b).

Additionally, a service design firm Ziraff in Estonia was responsible for re-designing Road Administration's services. The case study was used for creating a handbook for the public sector that would assist with designing user-friendly public services (Ziraff, 2013). Based on their experience, it was possible to develop a handbook to be used in e-service design in the public sector. Firstly, a number of prerequisites for the design process were defined. On the one hand, the prerequisites for an e-service environment need to be considered. On the other hand, the prerequisites for developing concrete functionalities need to be studied as well. The first requirement includes:

- Clear understanding of the roles (including the owner of the service) within the service channel in the design process;
- Know-how about developing user interfaces;
- Know-how for the unification and simplification of the processes;
- The awareness and support of the management;
- Sufficient resources for the project;
- Necessity for developing e-services;
- The existence of the Internet strategy;
- The existence of the style handbook.

The second, functional requirements include:

- Motivated project team (including the channel owner, service owner, business analyst, IT analyst, designer);
- Pre-analysis document;
- Software developing partner;
- Design and usability partner;
- Accepted timeline and assessed levels of priorities;
- Sufficient resources for the service development.

Stickdorn and Schneider (2010) introduce a number of steps in the iterative design process. They argue, that at every stage of the process it might be necessary to take a step back or event start from scratch. Furthermore, the single but crucial difference in the iteration is in ensuring that you learn from the mistakes of the previous iteration. The steps are:

- Exploration – gaining a clear understanding of the situation from the perspective of current and potential customers;
- Creation – this step is not about avoiding mistakes, but rather about exploring as many possible mistakes;
- Reflection – is about prototyping service concepts in circumstances close to reality by incorporating different staging and role-play approaches;
- Implementation – demands a process of change from a variety of angles. Here the consistent concept that is formulated and tested is clearly communicated. The emotional aspects of a service are addressed, and the employees are involved from the start of the design process. One of the key components in this stage is the clear understanding of why it is necessary to carry out the project. And finally, the management should be also convinced of the service concept and should not flinch from any problems that could arise.

In addition to the stages Stickdorn and Schneider (2010) proposed a toolbox in order to aid with exploration and creation stages. The components are brought out in Table 3 below.

Table 3 Techniques for service design research (as presented in Stickdorn and Schneider, 2010)

Tool	Definition	How? Why?
Stakeholder maps	A visual or physical representation of the various groups involved with a particular service	A comprehensive list of stakeholders needs, connections between each other, motivations, and interests have to be drawn up. This can be done through interviews, desk research. This is a way to highlight the issues concerning each stakeholder group, which then can be clustered together by shared interests or other relevant characteristics in order to prevent or respond to problems.
Service safaris	People are asked to go "into the wild" and explore and collect samples of what they think are good and bad service experiences.	People are asked to record their experiences by using voice recorders, cameras or notebooks. A service is often chosen from the same sector as their own organisation. This approach is used, as it is one of the easiest ways to put people into the shoes of their customers. This allows identifying the common needs that people have, and the common problems that are encountered.
Shadowing	Researchers immerse themselves in the lives of customers, front-line staff, and people behind the scenes in order to observe their behaviours and experiences.	This is done by the use of text, video, and photographs. One of the biggest issues is how to manage the observer effect and the influence of the researcher that may be exerted simply by being present. This approach allows researchers to notice the moment at which problems occur, and observe problems that the staff may even not notice themselves.
Customer journey maps	This approach allows providing a vivid but structured visualisation of a service user's experience. The touch-points where users interact with the service are often used to construct a journey, which can be presented as an engaging story based upon their experience.	Identifying touch-points were users interact with the service is crucial. These can take many forms from personal and face-to-face communication to virtual interaction with a website, or a physical trip to an office. Interviews can be used here in addition to blogs or video diaries. It can be visually engaging, but the focus is on incorporating enough detail to provide real insights into the journeys. A high-level overview of the factors influencing user experience from the user's perspective can be constructed. A structured visual representation makes it possible to compare several experiences in the same visual language, which also facilitates simple comparisons between a service and its competitors.
Contextual interviews	These are conducted in the environment or context in which the service process occurs. This allows the researcher to both observe and probe the behaviour they are interested in.	Interviews are conducted with customers, staff, and other relevant stakeholders. This approach uses a combination of questions and observations in order to generate the desired insights. Audio recordings, photographs, and videos are used here. This approach may help the interviewee remember the kind of specific details that often may get lost in a traditional focus group setting. People may also be more comfortable in known environments.
The five why's	A chain of questions that are used to explore a specific	The limitation of 5 "why" questions prevents the process from losing relevance while still providing insights into the underlying processes which may be

	problem in order to uncover the motivations, which are at its root cause.	exerting an influence. This approach creates an easy way to establish links between root causes and surface problems with requiring very little preparation. It is useful for quickly gaining an overview of complex issues, and provoking interviewees to go deeper when trying to explain common problems.
Cultural probes	Are information-gathering packages, which are based around the principle of user-participation through self-documentation. Research participants are expected to be involved for a prolonged period of time.	Diary entrances, videos, blogs or voice recorder among others can be used for this method. Regular instructions and follow-ups are expected and assumed. This technique provides the closest insights without the researcher needing to be present, and may prove effective in overcoming cultural boundaries.
Mobile ethnography	Here the participants are free to choose how to structure the research separate from the researcher, but based on the research questions.	This can be done practically in any environment through the use of smart phones (e.g. audio, text, video recordings), which are able to gather time- and location-independent user-centred information. Having participants define their own touch-points provides a user-structured image of how a service is functioning.
A day in the life	This is the collated research material relating to a certain type of customer and it provides a descriptive walk-through of their typical daily activities.	Here simple graphics (e.g. comic strips) are used. Video and photography rich depictions of users' daily environment and routines are explored. This should include as many insights gathered as feasible as the purpose is to provide an overview of a typical day including what a customer is thinking and doing outside of their service interactions.
Expectation maps	Investigating and charting what customers expect when they interact with a service. This either focuses on one specific service or takes a more generalised form of analysing a particular service category.	Here in-depth interviews are conducted to gather their reflections and insights. This serves as a diagnostics tool, as it draws out those areas of a service that need attention from a customer's viewpoint.
Personas	The fictional profiles, personas, are often developed to represent a specific segment or group based on their interests. It represents a character with which the client and design team can engage.	By collating research insights a workable character is built. Success of the persona stems from the level of engagement it can provide. Visual representations and profiles are often built from stakeholder maps, shadowing, interviews and other supporting techniques. Personas can provide a range of perspectives of a service. Although fictional in essence, effective personas can help

		move away from abstract demographics towards what real people could want or need.
Idea generation	Ideation techniques are used to structure and inspire brainstorming sessions.	Mind-mapping, SWOT analysis, and Six thinking hat tool are used here. The approaches are used as ice-breakers, for relaxing participants, and as imaginative exercises. These exercises may aide stimulating idea generation.
What if…	Exploration of the most un-probable scenarios.	The approach is often used to explore wide-ranging changes rather than real experiences. This helps preparing organisation for a broad range of likely changes.
Design scenarios	Essentially, there are hypothetical stories that are created with enough detail to meaningfully explore an aspect of a service offering.	Plain text, storyboards, and videos can be used here together with research data to construct a plausible situation around which the scenario can be based. Here using personas can be beneficial. Design scenarios can be used in almost any stage of a service design process. Here brainstorming for new solutions can be done.
Storyboards	Series of drawings or pictures that visualise a certain sequence of events. A hypothetical implementation of a new service prototype can be tested here.	A series of illustrations can be used to tell the story that involves as many contextual details as possible. This allows stories about user experiences to be brought into the design process.
Desktop walk-through	This is a small-scale 3D model of a service environment.	This can be done fairly simply in a building block (e.g. lego) or label format. This allows an iterative analysis of the situations depicted. Can be seen as a service environment "brought to life."
Service prototypes	Simulation of a service experience. This moves from an informal role-play to a more detailed full-scale recreation of a service.	This is a mock-up of a service system, which plays with the capacity to test the solution in a real-world environment. Prototyping can generate a deeper understanding of a service than a visual description could.
Service staging	This involves physically acting out scenarios and prototypes by design teams, staff, and customers.	The use of safe and playful environment is implemented. This allows involving learning and emotion into the design process. Furthermore, role-play helps to empathise with the personas.
Agile development	Agile development is an iterative methodology that allows projects to grow and develop over time. This approach adapts around both the evolving needs of the client and the generated research materials.	This approach is derived from software engineering and it emphasises on individuals and interactions over processes and tools. Formalised methodologies are pushed aside in favour of iterative approaches that accommodate a diverse range of stakeholders together with the adapting and evolving nature of the project.

Co-creation	This is one of the core components of the service design philosophy, as it seeks to involve anyone from staff, designers, executives, and customers.	This approach does not mean that a service is built or designed based on a group decision, rather the ideas and solutions that are proposed will always be iteratively filtered and considered so that only the strongest and resonating ideas are developed into new prototypes and innovations.
Storytelling	The tool included sharing insights and new service concepts.	This situates the new or improved service within a narrative context using key insights and ideas to tell stories from different perspectives. This approach is often paired with personas. Furthermore, it helps maintaining its relevant event when the story is presented to people unfamiliar with the project structure.
Service blueprints	The technique allows specifying and gives detail about each individual aspect of a service. This involves creating a visual schematic that incorporates the perspectives of the user, the service provider and other relevant parties.	The blueprint is a "living document" and is often produced collaboratively as it brings together various departments and allows sharing awareness of each other's responsibilities. By describing and outlining all of the elements of a service, the blueprint allows identifying the most crucial areas, while also revealing where overlap or duplication of work or processes is possible.
Service role-play	This technique is used to explore and generate ideas (from service staging). It involved interactive training experiences that are directed towards the service staff.	Staff members are asked to enact a number of situations where customer contact is possible. The circumstances are customised with cards that depict different moods, personas, problems, and characteristics. This training exercise provides the staff with tools and training that is needed to meet customers' needs effectively. This also enables generating higher levels of ownership of the service of process among staff.
Customer lifecycle maps	Holistic visualisation of a customer's overall relationship with a service provider. This collates a series of customer journeys over time from an initial contact to the last point where service use is ceased.	Known data about customers is visualised into a series of key events that relate to their service usage. Each of these events is incorporated onto a map to provide insights about customers' drives and motivations. Generating such detailed overviews allow companies make more complete and balanced business cases. This, in turn, contributed into developing more effective marketing strategies. The maps allow service providers to provide their customers with holistic and synchronised approaches that take into consideration customers' evolving wants and needs.

Business model canvas	This allows describing, analysing, and designing business models.	Usually a large printed writable surface is used, which represents the following sections: key resources, partners and key stakeholders, key activities, type of intervention, channels, segments, value proposition, cost structure, and revenue structure. This approach is increasingly popular as it allows organisations view themselves as service-focused businesses. This is also a focusing tool, which brings clarity whilst identifying strengths, weaknesses, and priorities of the organisation.

All of these techniques brought out in Table 3 provide a valuable set of tools that could assist service developers and public sector officials both in social and technological settings. Not all of these techniques need to be used concurrently. However, the insight from each of the tool could provide beneficial and complementary insights during the service design process. The author of the dissertation argues that based on the need to understand the key players in the service ecosystem, and the increasingly relevant requirement of understanding the pain-points and needs of the citizen, stakeholder maps and customer journey maps provide valuable insight to a diverse range of decision-makers.

As seen here a number of approaches exist. One of the similar qualities of these design approaches is that the main goal in designing services is the necessity for clarifying the needs of stakeholders. The author of this dissertation argues that Agent-Oriented Modelling (AOM) (Sterling and Taveter, 2009) could be considered as an additional design tool that would support the design process in the initial phases. AOM has the attributes for reflecting on the goals, roles, and emotions of stakeholders through goal modelling, thus giving useful insight in the current dissertation. Furthermore, AOM considers proactivity within its core and thus supports the furtherance towards automation and intelligent processing of existing information (Sirendi and Taveter, 2016) while aiming to model the complex systems and environments through simplified treatment.

In the context of this dissertation particular interest is in the conceptual space of AOM, as it could be considered as an open environment where new elements can be added, and existing ones replaced or deleted. In AOM, the conceptual space consists of three layers: the motivation, the system design, and the deployment layer (p. 27 and p. 29 Figure 2.1 in Sterling and Taveter, 2009). It will be argued later in the contributions' chapter that the conceptual space of AOM will be especially relevant in the discussion about complex life events, where proactive service provision (with the help of a proactive agent) would aid making peoples' lives easier and interacting with the public sector more seamless.

It was shown in this section how the main concepts of socio-technical systems including e-governance systems together with e-services are interlinked. The connection of theoretical concepts to real-life examples will be illustrated in the Discussions section.

2 Research methodology

The current chapter will explain the methodologies and approaches considered throughout this thesis. The focus of this research is to explore the possibility and conditions for designing and implementing proactive public services as socio-technical systems.

The aim of this dissertation is to make four contributions. The first objective is to make a contribution in service development theory by constructing a meta-model of proactive services that enhances the state of the art in proactive service research. Secondly, the reactive-proactive conceptual service space will be presented and discussed. Thirdly, a set of guidelines for designing proactive services will be provided together with an annexed list of questions for a self-assessment survey for public sector officials. And lastly, the Reactive-Proactive Spectrum will be introduced, which will be able to characterise and illustrate the different levels of proactivity that have been presented through the case studies.

Case study research methods were used in the current dissertation as it provides a diverse and multi-faceted set of tools for understanding problems deriving from varied sources and from different point of views. Case study research is widely used in many disciplines, starting from social sciences more generally (Yin, 2014; Yin, 2018) to political science, business, education, but also software engineering more particularly (Runeson, et al. 2012). A case study is often qualitative, and the collected data sets may include words, interpretations, descriptions, and explanations (Runeson, et al. 2012). It is a preferred method in situations where the main research questions are “how” and “why”, where the researcher has little or no control over behavioural events, and where the focus of research is a current phenomenon (such as service design in the public sector) in the real-world context (Yin, 2014). Preparing for a case study consists of several stages, such as establishing the background, creating research questions, selecting the concrete cases and subjects, preparing for the case study, establishing data collection procedures together with analysis and validation procedures (Runeson, et al. 2012).

Additionally, a diverse set of supporting research techniques were applied. These included conducting qualitative interviews, desk research that involved both literature analysis and thematic analysis of concepts, and inquiry into different service design methodologies that were listed in the previous chapter. Agent-oriented modelling, an approach historically used in software engineering, was used as a complimentary tool for service design in order to aid with visualising a potential roadmap for designing proactive services. Qualitative methods in general help to answer questions that involve human characteristics such as motivation, attitudes, experiences, and personal interpretations of different phenomena. Particularly, in the context of this research, a range of qualitative techniques was used to exclude bias by triangulating the information between feedback from interviewees, respondents, and available literature. The latter data were analysed by using categorisation of resources by themes as shown in the related works chapter. By assimilating the previously mentioned methodologies it would be possible to examine relevant subjects both from the interdisciplinary fields of software engineering, public sector, and service design contexts, and allow presenting multiple perspectives without being inflicted to bias. However, the problems and limitations of a case study involve difficulties such as generalisation based on a limited number of examples and researchers’ biases and personal perceptions (Runeson, et al. 2012). The chosen techniques have proven its suitability in the context of e-governance

and proactive service research before by a number of defended Master's theses at the Tallinn University of Technology (Kõrge, 2019; Kroonmäe, 2017; Koplimaa, 2016; Männik, 2016).

2.1 Background

As mentioned in the previous, related works chapter, there is a growing interest among governments and international organisations to explore the possibility of providing proactive services. However, the research on proactive services in the public sector setting more generally and its design more particularly is still limited with only few authors addressing the novel concept (see Wauters, 2006; Linders, et al. 2015; Scholta, et al. 2017, Scholta, et al. 2019).

To address the apparent gap in knowledge, a multiple case exploratory-descriptive research on four case studies were conducted both in Estonia and Australia together with the initial D5 countries (Estonia, Israel, New Zealand, United Kingdom, and South Korea). Two complementary analyses were conducted in order to especially stress the necessity of understanding technological and ethical/legal requirements for proactive services. The focus on these countries originates from the author's academic involvement with a research group Laboratory of Socio-Technical Systems at the Tallinn University of Technology in Estonia and Swinburne University of Technology in Australia. Furthermore, as the author is also a lecturer of public service design and implementation at an international e-Governance Services and Technologies master's programme, the cases were chosen based on the emerged topics during teaching and supervising, and interests of the author of this doctoral dissertation.

Although the focus on the below-mentioned case studies is mainly public sector services, the outcomes of this dissertation will help practitioners and decision-makers from all sectors develop and design proactive services. Through the dissertation the readers will be able to understand the challenges, benefits, and requirements of designing such services. The main objectives of this research are the following:

- To identify the current state of service ecosystems in selected countries' setting through selected case studies (corresponds with SQ1);
- To identify the challenges and benefits of designing proactive services (corresponds with SQ3);
- To identify and formalise the prerequisites for designing such services (corresponds with SQ3);
- To propose a conceptual meta-model for the design of proactive services (corresponds with Main RQ);
- To contribute to the academic field through the Reactivity-Proactivity Spectrum, which would describe and characterise the different levels of proactive services (corresponds with SQ2);
- To provide a set of guidelines for service designers who are involved in designing proactive services (corresponds with Main RQ);
- And lastly, to expand on the general understanding of reactive-proactive service space (corresponds with SQ2, SQ4, SQ5).

To achieve the objectives of this research, the study was divided into a number of phases:

- Case selection: The case studies were chosen according to the interest of the author, pain-points of the society, and priorities of governments;

- Data collection: Evidence was collected through interviews and the questions for the interviews were derived to help answer the dissertation's main research question and sub-research questions;
- Data analysis: The collected evidence was collated, and analysis was conducted in order to identify the recurring themes for proactive services;
- Conclusions: The organised results were generalised and analysed according to the emerged themes;
- Contributions: Finally, the research contributions were developed to contribute to the growing body of research of proactive service design and appropriation.

2.2 Research questions

One of the main values of this dissertation lies in integrating an interdisciplinary research approach from analysing the concepts of socio-technical systems, the needs and wants of people, and proactivity to providing both novel academic contribution into the wider understanding in public service development to generating real-life guidelines for designing and developing proactive public services. This research borrows from a wide range of disciplines, such as political science, sociology, and software engineering, and, thus, raises awareness of the possibilities in designing such services from all these angles.

Based on the goals of the dissertation mentioned in the introduction of the dissertation the following research questions are developed. Therefore, the main research question is:

Research Question (RQ): How to design proactive services?

The overall question throughout this dissertation is focusing on the essence and qualities of proactive public services. Based on the knowledge accrued through desk research and conducting case studies, it will be possible to visualise the process of proactive service design. To allow a more detailed analysis of the dissertation, the main research question is into more concrete sub-questions. In order to answer the main research question a set of preconditions need to be met. Firstly, the theoretical concepts of socio-technical systems, the essence of services and government stage models, and service design methodologies will be addressed. Secondly, the cases from Estonia and Australia together with examples from the D5 countries will be introduced in order to create a diverse and comprehensive, while not conclusive, picture of citizen-centric public services. Thirdly, the dissertation provides a conceptual rendition of designing services while providing guidelines that stem from and are aimed at solving service provision related issued in real situations.

Sub-Question 1 (SQ1): What is the current state of service provision?

The purpose of this sub-question is to find out what the main pain-points and opportunities in the current services' ecosystems are. The sub-question is answered by researching more thoroughly the concepts of government stage models, proactive services, and by illustrating the results of the literature review with examples from case studies. Here, as all case studies inquire about a service component, input is gathered from all four main case studies. The complementary analyses that were conducted based on their relevance to defining the requirements for proactive services, are consulted and analysed in the light of the current state of service provision.

SQ2: How to define the concept of proactivity?

Through this sub-question the essence and characteristics of proactivity are defined and analysed. Here, the concepts of service delivery, proactive and reactive services, and examples primarily from Estonia are addressed. Estonia is the first country to stipulate in a state regulation the concept of proactive services in the context of public sector. Thus, the Estonian experience is collated and compared with existing literature.

SQ3: What are the prerequisites for proactive citizen-centric services?

To answer this sub-question the concept of socio-technical systems will be analysed. As an extension of the discussion on socio-technical systems both human and technological factors will be mapped out to describe certain attributes that could affect the outcome of proactive service design. Additionally, the complementary analyses on technological and ethical/legal prerequisites for proactive services will be considered as one of the main inputs to answering this sub-question.

SQ4. What approaches or service design methodologies could be beneficial to consider when designing and developing proactive public services?

The purpose of this sub-question is to determine if there are a number of expected steps or approaches that could aid the development of proactive public services. Here, the literature overview of service design methodologies will be consulted. Based on the presented techniques and the existing design examples, it will be possible to exemplify a set of methodologies that focus primarily on the necessity of considering the needs of citizens and the need for efficiency as first priorities.

SQ5: How to utilise this knowledge in the real world?

Lastly, this sub-question aims to centralise the gathered information and helps to make an academic and a real-world setting.

2.3 Case and subject selection

A case can be holistic or embedded (Runeson, et al. 2012). In a holistic case study, the case is studied as a whole, while in an embedded case study multiple units of analysis within a case are studied (Yin, 2014). For the purpose of this dissertation, case studies are examined separately and then collated into an embedded case study. The unit on analysis will depend on some aspects of the research design, research objectives, and questions (Runeson, et al. 2012). The table below (Table 4) will give an overview of the context, case, and chosen units of analysis.

Table 4 Context, case and units of analysis

Context: Public service provision			
Case: Proactive service design			
Unit of Analysis 1 – The concept of proactivity	**Unit of Analysis 2** – Limitations and benefits of proactive services	**Unit of Analysis 3** – Prerequisites for proactive services	**Unit of Analysis 4** – Service design approaches

Proactive government is not a new concept. However, the growing technological capabilities of governments and the changing needs and wants of service users, both citizens and non-citizen, have revitalised the interest in the subject. Although not covered widely, the topic of proactive services in the public sector has raised attention among many digitally advanced nations. Malta, Austria, Finland, Taiwan, Denmark, and Belgium (see Wauters, 2006; Linders, et al., 2015; Boll and Tell, 2015) are just a limited group of countries looking toward the methods of developing public services with proactive qualities.

For this dissertation a diverse set of case studies was collected and analysed. The dissertation lends from the qualitative research methodologies in order to aid in analysing the multiple case approach. Here, all cases are chosen from a variety of areas while having the same context: Public sector service provision. All cases are chosen to complement each other. For the current dissertation the comparative research aspect is not used, as each of the cases provides a unique set of insights, thus not being subject to comparison. The units of analysis for the current dissertation were developed based on the set research questions. Each unit of analysis allows the author of the thesis to understand different aspects of one unified case: Proactive service design.

2.4 Preparation for the case study

The current dissertation is conducted by including the aspect of an exploratory embedded multiple case study that has inductive features. The research also seeks to describe the phenomenon of proactivity in the context of the chosen multiple cases. An inductive case study begins with the observations based on selected case studies, seeks to find a pattern between these, after which proposes tentative hypotheses, and results with a theory relevant to the current context. In the current case, four main case studies and two complementary analyses were observed and analysed.

Firstly, an exploratory case study about the family benefit system in Estonia was conducted in 2015. Currently, many services and benefits are provided to persons with children residing in Estonia. Four stakeholders from the Social Insurance Board were interviewed regarding:

- The current state of providing family benefit services,
- About the involved stakeholders in the service provision,
- And the possibility of providing such services proactively.

As the exploratory case study was already conducted in 2015, a follow-up content analysis based on public information was conducted.

The first case study was followed by research activities in 2018 that were conducted by the author in collaboration with the officials at the Ministry of Economic Affairs and Communications (MEAC) of Estonia. This set of research activities was focused on choosing and describing 15 most common life and business events in Estonia. Based on

these 15 chosen events, the most impactful and feasible events (for re-design and development) were measured and reordered. The reminding list of events was presented to the Chief Information Officer of Estonia as an inventory of potential development priorities. Birth life even was measured as the one of highest priority to be re-designed and developed as a proactive and invisible public service.

Secondly, a set of services for parents with disabled children in Estonia was explored. Three services were analysed and eleven interviews conducted in order to explore the need for and possibility of providing proactive public services to parents with disabled children. The stakeholders, who included people from the public sector, hospital workers, and parents with a disabled child, were asked about:

- The current situation of services to disabled children,
- The complexness of finding information about needed services,
- And potential solutions for providing such services proactively.

A Master's student (Koplimaa, 2016) who was supervised by the author of this dissertation conducted the case study in 2016. A follow-up content analysis based on public information was conducted to complement the previously gathered data.

Thirdly, an online homelessness service, Ask Izzy, based in Australia that was launched in the beginning of 2016 was studied. Thirty in-depth interviews with wide sample coverage (e.g. interviewees with homeless background, service providers, public servants) were analysed in cooperation with the colleagues at the University of Melbourne in order to understand how to provide services for the homeless people through a mobile web-application. The themes of the interviews were divided roughly into the following topics:

- Questions about the application and its features,
- Questions about restrictions or barriers;
- And questions about the appropriation of the application.

Albeit proactivity was not directly addressed in the interviews, several interviewees addressed the issue of proactivity within the Ask Izzy web-application. A subsequent development of Ask Izzy has been implemented after conducting the case study. The expansion of the project has seen the implementation of the Ask Izzy Open Data Platform, which provides insight into the supply and demand of homelessness services (e.g. housing, food, health, etc.). In essence, it has involved some characteristics of proactivity.

And lastly, life and business event services in the Digital 5 (D5, now D9) countries (Estonia, United Kingdom, Israel, New Zealand, and South Korea) were explored. Five extensive surveys with the initial D5 countries were conducted. The coalition of digital nations has grown since, and has involved the following countries: Canada, Uruguay, Portugal, and Mexico. The interviewees were stakeholders from the mentioned countries who are leading the digital transformation of the public sector in their respective countries. The interviews were divided into eight thematic areas such as:

- Policy,
- State of art (in providing life and business event services),
- Design principles for life and business event services,
- Service channels,
- Development process,
- Technological platforms,
- Governance model (e.g. how are the life and business event services governed and managed),
- And barriers and enablers.

The extensive questionnaires were distributed in the end of 2017 and these include the most recent input from the D5 countries regarding their current state of life and business event services together with proactive service provision.

A detailed description of each case study will be provided in the following chapter.

2.5 Data sources and data collection procedures

The data sources for the current dissertation are the above-mentioned stakeholders within each case study. As the current multiple case study approach is borrowing from an embedded exploratory inductive case study methodology, observations regarding the research focus, proactive services, are made based on the diverse set of case studies.

The main qualitative methodology was conducting in-depth interviews. However, different case studies collected the data differently. The table below (Table 5) illustrates the format of interviews in each case study.

Table 5 Collected data format

Case study One	**Case study Two**	**Case study Three**	**Case study Four**
Family benefit services in Estonia	Services for disabled children's parents	Homelessness service in Australia	Life and business event services in D5 countries
E-mail communication and interviews	Face-to-face interviews	Face-to-face interviews	Filled out form through e-mail communication

Conducting interviews was considered as the most suitable method for collecting qualitative data as it allows gathering different types of data together with exploring thoughts and feelings of interviewees (Runeson, et al. 2012). However, considering the physical location of some respondents, e-mail communication was also used.

Additionally, two complementary analyses based on two interviews were conducted. The author of the dissertation estimated the necessity of adding the data of the complementary analyses to the dissertation because the technological and ethical/legal prerequisites for proactive services are two of the more crucial aspects of proactive service design, which require more focus. The goal of these interviews was to explore the requirements necessary in order to provide proactive public services based on Estonia's experience (Table 6).

Table 6 Complementary analyses of requirements for proactive service provision

Complementary analysis One	**Complementary analysis Two**
Technological requirements for proactive public service provision	Ethical and legal requirements for proactive public service provision
Face-to-face interview with three technical personnel from the EISA	Face-to-face interview with three technical and legal personnel from the EISA

The analysis procedure for the current dissertation consisted of the following stages. Firstly, the case studies were collated and central themes for each case study specified

(as seen in 2.4.). Secondly, the research questions proposed in the dissertation were answered based on the results of the case studies (as seen in 4.1.3.). Thirdly, the theoretical approaches brought out in the related works section were opposed to the results of the two previous stages. The evaluation of the results is done by triangulation of multiple sources of evidence, which include interviews, questionnaires, published documents, and literature (Yin, 2014) on the provision of public services.

2.6 Validity procedures

All of the present case studies are conducted in the real-world environment. On the one hand it may improve the validity and practicality of the research. On the other hand, this type of research may have some limitations due to the complexity of the case studies. Furthermore, some of the most important limitations of case study research are the difficulties with generalising the gathered evidence and facts, and the impact of researchers' biases on the results (Runeson, et al. 2012). Additionally, the limitations may also include the personal perceptions of interviewees.

The aim of construct validity is to remove any misunderstanding of the research objectives, research questions, and interview questions by the interviewees and author. Although having a different research structure and methods (as seen in Tables 5 and 6), all four main case studies and two complementary analyses were centred around the proposed research questions and the chosen research context (as seen in Table 4). By not having a generalised research approach, the case studies present a complex situation where analysis and conclusions need to be made based on the collated thematic topics.

Validity can be divided into two parts. Internal validity seeks to ensure that the study measures or tests what is actually intended. Where possible, supporting data may be obtained from documents to provide background to and help explain the attitudes of interviewees under scrutiny, as well as clarify details that the participants have supplied (Shenton, 2004). This can be done through triangulation. External validity is concerned with the degree to which the findings of one study can be applied in other circumstances.

In the case of the current dissertation, the results of the data collection and analysis will give input for the meta-model of proactive services. That, in turn, would be scientifically justifiable, customisable, and reusable in other situations (e.g. services and sectors besides public sector). Although, as Shenton (2004) brings out, it is never possible to demonstrate that the findings and conclusions are applicable are conventionally generalizable, as all observations are defined by the specific contexts in which they occur (Erlandson, et al., 1993).

In order to address the dependability issue, the processes within the study should be reported in detail, thereby allowing a future researcher to repeat the work, if not necessarily to gain the same results. Thus, the research design may be viewed as a "prototype model" (Shenton, 2004).

Objectivity in science can be associated with the use of instruments that are not dependent on human skill and perception (Patton, 1990). Even tests, interviews, and questionnaires are designed by humans, so the intrusion of researcher's biases in inevitable. As Shenton (2004) argues, the concept of confirmability is the qualitative researcher's comparable concern to objectivity. Here, thus, a number of steps must be taken to help ensure as much as possible that the findings are the result of the experiences and ideas of the interviewees and respondents, rather than the preferences of the researcher. The role of triangulation is once again brought out as a tool that could be used in order to reduce researcher's bias. To this effect, the underlying beliefs of the

researcher need to be acknowledged within the current dissertation. Proceeding from that, Table 7 below illustrates the characteristics of a number of strategies for ensuring the trustworthiness in qualitative research by Shenton (2004). Out of the selection of methods provided by Shenton (2004) the author of this dissertation has explicitly used the methods in bold.

Table 7 Trustworthiness in qualitative research (Shenton, 2004)

Quality criterion	**Possible provision made by researcher**
Credibility	**Adoption of appropriate, well recognised research methods** **Development of early familiarities with culture of participating organisations** Random sampling of individuals serving as informants **Triangulation via use of different methods, different types of informant and different sites** Tactics to help ensure honesty informants **Iterative questioning in data collection dialogues** Negative case analysis **Debriefing sessions between researchers and superiors** Peer scrutiny of project **Use of "reflective commentary"** **Description of background, qualifications and experience of the researcher** Member checks of data collected and interpretations/theories formed **Thick description of phenomenon under scrutiny** **Examination of previous research to frame research**
Transferability	**Provision of background data to establish context of study and detailed descriptions of phenomenon in question to allow comparisons to be made**
Dependability	Employment of "overlapping methods" **In-depth methodological descriptions to allow study to repeated**
Confirmability	**Triangulation to reduce effects of investigator bias** **Admission of researcher's beliefs and assumptions** **Recognition of shortcomings in study's methods and their potential effects** **In-depth methodological description to allow integrity of research results to be scrutinised** **Use of diagrams to demonstrate "audit trail"**

2.7 Conclusion

The current section on research methodology briefly described the motivation behind case study selection, research approaches, and reflection on validation of the data. Triangulation was seen as the key tool for ensuring the credibility and transferability of the data and will be used throughout the dissertation.

3 Case studies

The following sections describe the before-mentioned four main case studies that were conducted and analysed for the purpose of this dissertation. Brief background is introduced and rationale behind choosing these case studies explained. After that the results of the interviews will be presented. Two complementary analyses are presented thereafter. These two analyses focus on the technological and ethical/legal requirements for designing and providing proactive public services and were deemed relevant to focus more thoroughly on. However different the case studies are, all of these are addressing the diverse nature of service provision. More specifically, all case studies, while not being subject to comparison, are aimed at answering the question of how to design proactive services.

The structure of the case studies is similar. Firstly, the domain, which they are positioned in, is clarified. Secondly, the method for data collection is described. Thirdly, the method of analysis is described together with the overview of sub-research questions associated with the case study. Fourthly, the key quotes and excerpts from the case studies are presented. Fifthly, the main observations about each case study are collated. And lastly, the most relevant insights from the case study are discussed. The case study chapter is followed by the discussions and contributions section, which will showcase the novelty of the research and introduce the main findings of this dissertation.

3.1 Case study one: Birth and family benefit services in Estonia

3.1.1 Domain

From 2012 until 2017 the average number of births per year in Estonia has been around 14,000 (TAI, 2018) out of who about 56% are born outside a registered marriage. Birth event related activities such as registering the birth, assigning a name for the baby, or enlisting for kindergartens can be done electronically through the state portal eesti.ee. The process is straightforward and relatively seamless when the parents are in a registered marriage. However, should the parents not be married, the application for registering the birth can be done in a Vital statistics office or a local municipality (Eesti.ee, 2019a).

On a larger scale, in Estonia, as of the end of 2017, more than 230 databases and 950 institutions are offering services via the data exchange layer – X-road, which is the architectural backbone of e-Estonia (EISA, 2018b). X-road was launched in 2002, and it allows Estonia's different databases, both public and private to function in an interoperable manner. According to the Estonian Information System Authority (EISA) it employs a versatile security solution including authentication, multilevel authorisation, a high-level log processing system, encrypted and time-stamped data traffic (EISA, 2018a). Estimably, over 2400 e-services are provided (EISA, 2018c).

However, only a fraction of these services are truly proactive. The most notable and widely publicised is the service of e-taxation. Furthermore, taking into consideration the ever-evolving nature of information technology that is embedded in this domain, it is becoming increasingly important to address proactivity in the public sector, and especially in the context of public services (Püüa, 2008; Taveter, 2014; Tallo, 2015). This coincides with an increasing demand on countries to make use of the allocated resources in an efficient manner (Lindgren and Jansson, 2013).

3.1.2 Motivation for the case study

The first exploratory case study, providing family benefit services in Estonia, was chosen for the following reasons. Firstly, it is a widely used package of services provided to all eligible people in Estonia by the Estonian Social Insurance Board (SIB). Secondly, the government CIO of Estonia has stated that it is one of Estonia's priorities to provide life and business event services in a proactive and predictive way (Päevaleht, 2017). Some of these services that can be predicted are family benefit services, and especially these associated with birth.

As mentioned, family benefit services are widely used and are available to permanent residents and foreigners who have a temporary residence permit or the right for residence (Social Insurance Board, 2018). The list of family benefits includes the following social benefits: childbirth allowance; child allowance; child care allowance; parental benefit; compensation for the parental benefit and maternity benefit gap; single parent's child allowance; conscript's child allowance; foster care allowance; allowance for big families with seven or more children; allowance for a parent raising seven or more children; adoption allowance; guardianship allowance; and maintenance allowance (Social Insurance Board, 2018).

3.1.3 Data collection and analysis

The current case study was divided into two main sets of activities. The initial exploratory survey on the potential for creating proactive services in the social services area was conducted in the first half of 2015. The author of the dissertation prepared and interviewed the stakeholders from the Estonian Social Insurance Board. The second set of research activities were designed and implemented in the first half of 2018. Here, the author was the main contributor to the list of guidelines (discussed more thoroughly in the Contribution's sub-chapter) and member of a team who conducted the research regarding the life events listed below.

3.1.4 Exploratory case study in 2015

The questions for the exploratory case study activities were conducted in order to comply with the SQ1: What is the current state of service provision?

The interviewees of the exploratory case study were the officials of the family benefit department and e-service advisor of the Social Insurance Board. The interview questions for the exploratory case study were designed to address the following interest areas:

- Who are the stakeholders involved in the family benefit services?
- How to characterise the efficiency of the service (both online and offline)?
- What are the potential areas where an increase in efficiency is possible?
- What are the preferences in the use of a channel by service users?
- What are the potential weaknesses and constraints of the family benefit services?

The responses for the questions were presented based on the main themes of the replies. As the exploratory case study activities conducted in 2015 only focused on the concrete and limited set of questions presented above, the main observations provide a compendious overview of the family benefit service provision in Estonia in 2015. The results of the exploratory case study were presented at a peer-reviewed International Human Computer Interaction Conference in 2016 in Toronto, Canada.

3.1.5 Main observations

The main observations from the questions are brought out below. The interviewees identified a range of stakeholders, for example the ones covering support functions, procedural activities, e-service hosting on the state portal eesti.ee, and different

registries on the architectural backbone for Estonia – X-Road. A number of stakeholders, such as the Social Insurance Board, the Ministry of Social Affair, the Estonian Information Systems' Authority, different registries, service developers, and different officials at the Social Insurance Board, are involved whether in the application procedure or covering the support functions.

The responses revealed that increasing the efficiency of the service, both online and offline, would involve moving from an e-service (which currently enables submitting an application by electronic means) to an automated e-service (that would allow gathering information from different registries and databases). Also, the offline service would benefit from switching from a service-specific application to a unified application, where the user of the service would be able to apply for a number of services at once to save time on doubling the provided by him/her application data.

Although the e-service is available on the state portal, it turned out from the interviews that only an average of 40% of the service users are currently opting for that. The numbers vary from city to city, reaching up to 50% in bigger cities (such as Tallinn and Tartu), whereas only around 10% of families are currently using the e-service in the north-eastern part of the country. The interviewees pointed out that a stronger focus on promoting the service and delivering clarifications in different languages would be beneficial.

The interviews showed that the current situation, where the necessary data is available in the registries, allows the application process to be relatively seamless and quick, taking from 15 to 20 days to process an application. However, should the applicant have been previously working or living abroad, the process would be longer, as each situation would usually be looked at in a case-by-case way.

In 2015, the use of the family benefits service required an individual to show initiative and apply for the benefit. According to the respondents, proactivity in the provision of family benefits service was hindered by the fact that different stakeholder may be eligible for the same benefit (e.g. both parents may apply for the childcare allowance). However, a proactive proposal for the application could be made to all who are eligible to apply for the service.

3.1.6 Main insights

The exploratory case study activities that were conducted in 2015 allowed us to understand more clearly how the service provision in the family benefit services' sector was conducted. In order to understand how to provide public services more proactively a number of insights could be taken into account:

In order to ensure the knowledge about the existence of the services that would benefit the citizen or resident promotional activities should be carried out. It was stated that clarifications about the available services ought to be provided in several languages. This would aid delivering services in different parts of the country and with people from other cultural background rather than only Estonian-speakers. This is becoming increasingly relevant in 2019 as more English or other language speakers are becoming residents of Estonia.

In order to provide proactive (family benefit) public services it needs to be made clear, who would be the beneficiary of the service (i.e. who will receive the benefit onto their bank account). For that, the process of benefit notification should be clarified, and possible re-designed.

3.1.7 Research activities in 2018

Since June 3, 2017 the provision of public services is guided by the Principles for Managing Services and Governing Information (PMSGI) (State Gazette, 2018). The mentioned legal act defines the notion of life and business event services. PMSGI §2 (4) defines the life and business event services in a following manner:

"Event services are the direct public services provided jointly by several authorities so that a person would be able to perform all the obligations and exercise all the rights conferred on the person due to an event or situation. An event service compiles several services (hereinafter component service) related to the same event into a single service for the user." The author of this dissertation argues that the inclusion of the notions of proactive services and life and business event service illustrates the political readiness and motivation to start providing these services in a more structured and reasoned method in Estonia.

3.1.7.1 Motivation for the research activities

The author of this doctoral dissertation participated in the work of the Department of Information Society Services Development (DISSD) at the Ministry of Economic Affairs and Communications (MEAC) from February 2018 until September 2018. During that time, the goal of the activities was to map out 15 most common life and business events together with the component services and service stakeholders. As a result, an indicative list of life and business events based on their impact and feasibility to design and implement was created (see Table 8 for an overview of life events). The following characteristics of each event were considered:

- What is the influence of each service (how many times per year and per life time it is used);
- How many counterparts are involved in providing each service;
- How many sectors are linked;
- How easily can the service be automated;
- What is the level of technical complexity;

These 15 events included instances such as birth, going to school, applying for a driver's licence, starting a business, and death among others. Based on the strategic focus of the Estonian state, the family event more generally, and childbirth event more specifically have been prioritised as the first areas to be restructured in order to be able to provide these services seamlessly in an automatic and/or proactive manner. The first goal that has been set is to provide the childbirth event in a seamless information service format as early as in the end of 2018. Simultaneously, the childbirth event is developed and the possibilities for the automatic and/or proactive provision are mapped in order to be launched by the end of 2019. Table 8 contains the overview of the 15 described and mapped life events.

Table 8 Overview of described life and business events

Life event	Technological complexity	Involved stakeholders	Number of component services associated
Birth	Most services and information gathered in State Portal eesti.ee. It is possible to do everything online, but also go to the Vital statistics office	Local municipalities, Social Insurance Board, Health Insurance Fund, kindergartens, hospitals, Vital statistics offices	34
Death	Currently, most services associated with this life event happen in paper-form	Hospitals, doctors, Vital statistics offices, local municipalities, funeral bureaus, cemeteries	38
Changing the name (marriage, divorce)	Getting married and divorced are still the last two services in Estonia that only accept face-to-face applications. For that the person looking to change the name needs to fill out a paper application and take it to the office	Local municipalities, notaries, Ministry of Finance for the state fees, Police and Border Authority, Banks, Road Administration, other stakeholders associated with the person who need to know about the name change	19
Changing the residence	If a person is buying a new home, the communication with the state is only limited to notaries, where physical attendance is necessary	Banks, notaries, real estate bureaus	7
Construction activities	Digital communication is happening through the Building Registry. However, the process is complicated as many applications for the construction permit need to be submitted and the waiting times are long	Local municipalities, Ministry of Economic Affairs and Communications, Ministry of Finance for the state fees, architects and other building specialists	n/a
Conscription	Technologically complex as many stakeholders are involved in the process, information is not changed seamlessly	The Office of Defence Resources, Digital Health Registry – Digilugu, family doctors	57
Right to drive	Technologically diverse, it is possible to fill applications both online and at the office. The application process is fairly simple	Road Administration, Estonian Motor Insurance Bureau, Traffic and Road Registry, Traffic schools	21
Owning a car	Technologically diverse, it is possible to fill applications both online and at the office. The application process is fairly simple	Road Administration, Estonian Motor Insurance Bureau, Traffic and Road Registry, Private sector parties and individuals	26

Going to school (1st grade)	Many municipalities provide an e-solution for applying to the 1st grade. However, smaller areas and schools only take paper-based applications	Local municipalities, schools, Ministry of Education and Science, Education Registry	41
Changing the school	Depending on the school and location applications can be submitted either electronically or directly to the school	Local municipalities, schools, Ministry of Education and Science, Education Registry	41
Looking for a job and unemployme nt	Simple processes, all applications, trainings, and activities are organised centrally. Services can be applied for through the office or e-environment	Estonian Unemployment Fund	27
Retiring	The current situation is built upon a paper-based application. There is only one application, but every person needs to submit personal documents that would support the application.	Social Insurance Board	15
Becoming a victim in a crime	The process is dependent on the type of the crime. However, all documents are accessible through the e-court system, which enables access to all relevant stakeholders.	Courts, Hospitals, Police, Estonian Motor Insurance Bureau	16
Business event services	Many steps are necessary in different business events. However, most of the services and applications are available through the Internet	Centre of Registers and Information Systems, e-Business Register, Tax and Customs Board, Ministry of Finance for state fees, Statistics Estonia, Courts	30
Applying for disability	Difficult, as each disability needs a separate procedure for applying for benefits and disability classification	Social Insurance Board, doctors, Estonian Unemployment Fund	16

3.1.7.2 Data collection and analysis

For this part of the case study both desk research and interviews together with the officials of the MEAC were conducted. The first stage included gathering information about the current state of the birth related services. Birth as an event is an occurrence or a trigger that sets off a set of following events and services. For the purpose of this study, the start of the birth event was determined with the registration of pregnancy and the end with registration of the child to the kindergarten. Data about the birth event was collected by analysing the publicly available materials about the existing services, birth

and services statistics, and stakeholders who are involved in providing any of the associated services.

The involved stakeholders for the broader birth event included the Ministry of Social Affairs and the Ministry of Internal Affairs, the Social Insurance Board, Estonian Health Insurance Fund, the State Support Services Centre, local governments, the Centre for Health and Wellbeing, and different healthcare service providers.

3.1.7.3 Main observations from data analysis

31 services were identified and listed as component services of the birth event. Out of the 31 services, 7 were identified as to occur before and 24 after the childbirth. The pre-birth services are brought out in Table 9 below.

Table 9 Pre-birth services

Service	Service provider	Registry/Information System
Registering the pregnancy, monitoring the pregnancy, and calculating the due date of the birth	Healthcare providers	Patient portal digilugu.ee, SA TÜ Kliinikum eHealth PERH-EsTer Hospital Information System LIISA (Lääne-Tallinna Keskhaigla)
Pregnancy health insurance	Health Insurance Fund	Health insurance database at the X-Road sub-system
Calculation process of the birth benefit (Information service)	Health Insurance Fund	Descriptions on the homepage and illustrative calculations
Applying for the birth benefit	Health Insurance Fund	Health insurance database at the X-Road sub-system
Staying on pregnancy and childbirth leave	Employer	Worker's Registry (TÖR)
New birth benefit during the childcare leave (cancelling the current childcare leave)	Employer/ Health Insurance Fund	Worker's Registry (TÖR)
Calculating the amount of the parental benefit (Information service)	Social Insurance Board	Descriptions on the homepage and illustrative calculations

The after-birth related services are brought out in Table 10 below.

Table 10 After-birth services

Service	Service provider	Registry/Information System
Deciding on the name – inquiry about the name statistics (Information service)	Statistics Estonia	Homepage
Inquiry about the suitability of the chosen name to register the birth of the child	The official of the Vital Statistics Department	n/a
Application for the childcare leave	Employer	Worker's Registry (TÖR)
Application for the father's childcare leave	Employer	Worker's Registry (TÖR)
Registering the birth of the child and the name	Vital Statistics Department/Local government	Population Registry
Acceptance of paternity	Vital Statistics Department/Local government	Population Registry
Issuing the birth certificate	Vital Statistics Department/Local government	Population Registry
Child's health insurance	Health Insurance Fund	Health insurance database at the X-Road sub-system
Assigning a family doctor to the child	Health Insurance Fund	Health insurance database at the X-Road sub-system
Applying for the national childbirth benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the local government childbirth benefit	Local government	n/a
Applying for the parental benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the difference between the parental benefit and childbirth benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the parental benefit tax exemption	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the additional payments of the mandatory pension	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying to change the recipient of the parental benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)

Applying for child benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for childcare benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the single parent benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the conscript's child benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Applying for the big family benefit	Social Insurance Board	SKAIS (Information System of the Social Insurance Board)
Health insurance of the childcare benefit provider during the childcare leave	Health Insurance Fund	Health insurance database at the X-Road sub-system
Applying for kindergarten	Local government/ Kindergarten	E-service in Tallinn, ARNO in Tartu
Monitoring child's health	Health care provider	n/a

3.1.7.4 Data collection and main observations from the interviews

Semi-structured interviews were conducted with the above-mentioned service providers in order to investigate about their readiness and mentality about the life and business event-based approach to public service development. Similarly, the conducted interviews supported the proposed SQ1. What is the current state of service provision? Interviewees were asked:

- What is the current state of birth related service provision (in the context of their organisation)?
- What is the mentality of the organisation about providing proactive public services?
- Who should be the owner of the jointly provided birth event?

As a result of these interviews, the DISSD was able to provide a set of guidelines and suggestions for the renewed "Estonian Information Society Development Plan 2020" (MEAC, 2018a) that were approved by the Government in November 2018. The Development Plan focuses on developing and designing future e-services in a user-friendly manner and brings attention to the goal of providing seven life event services within two years (before 2020) (MEAC, 2018b). The goal is to:

- Centre the future development of proactive and life event services on the Principles for Managing Services and Governing Information (PMSGI) (State Gazette, 2018);
- Focus on the agreed service evaluation indicators (time, satisfaction, cost, and the number of transactions);
- Move towards life event based service provision (that collocates the different organisations' and fields' services), which allows holistic service provision from the citizen's point of view;
- Move towards the provision of proactive services that is based on the already existing data sets (MEAC, 2018a).

The readiness for proactive and life-event-based services is also illustrated by the State Portal, eesti.ee. The portal is developed and maintained by the Estonian

Information Systems Authority and since the beginning of December 2018 it has re-designed its functioning logic to accommodate the life-event-based thinking in the public sector (Geenius, 2018a). In the initial phase, the renewed State Portal focuses on first six life events, whereas one of them is the birth of a child. The current visual of the State Portal can be seen in Figure 5 (eesti.ee).

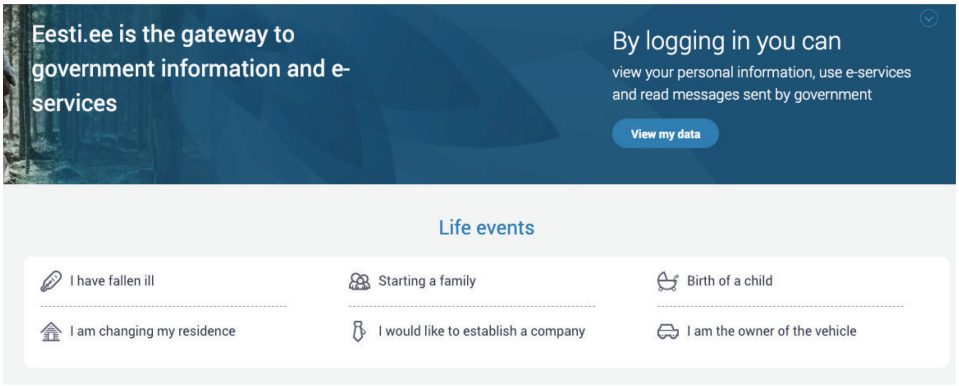

Figure 5 State Portal eesti.ee introducing the life events' logic

3.1.7.5 Main insights

Case study one presented the author with an initial perspective into the service delivery in the social services sector. The research activities were designed in order to help respond to the first sub-question (SQ1): What is the current state of service provision?

In 2015 the concept of proactive services had not been discussed broadly. However, when inquiring about the concept proactive service provision, the Social Insurance Board (SIB) stated that a new information system, SKAIS2, was in development that time, which would be able to provide family benefits in a more proactive manner, e.g. through one application. In 2015, when the first exploratory set of activities were conducted, the application was seen as "relatively seamless and quick" and allowing the social service's official process the application from 15 to 20 days.

One of the key issues that were mentioned about family benefit provision was the relatively low average number of e-service users (40%), reaching up to 50% in bigger cities (Tallinn and Tartu), and getting as low as 10% in the north-eastern part of the country. The 10% user rate could be explained by the fact that according to the last census from 2011, about 5% of the population in Narva (the biggest city in North-Eastern Estonia) is Estonian, 82% Russian, and rest of the 13% are divided by Ukrainians, Belorussians, and Fins (Statistics Estonia, 2019). It was brought out that still a lot of information was not thoroughly translated. Thus, it can be assumed that the number of people who could use the family benefit e-service in the North-Eastern part of Estonia could be solved by ensuring an equable use of different languages when providing online services.

The concepts of proactivity and the acceptance of this idea in the public sector have grown and developed in the last 3-4 years as it is showed by the following research activities conducted in 2018. Together with the MEAC 15 life and business event services (as seen in Table 8) were described and collated to provide an overview of the current state of service provision and provide the Government of Estonia with a list of prospective public service development directions. Out of these 15 events birth and

family benefit services were prioritised. Semi-structures interviews were conducted with different stakeholders from the Ministry of Internal Affairs, Social Insurance Board, State portal eesti.ee and the service design team at the Estonian Information Systems Authority, as well as the Tallinn City Government among others. Mainly, the readiness and mentality about the life and business event based approached to public sector development were investigated.

By conducting interviews with the public sector representatives, the DISSD (Department of Information Society Services Department) was able to get assurance from the stakeholders that there is readiness from the organisations to start providing proactive services in the public sector. As a result, the DISSD provided suggestions for the renewed "Estonian Information Society Development Plan 2020) (MEAC, 2018a). The goal is to design and provide seven proactive life and business event services that work automatically and in a user-friendly manner before 2020. Furthermore, the readiness of the state to start providing proactive services is also illustrated by the recent developments of the State portal who have started rolling out life-event-based services since December 2018.

3.2 Case study two: Services for disabled children's parents in Estonia

3.2.1 Domain

In Estonia, there are many different organisations, both public and not-for-profit, which are dealing with the issues of providing information and different services for disabled children and their families (Koplimaa, 2016). According to the Ministry of Social Affairs the number of children aged 0-17 with a disability has almost doubled from 7368 up until 12896 (Postimees, 2018). Figure 6 (in Estonian) shows the growth in the numbers. The categories of disabilities listed are: visual (177/160), hearing (313/254), cognitive (47/393), physical movement (1085/937), speech and language (164-1201), mental (1207/1861), compound (1306/3957), and other (3069/4133).

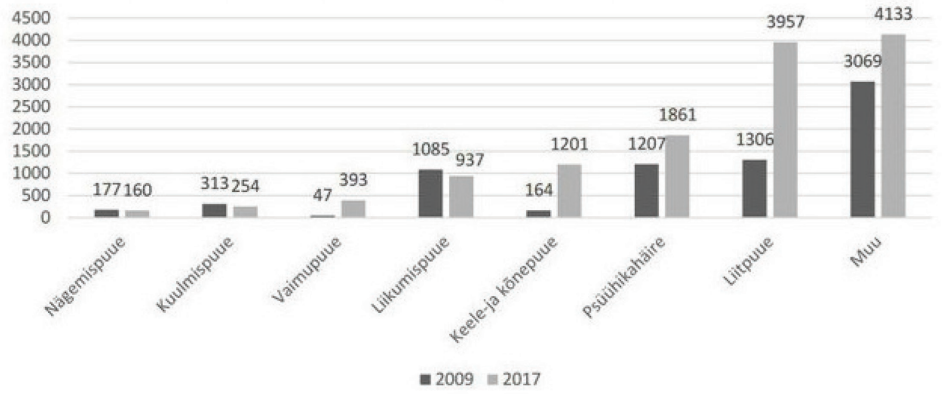

Figure 6 The number of disabled children in 2009 and 2017

Altogether, as of 2017, the total number of disabled people in Estonia is 149 904, which accounts towards 11,4% out of the entire population of Estonia (TAI, 2019).

3.2.2 Motivation for the case study

The information that is available through the different organisations and provided to parents with disabled children is often scattered and spread between different databases and information systems. A situation that already complicated is made even more cumbersome by not providing a comprehensive and understandable solution to the potential service user. It is argued here that there is a need for providing a holistic and proactive service that allows the family to maintain and restore a reasonably normal life and living standard (Koplimaa, 2016). With the growing interest towards the provision of proactive public services the author argues that such complex life events, such as giving birth and caring for a disabled child or dealing with disability in the adult life, is a sensitive area in a person's life, which would benefit from being design proactively. Providing proactive public services for people with disabilities (or their parents) or with any other disadvantaged citizens' context would potentially help making their lives easier, increase their sense of belonging in a society, and would make them deal with everyday bureaucracies more seamless.

3.2.3 Data collection and analysis

The second case study investigated the situation of providing services for the parents of disabled children. Information gathering and analysis was by an e-Governance Technologies and Services master's student Mariane Koplimaa in April 2016 for her master's thesis (Koplimaa, 2016) under the supervision of the author of this doctoral dissertation. In this case study, the problems of service design were illustrated, and solutions for three chosen services were presented. The case studies were conducted through using eleven in-depth qualitatively analysed interviews and descriptive overviews, primary information sources, and Agent-Oriented Modelling (AOM) (see Sterling and Taveter 2009) for understanding the context and representing the findings.

Firstly, the application process for yearly allowance for a disabled child in the city of Tallinn was described, modelled, and analysed. Secondly, the application process for special nutrition or food support for a disabled child was described, modelled, and analysed. And lastly, the application process for day-care for a disabled child was described, modelled, and analysed. These case studies were chosen to illustrate how the system of submitting the relevant applications and providing the parents of disabled children with relevant information is not as coherent and seamless as it would be expected.

The analyses of the available services were supported by eleven in-depth interviews. The interviews help to answer the SQ1: What is the current state of service provision? and SQ3: What are the prerequisites for proactive citizen-centric services?

The themes of the interviews were divided into the following topics:

- Access to information – knowing about the benefits and services;
- Speed of receiving the service or benefit;
- Suggestions for a new system;
- State plans for a new system;
- Time plan for the development of a state-planned new system.

For the purpose of this case study eleven interviews were conducted with stakeholders to gather feedback and opinions about the current situation of informing and providing services for parents who have disabled children. The focus of the interviews was mainly on how necessary information can be found, how satisfied were the families with information provision, what is currently missing from the information provision, how could medical doctors' involvement be described, and what were the

current plans by the state. For the purpose of this dissertation, the focus will be mainly on the information provision and potential developments for a proactive solution.

The author of the current dissertation extended the previously done research by focusing on the below-mentioned topics, and by adding an extra dimension of a disadvantaged sector in an article in Appendix 6.

3.2.4 Key quotes and excerpts from the interviews

- Information provision:

Information provision was seen as a wide problem that affects people in different life situations, including those with disabled children. At this point, information provision was seen as one of the biggest problems, as the parent of a disabled child did not receive it on time, received it too late, or not at all:
"The lack of information starts from already an early stage when a child is born with disability. /…/ One must be very aware by himself/herself to cope."

One of the stakeholders brought out that the application process for different disability services was still complicated and unclear:
"The current situation is not good and is complicated for the parent. The parent needs to send application to different places and even within one office, several applications are needed. It is not a clear system."

Furthermore, another interviewee, a specialist at the MoSA (Ministry of Social Affairs), emphasised that the needs of children with special needs were not considered separately from the needs of children with no special needs:
"All the resources that the state has are at the moment divided between everybody equally, no matter what the need is. But the plan is to re-divide everything /…/."

A social worker explained about the obstacles and brought out the critical aspects of information provision and information translation:
"Parents do not make difference, who is the service provider, what comes from Health Insurance Fund and what from Social Insurance Board. These assignment letters have been very confusing and there is always a lot of explanation. In each county the situation is different, and the possibilities are also different. We are not aware of all the information in the hospital about the possibilities to the parent and we sent the parents often to local city governance to social worker who is there. Also, the language is a big problem. Russian speaking families are in big trouble as they have no access to information if it is not translated."

A doctor claimed that there has been a problem with information systems capabilities in general, and doctors' database in particular:
"I do not know to whom these systems comfortable are as the digital system for the doctors is not working well. Besides this, parents do come to ask additional information. I reply that the system is so complicated that I don't understand and cannot help them so much. The system is so complicated and I ask them to turn to Social Insurance Board. It disturbs my work a lot. It is not what I should do as a doctor. The medical worker and doctor should not even know so detailed information about the services or what comes after the diagnosis besides medical questions."

A specialist from the MoSA agreed on the complexity of the current system:
"The current situation is not good and it is complicated to the parent. A parent needs to send an application to different places and even in one office several applications are needed. It is not clear system, especially considering the difficult system for the parent, to search necessary information is not a good solution to the parent now."

Interestingly, it was emphasised by another interviewee that acquiring information also depends on the capabilities of the parent:
"Sometimes it all depends on the activities of the parent. Parents who are not that active and educated reach to undergo the rehabilitation plan later and then it may be the case that the child does not get the needed service."

- The potential improvements in service provision and requirements for the development:

The interviewees were also asked about time-sensitive services. In this area it was brought out that services are not provided in a timely manner, although the information exchange between organisations is allowed:
"There still should be someone dealing with these children to inform city government that a disabled child was born or was diagnosed, and help should be provided. /…/ For the child it is really important that the services should reach the child as soon as possible, urgently. Every parent has experience with 'if I only had heard about it before'."

Furthermore, it was claimed by one of the stakeholders that information should be provided in an efficient and timely manner according to the current situation of the family and the disabled child in particular:
"/…/ Personal approach should be the solution. All packages should be "delivered" by this person to the family. No matter if it is a service by the state or the local government. The problem is also that the person cannot accept too much information at the same time. There should be good reasoning behind the system – what comes first, primarily. Information comes in vertically and horizontally. It should be linked to new information automatically. /…/ There should be offers for services that the child may need. All should be connected and holistic. Now all is separated."

One of the parents said that, in addition to the online tool, a case manager is needed in order involve necessary people in the rehabilitation plan:
"The case manager role is important, online tool alone does not help. The experts can suggest what the parent needs to know."

One of the stakeholders, a representative of SIB, pointed out that there have been plans for a new system of e-service provision by the state:
"The web will be new and we will start to measure more service usage, how information is read, received, used and to see the customer behaviour, how the need develops, and how people use it. How well the channel is used and if it is used. SKAIS2 (SIB's updated Information System) will be a new SKA (SIB's old Information System) with a new website and self-service portal. /…/"

One of the stakeholders suggests an online and automated system should be designed for the parents:
"Like I pay for my electricity – I do not have to do anything for it. If the doctor has made the decision and filled the files, then for the kindergarten for example, the doctor should not do anything extra. The page should be easy and understandable. It cannot be overloaded and not too much text. It often also depends on the parent ability to understand."

An additional function that would be useful in a proactive system would be automatic reminders:
"For the rehabilitation plan, there is still manual signing. There is also no reminder after three years for the parent to renew the plan. A complete and complex service would be really helpful. Otherwise we do not know everything and we cannot help the parent as much as needed."

- Providing proactive services and user-centric services:

One of the stakeholders, clinical child psychologist, claimed that the information is fragmented and not supporting the needs of people:
"The information for the parent is spread around. It is fragmented and splintered. A place to connect these possibilities, state ones, would be good. It would be of course good if there were a system for it. Also, the possibility of having access to support person contacts. Some families who need help, they do not know to ask due to the confidentiality although there maybe is money in the local city governance budget. Even if the possibilities at least are collected together would be good and useful."

An interviewee from the Genetics Centre at Tartu University Clinic supported the idea about a contact person and a user-centred service:
"Would be good If there is a person to whom the parent can turn to or a website from where to get information. With this system, there is need for personal touch. /…/ At the moment there is approach that officer-centred. It is important that information is accessible and that people reach it. At the moment it needs high IQ to reach the services."

Two sides are presented. On the one side, a parent and author of handbooks for and about disabled people said:
"Until now there is nothing heard about the plans for new system. There is nothing known about ministry plans. Also they want to hide behind data protection when planning something new."

On the other side, the previous stakeholder continued that there are plans for new services and solutions:
"Yes, there are plans, for several years there are many ideas and plans going around. The web will be new and we will start to measure service usage more, how information is read, received, used and to see the customer behaviour, how the need develops and how people use it. How well the channel is used and if it is used. SKAIS will be new SKA with new website and self-service portal. Communication with service providers and users will be more precise. The plans are based on the state plans and Social Insurance Board

plans. Parents of disabled child will be involved in the development. The parents will be contacted and there is a working group working on it."

Stakeholder from the Ministry of Social Affairs explained:
"Today's information systems are old, once SKAIS2 is ready, it can be connected to STAR and eHealth information system and then the data can be used better. First the databases need to be ready. The existing data needs to start to move and to be used. The information the state needs should be asked once. Here the question of private information comes out as the health data is sensitive (GR complements that "it should be asked from the parent, if the parent shares data"). But for sure the numbers should be visible for the parent, how many services the child should get and how much is left."

One of the stakeholders from MEAC (Ministry of Economic Affairs and Communications) claimed that currently the legal system does not support the provision of proactive services:
"Today providing a public service is based on a voluntary will. It you do not want a service, it is not provided to you because actually there are people who do not want a service because, for example, they do not want to admit the disability of their child. There needs to be some type of classificatory feature in between, before the state can proactively provide the service. /…/ Here is the trick with proactive service and free will. But for the developed and changed system, it should be seen, what part of the work is possible to automate with an intelligent information system. The answer should come from the service owner if there is a need for a person – case manager – and why the part of this person cannot be automated, what is the extra value this person brings to the system, especially with respect to sharing information."

It can be seen from the excerpts of the interviews that the current situation with information gathering has been unclear and divided. More active parents have been able to find information through different sources and by sharing information amongst them. A strong emphasis is put on the future information system that would be able to pull together information proactively through different databases in order to empower parents to make informed decisions about their disabled children's welfare.

3.2.5 Main observations

Through the eleven interviews that were conducted for the second case study on providing proactive services for disabled children's parents a number of themes emerged. In understanding the main problems the parents of disabled children face daily, a number of pain-points were exemplified. Firstly, information provision and accessibility are crucial in any sector and area in the public sector. However, it becomes even more relevant in a situation where sensitive information is processed by a number of stakeholders. Often, in the case of illness, disability, or any other sensitive circumstance, the information is time-sensitive, but the large number of involved stakeholders increases the likelihood of the situation not being handled efficiently.

It was also mentioned by many interviewees that there is a need for proactivity to manage information. This could be done through a caseworker, a one-stop-shop that would be able to bring together all necessary forms, applications, bits of information, and contact details to social workers for instance. Additionally, it was mentioned that this system should include the functionality of pushing out notifications and messages to the service user (or a parent of a disabled child in this case). Such notifications are

examples of proactive functionalities that are already implemented by many public organisations for the last few years. The Road Administration in Estonia for instance is reminding driver's licence holders when their driver's licence or health certificate is coming to an end. However, such functionality has been implemented already for a longer period in the private sector, which has been sending push notifications and alerts to their customers and potential future customers.

The results of the interviews showed that people are looking to the public sector to start providing services in a similar way to the private sector. People affected by unfortunate life events, such as disability or illness in a family, wish not to spend valuable time on searching information about available services, benefits, or rehabilitation programmes. Neither do they wish to visit different doctors, caseworkers, local government officials, or social workers and explain their situation over and over again if this information has been provided already in a separate institution. This case study calls for unified information databases, interoperability between stakeholders' service provision procedures, and for increased empowerment through having access and control over data regarding their situation.

3.2.6 Main insights

The second case study focused on presenting the complex life event of providing proactive public services to parents with disabled children. Based on the presented data a number of key insights can be brought out. Firstly, as seen, information often already exists, but there is a lack of efficient use of that information. Secondly, there are also a diverse group of stakeholders, both from the public and not-for-profit sectors, who recommend that databases containing vital and time-sensitive information for the disabled people should be holistically provided in a personalised and customisable format. For that a one-stop-shop could be provided. Thirdly, building on the birth event, the concept of complex life event should be introduced. A child being born is a life event, which is connected to a number of pre-birth (Table 9) and after-birth services (Table 10). However, if the born child is disabled, a set of additional rules, regulations, and services are applicable for that complex life event.

3.3 Case study three: Ask Izzy homelessness services' platform in Australia

3.3.1 Domain

This section of the dissertation focuses on the case study of providing homelessness services through a mobile web-application Ask Izzy in Australia. Homelessness is a significant problem in Australia, whereas on any given night 1 in 200 people in Australia are homeless. Over 105 thousand people are homeless in Australia out of whom 56% are male, and 44% female. There are also more than 17 thousand homeless children under 10 (Homelessness Australia, 2019). Out of these people around 95% have access to a mobile phone (Accan, 2014) and out of them 80% have access to a smartphone (Infoxchange, 2019a). This is detected both in Australia and United Kingdom (Spinks, 2015). More than 250 thousand people have received support and almost seven million nights of accommodation have been provided by specialist homelessness services in 2014-15.

The Australian Bureau of Statistics (ABS) defines homelessness when a person does not have suitable accommodation alternatives. They are considered homeless if their current living arrangement "*is in a dwelling that is inadequate, or has no tenure, or if their*

initial tenure is short and not extendable, or does not allow them to have control of, and access to space for social relations" (Homelessness Australia, 2019). Such people are usually staying in following areas:

- Improvised dwellings, tents or sleeping out;
- Supported accommodation for the homeless;
- Temporarily with other households (also couch-surfing);
- Boarding houses;
- Other temporary housing;
- "Severely" overcrowded dwellings (Homelessness Australia, 2019).

There are a variety of reasons why people may become homeless. It is often a result of a number of complex issues such as:

- Lack of affordable housing;
- Poverty;
- Financial crisis;
- Poor physical or mental health;
- Drug and alcohol abuse;
- Family and relationship breakdown;
- Domestic violence;
- Physical and/or sexual abuse;
- (Long-term) unemployment (Salvation Army, 2019);
- Exiting state case;
- Exiting prison;
- Severe overcrowding and housing crisis (Homelessness Australia, 2019).

Services to support people experiencing homelessness were established in the early 20th century. First, the services began with accommodation for travelling workers or families who experience homelessness after the mass unemployment during the great depression. The 1970s brought new social movements such as the women's liberation and the increasingly vocal young people. Following that, in 1985 the Supported Accommodation Assistance Program (SAAP) was established through government funding that brought together a range of services that provided accommodation and support to single men and women, families, young people, and people escaping from domestic and family violence. In 2008, the Australian Government released a white paper on homelessness, The Road Home, which stressed the need to reduce homelessness in Australia through stopping the flow of homelessness, improving and expanding services, and breaking the cycle of homelessness (Homelessness Australia, 2019).

3.3.2 Motivation for the case study

Based on the research done at the University of Sydney in August 2014 by Dr Justine Humphry claimed that 95% of homeless in Sydney and Melbourne own a mobile. Out of these people about 80% have a smartphone (University of Sydney, 2014). As a response to this research, Ask Izzy, a free, anonymous, and Australia-wide web-application service was launched in early 2016 by the Prime Minister of Australia Malcolm Turnbull (Gillett, 2016). The main stakeholders and partners in the Ask Izzy project were Infoxchange, who wanted to make it easier for the people experiencing homelessness to find services that they need, Google, who funded the project (that was initially led by Infoxchange), REA Group, the company behind realestate.com.au, and lastly, News Corp, to inspire, inform and advocate for a better Australia (Ask Izzy, 2019). Later, Telstra, an Australian telecom

company, joined the fight to help homeless people by giving free unmetered access to Ask Izzy (Mason, 2016).

The case study was chosen as an example in this doctoral inquiry about proactive services in order to address the need for approaching people in a disadvantaged sector. As seen in the previous case study, people with disabilities are experiencing a complex life event. Similarly, becoming homeless or experiencing homelessness could be seen as a complex life event that needs additional focus. In order to understand how to address service provision in the homeless services' sector different stakeholders were interviewed.

3.3.3 Ask Izzy Platform

The platform serves as a one-stop-shop with the goal to help search for necessary information regarding different topics in homelessness area based on people's needs. The platform connects people who are experiencing homelessness or who are in the risk of becoming homeless with over 350 000 services nation-wide (Infoxchange, 2016). The categories of interest vary from medical to housing, from everyday things to legal, and from counselling to technology to name a few. See the screen capture of the application visual in Figure 7 below.

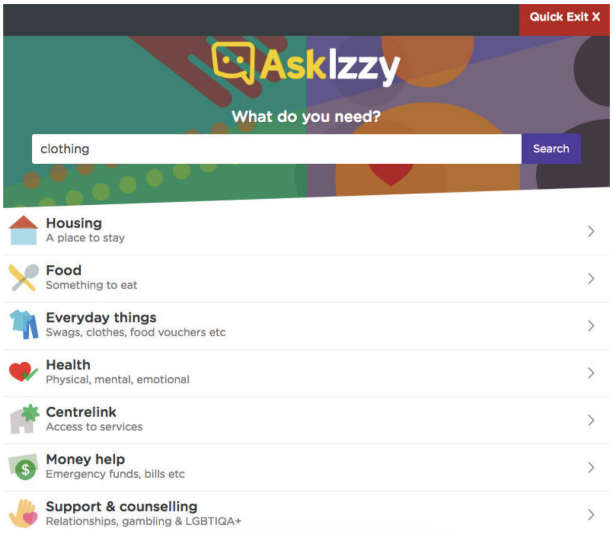

Figure 7 Screen capture of Ask Izzy service search page

The users of the web-application can specify their location using a postcode after which the closest results are displayed. The screen capture of the search results for "Clothing" is shown in Figure 8 below.

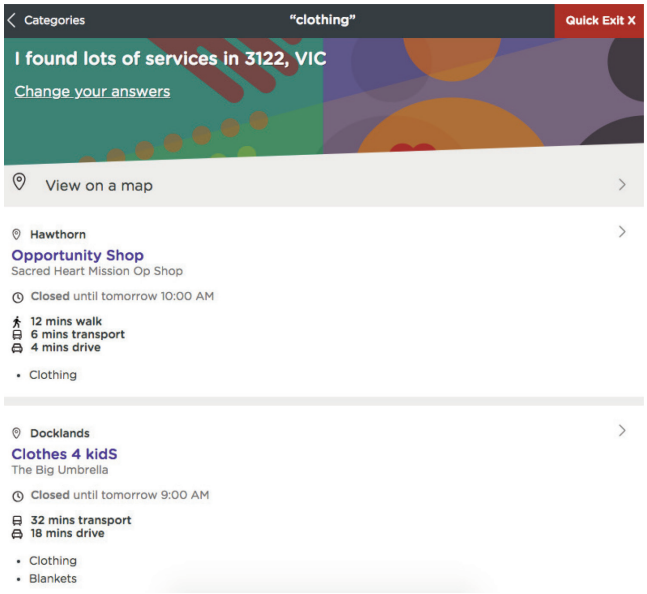

Figure 8 Search results in Ask Izzy based on location

Infoxchange, the social developers behind Ask Izzy, have recently added additional functionality to the platform. Now it is possible to use the Ask Izzy Open Data Platform (Ask Izzy, 2019b), which is a data tool providing actionable insights based on location-specific data about the supply and demand for services in Australia to policy-makers and service providers. The tool uses data sets from Infoxchange, Australian Institute of Health and Welfare (AIHW) (https://www.aihw.gov.au/), and the Australian Bureau of Statistics (ABS) (http://www.abs.gov.au/). The data is updated near real time as opposed to information that previously came from government data sources. Through the open data platform it is possible to see where people are looking for services, at what time of day people are looking for services, where are they located, and what are their needs (Pro Bono Australia, 2018).

The author of this dissertation argues that the added functionality of the platform enables providing homelessness services proactively. By analysing the open data available through the platform service providers and policy-makers can target potential service users exactly based on their needs, locations, and specific characteristics.

3.3.4 Data collection and analysis

The third case study was providing services for homeless people through a mobile web-application Ask Izzy. For this case study, thirty interviews were conducted with the purpose to understand the main pain-points in adopting and using the Ask Izzy web application. The interviewees included stakeholders from different groups: homeless and ex-homeless people, service providers, and the software owner. The research was conducted in cooperation with the colleagues at the University of Melbourne and Swinburne University of Technology in Melbourne, Australia. The author of the dissertation analysed the conducted interviews through the lens of proactivity in order to understand how to provide proactive services to people in the disadvantaged sector. The case study seeks to answer the SQ1: What is the current state of service provision?

As mentioned above, the platform serves as a one-stop-shop where the users of the service are able to search for necessary information based on their needs. The categories

of interest vary from housing to medical, from everyday things to legal, and from technology to counselling to name a few.

- The interviews focused mainly on two aspects.
- What did the interviewees think about the Ask Izzy web-application?
- What would be the best ways for anyone to promote it?

For the current dissertation of designing proactive services, the main focus was put on the issues of information provision and the roll out of Ask Izzy to its potential users. The following sub-section presents the excerpts from these themes.

The research on Ask Izzy has spanned over the last few years. The author of this research was directly involved with the research while spending a semester at Swinburne University of Technology from September 2016 until March 2017, by participating in focus groups and interviews.

3.3.5 Key quotes and excerpts from the interviews

- Access and types of information:

It was pointed out by one of the interviewees that for a homeless person, or for anyone in the disadvantaged sector, information is the most important:
"Information has been the biggest issue apart from housing. /…/ You never expected to be homeless and sometimes you just assume that it's taken care of by someone./…/ it's like I want to see information, I want to know when I become homeless, where I can go, who can help me, what can they do./…/ Because they need so much information, they need so much connection."
Search engine optimisation for homelessness services plays a crucial role in rolling-out Ask Izzy. When a Google search on homelessness was done, Ask Izzy did not come up at all.

The same argument was confirmed by a local area coordinator:
"/…/ And certainly having information available so that people have easy to understand that would be fabulous."
Homelessness service system is complicated and people are re-directed between service providers and jurisdictions around the service.

A local area coordinator suggested that information needs to be current in the back-office and it should be ensured with reasonable resourcing:
"/…/ The constant thing that we've had, even with ServiceSeeker (directory of community support services – Author) going back to the beginning, so is making sure that the backend is... there's enough resourcing at the backend to keep the information up and current. /…/ rather than relying on existing information systems potentially, because I mean even amongst ourselves, depending on the busyness of the week, /…/ depends on whether that information gets out on a Monday or a Thursday in our region."

However, keeping information up to date is arduous:
" /…/ And if we've learnt anything through Opening Doors it is just how much effort is required to keep systems and procedures, and contemporary and information up to date."

One mental health advisor suggested that information exists with some limitations:
"But the information, it's not that it's not public, it's just that people don't know what they don't know."

A focus group consisting of homeless people were asked about what kind of information they would be willing to give in order to use the (Ask Izzy) service:
Respondent 1: *"Myself personally it wouldn't really worry me about giving what information you would need to give in the app, because that would give you more information to get more help."*
Respondent 2: *"You need to put in as much information as you can."*

Social workers specialising solely on Indigenous people reported that normally they give out information in several forms:
"Print it out, word of mouth, write it down for them. Sometimes I text them phone numbers and stuff."

- Qualities of Ask Izzy:

It was pointed out by one of the participants that one of the main strengths of the web-application is its infrastructure.
"I think that one of the strengths of Ask Izzy as a tool is that it piggybacks on that existing infrastructure."

However, it was also emphasised that Ask Izzy is limited in scope in a way that it does not provide a complete solution for a person who is searching for housing, rather simply provides basic information about the service provider:
"It will provide you with the phone number for where you can go to go get that help, but of course it can't do more than that, and so that in a way was one of the limitations it's not you know of itself that's not the fault of the product obviously."

It was also pointed out that the role of a case manager could close the gap between the information what Ask Izzy provides and how people are able to use it:
"A case manager can do the practical things, let's look at where the library is, alright let's get in the car and let's go to the library."

- Rolling out and utilising Ask Izzy:

Another interviewee, a service provider, mentioned that it can be difficult to roll out the service to the target group if it has not been defined precisely who are the end users:
"I think one of the challenges for something like Ask Izzy, who is the end user? If it was someone for instance if it was someone with a disability, it's really clear. /…/"

Local area coordinator suggested a solution for contacting people:
"/…/ How do you let people know that the app's available? I think if we're talking with people that are having access with the entry point, then that's part of how you let people know the app's available and, "Look, you know, get this app on your phone and we can keep in contact with you, and we can let you know what's going on, and there's lots of good information on there," you know."

Following up on how the promotion for the app could be done:
"And, yeah, so the promotion of an app like can be done in a whole range of ways. For me it goes back to Sarah's point about not overpromising. /…/ But to turn that then into something that is more about accessibility, as a path to a solution for a client, yeah, under-promising and over-delivering is probably the better way to go."

Different customer segments should be addressed differently according to a local area coordinator:
"And then there are slightly different pathways depending whether someone's a young person, single person, family, or experiencing family violence. So it's worth making those differentiations as well."

It was also emphasised by them that there is a need for designing a system of communication:
"In terms of how would you get information to those people though, that's I think probably the key one for me if I was designing a system of communication to that would be the point at which they meet the homelessness system. So I would do two things, I'd make sure there was information about ASK IZZY at every entry point. They know where they are, they're clearly identified, as I said there's eighteen or twenty in Melbourne and then twenty or thirty ones that are sort of out posts of those organizations."

Communication with people experiencing homelessness can be complicated as they do not have a fixed address, which is for instance needed for census and voting. A local area coordinator explained how they approached the homeless in this situation:
"Oh, we just did the Victorian Electoral Commission, you know people that haven't got a fixed address can enrol under that to vote, but not many know. So we do the old poster thing and we go speak to people at community meals and stuff like that. But we get such a small percentage. Whereas this I think, you know, this could really get some movement on some of these things."

Different levels of divide to services can be exemplified and it is determined by whether people live in rural or urban areas:
"I think the biggest part becomes the access kind of stuff and the referral pathways to start with. /…/ I think when it comes down to rural, I think that tyranny of distance is a big one. /…/ So it's not in the centre of town, so basically to get there you've got to really get on a bus, things like that, so here comes the costs again, /.../ so basically to get the entry point for an appointment it costs you say five bucks for the bus, whatever it might be, and it also takes you four hours, you know one hour to get there, an hour wait, /…/, and back again."

A statement was also made on working together with other partners and stakeholders to publicise information about Ask Izzy:
"What's happening at the moment is that the marketing team in conjunction with the CEO /…/ has actually picked that up and working with Real Estate Australia and News Corp around how we actually get the word out. /…/ The second thing is working."

The more general function of AskIzzy was seen by a service provider to be preventative or reactive rather than proactive.

"So more in the way of thinking of ASK IZZY as a preventative thing rather than as a response to someone who's homeless only but as a way of a future proofing yourself or skilling you up to know how to search for what you need to make sure that you see a doctor when you need to see a doctor, know where they are, all those sorts of things."

As it can be seen from the excerpts of the interviews, access to information and information provision are some of the most crucial determinants of service usage. The need for proactive information "push" towards the potential customers of this platform allows making assumptions about the different potential levels of proactivity in service provision.

Proactivity, as a novel concept explained in the previous chapters, had not been known nor considered for the use of this project. However, the representative of Infoxchange claimed that the upcoming stages for Ask Izzy included the introduction of the open data platform (Ask Izzy Open Data Platform), which would aim to provide organisations information about how to make better decisions for people affected by homelessness within their jurisdiction. This, in turn, would be potentially the driver for proactive behaviour from service providers, e.g. public organisations and not-for-profit organisations.

3.3.6 Main observations

Case study three focused on the homelessness service in Australia for which a web-application Ask Izzy was examined. As exemplified through the previous two case studies, and confirmed here, information in sensitive situations and complex life events is always needed and may play a defining role in the wellbeing of a person. Homelessness is a diverse social problem that can have many different reasons ranging from domestic abuse, drug and alcohol abuse, or mental illness to name a few. This is a situation where proactivity is not necessarily something one can apply before becoming homeless.

Understandably, proactivity was not considered in the initial phases of the research. However, through the further development of the Ask Izzy platform, the subsequent stage has in the development of the platform has brought the homelessness community and the service providers serving it an opportunity to get insight into the supply and demand of services. The Open Data Platform allows creative use of technology by displaying on an interactive map where people actually need help. It pulls together information through Infoxchange databases, and data sets from the Australian Institute of Health and Welfare and the Australian Bureau of Statistics. The data can also be downloaded and use for one's own purposes, such as research, reporting, or support for funding requests.

As emphasised in the interviews, in order to roll out a service to a set target group the end user of the service needs to be defined. Segmentation needs to be done based on their socio-economic, education, family status, or age group. Each segment requires a specialised approach, as all these require different pathways for promotion. It can be concluded from the interviews that promotion is always needed and help from promotional activities could assist in rolling out and utilising Ask Izzy and other services or initiatives in the disadvantaged sector. As said, proactivity in the most "traditional" sense is not necessarily the way homelessness services can be approached. However, as it will be discussed below, there are different levels of proactivity that can be considered. For instance, proactive actions could also include preventative and anticipating activities, such as providing public information on the risk factors of

homelessness, dealing with mental health issues in the early on, and creating anonymous support for people who are suffering from domestic violence for instance.

3.3.7 Main insights

Based on the case study three it is possible to make a number of conclusions. Proactivity in the public sector context, or for the purpose of fulfilling peoples' needs, can take different forms and have varied qualities. Proactivity is not a fixed term, but rather can be illustrated as a spectrum where in the one end there is reactivity (i.e. where people need to act in response to a situation) and on the other end there is proactivity (i.e. a situation or service that is pushed to you based on your assumed will and need). In the homelessness case study, it is possible to describe proactivity as a set of actions that are taken in order to provide information to homeless people about the existence of services that may be relevant and beneficial to them. However, promotional and proactive activities are difficult to conduct when the people segment (e.g. homeless people) towards whom to promote services is ill-understood. Subsequently, this raises an interesting research problem. How to market public services to homeless people?

3.4 Case study four: Life and business event services in Digital 5 countries

3.4.1 Domain

D9 (Digital 9) or previously D7 (Digital 7) and D5 (Digital 5), is a network of the world's most advanced digital nations. The D9 countries are focused on adopting open standards and open-source software together with promoting connectivity, and teaching coding to children. In the initial alliance of D5, the founding members were Estonia, Israel, United Kingdom, New Zealand, and South Korea. In February 2018, Canada and Uruguay were accepted into the network. In November 2018 Portugal and Mexico joined. One of the main principles and shared goals is harnessing digital technology and new ways of working to improve citizens' lives (Government of New Zealand, 2019a). The D9 countries have a track record in leading in the development of digital government and designing services that focus on the users' needs.

3.4.2 Data collection and analysis

For the current case study, from December 2017 until January 2018, the members of the D5 countries, Israel, United Kingdom, New Zealand, and South Korea together with the initiator Estonia, were asked about the current situation regarding life and business event services and proactive services. The research was conducted on behalf of the Ministry of Economic Affairs and Communications by the author of the dissertation, and the results of the research were presented for the representatives of the D5 countries at the D5 Digital Nations 2030: A Global Future Summit in February, 2018 in New Zealand. The case study sought to provide insight to the SQ2: How to define the concept of proactivity? and the SQ4: What approaches or service design methodologies could be beneficial when designing an developing proactive public services?

In detail, the survey focused on eight main areas:

- Policy
- Current state of art
- Design principles
- Service channels
- Development process

- Technological platforms
- Governance model
- Barriers and enablers of life and business event services

The analysis of the data set was conducted based on the presented themes. In the interest of the current dissertation, the author of this dissertation is focusing on the areas that concern the requirements for life and business event and proactive public service development. Furthermore, the focus of the author was to collate the excerpts based on selected topics: definition of life and business event services, design methodologies for life and business event services, adoption and development practices for life and business event services, lessons from the service implementation process, limitations in the legislation for life and business event services, and barriers and enablers in the life and business event development process.

For the purpose of common understanding of concepts, life and business event services were defined as services that are provided jointly by several agencies to allow people or enterprises to perform all the obligations and exercise all the rights conferred on them due to an event or situation. A life or business event service compiles several services related to the same event into a single service for the user.

Proactive services were defined as services, which are provided by an agency on its own initiative in accordance with the presumed will of persons and based on the data in the databases belonging to the state information system. Proactive services are provided automatically or with the consent of a person.

3.4.3 Key quotes and excerpts from questionnaires

- How are life and business event services defined in your country?

Israel:
"We don't have a definition in our country regarding life events in general, rather we have existing policy decisions regarding specific life event services."

New Zealand:
"The Service Innovation Work Programme is a cross government programme of work focused on integrating government services around life events. These life events are based on earlier customer research that identified the key pain points New Zealanders have when interacting with government. /…/ NZ has also recognised that a person or family can experience multiple life events at one, and that these life events don't always occur in a linear or predictable way. "

South Korea:
""Lifecycle Services" was first promoted as part of the 7 key national agenda of the previous administration, Government 3.0 in 2015. It aims to provide services related to key life events such as pregnancy/birth, employment, life after retirement, death, etc."

Estonia:
"The idea for life and business event services exists. It is brought out in State Gazette. /…/ In our view we define life and business event services in a following manner: Life and business event services are services provided jointly by several agencies to allow people or enterprises to perform all the obligations and exercise all the rights conferred on them due to an event or situation. A life or business event service compiles several services related to the same event into a single service for the user."

United Kingdom:
"We are making content changes to Gov.uk (which houses government services) so that services are presented by themes rather than the organisation that is delivering them – this is in response to user research around making the site easier to navigate."

- Have you adopted or compiled any design principles for life and business event services?

New Zealand:
"NZ has recently published a draft digital service standard and will be gathering public dieback on this draft over the next few months. This draft service standard outlines a principles-based approach to sustainable, user-centred design and delivery of government digital services."

Estonia:
"We have a number of guidelines that can be applied to life and business event services, but we are currently working on a unified guideline for all. The biggest barrier is how to achieve cross-domain acceptance of the service principles."

United Kingdom:
"UK has implemented its Service Manual, which sets out the codes, policies and guidance for the development and implementation of digital services. This includes specific guidance on service design and principles. GDS has a Service Design Team which works actively across government."

Israel:
"The main principles in our opinion are service design, user centric design, and customer journey methodology."

Estonia:
"User-centricity, automated and simple services. Focusing on change management."

- What method you used for design and initial development process of life or business event services?

Israel:
"Agile, cross-agency and cross-sector task forces."

South Korea:
"Two most important lessons learned were: First, the government had to reengineer the service process to citizen-centric from government-driven. One-stop service was designed to notify the users of services they are entitled to before they ask and to minimize the inconvenience they might face when receiving benefits and services. Second, all service should be custom designed to meet needs of each individual as the society becomes more complex and the number of government services grows."

Estonia:
"Currently, we have a number of unstructured guidelines that have all been built through real case studies. These include guidelines for process management, service design, etc."

United Kingdom:
"All guidance and policies with regard to building services is contained within the Service Manual. This also set out information on the Service Standard and Technology Code of Practice GDS uses Agile methodologies and practices for all digital services."

- What are the biggest lessons learned in the development process?

Israel:
"To get the main player on-board from day one; to use user-centric methodologies."

New Zealand:
"Working cross-agency is still difficult (from ideation to implementation and funding)."

Estonia:
"Administrative management, how to divide responsibility, as we currently don't have concrete mechanisms in place."

- Are there any limitations to life and business event services in the legislation?

Israel:
"Not that we know of, at least not any more than the normal barriers to digitisation."

New Zealand:
"Design and development processes to date have uncovered a number of legislative barriers, e.g. that prohibit the sharing of information between agencies, or that overly prescribe the service delivery form or format limiting innovative approaches, or proactive delivery."

South Korea:
"In case of One-stop Childbirth Service, MOIS cooperated closely with the Supreme Court to revise the Act on the Registration, etc. of Family Relationships, enabling online birth registration online from 2017. Now, a new parent can easily register a birth online and a birth certificate will be sent to the local government system directly from a hospital."

Estonia:
"Data exchange limitations - legally limited, but not technically. Especially cross-domain data exchange."

- Barriers for life and business event service development?

Israel:
"Capacity – we'd like to do more, but right now we're limited by manpower since each life event is complicated, as we mentioned above – for example with the implementation of rights for people with disabilities in which we were only able to focus on people with a

certain class of disabilities, and then only for people between the ages of 20-60 and then only for 10 of the main benefits."

New Zealand:
"The approach is in its early stages and at this stage and needs greater awareness and buy-in across the NZ public sector for the life and business event approach. The NZ public sector operating model is often siloed and agency centric. Operating models need to be optimised to enable Life and Business Events services to be implemented and run across organisational boundaries. This includes clarifying structures and accountabilities for funding and on-going support and delivery. Legislative and policy settings can be prescriptive and limit service innovation. In some areas the public sector lacks the mind-sets, skillsets and toolsets to design and deliver life and business events."

South Korea:
"Identifying exact user needs. Korea overcame this barrier through big data analysis and target group discussions & surveys. Facilitating inter-ministerial collaboration - It was difficult to overcome silos among ministries. Other government agencies were afraid of security glitch or information leakage. MOIS took the leadership and made sure the project got included in the National Agenda. Then, the ministry had conducted meetings with different stakeholders to convince them. It also attracted interests of heads of organizations to facilitate collaboration."

Estonia:
"Mind-set, data exchange legal, driving development and keeping sustainable, Defining the owner and ownership of life events."

- Enablers for life and business event service development?

Israel:
"Methodology of customer journey. Team building."

New Zealand:
"There are some standards and frameworks that can work over the top of individual agencies without requiring them to change their own operations too much. The assumption being that NZ works towards a federated system not a centralised system. The Service Innovation Lab environment and team are supporting collectives of agencies to work together, grow their skills and design and deliver life events. The lab environment provides a safe, neutral space for government and non-government people to collaborate and innovate. Leadership within the Digital Government Partnership supports service innovation, experimentation, and agile approaches and actively works to support the collaborative efforts of their respective agencies."

South Korea:
"One-stop service increased workload of local government workers at each local government offices. They were the ones who had to inform the users and accept single form for different services. MOIS included the local government offices from the beginning of service design and received feedbacks from them to minimize the burden. In addition, by completing the system integration, we were able to automate the process."

Estonia:
"Existing infrastructure, technical side covered, partial case studies for life events already existing, Political support in governmental level (no limitations from governmental level)."

There has been an increase in interest and activities of life and business event services among the D5 countries. Furthermore, the leading digital nations have been working for the last few years on developing and re-designing public services in a more user-centric manner.

3.4.4 Main observations

For the fourth main case study, questionnaires were sent out to D5 members in December 2017, Estonia, Israel, South Korea, New Zealand, and United Kingdom. The coalition of advanced digital nations has grown since then (in November 2018), and four additional members, Portugal, Uruguay, Canada, and Mexico, have been included. The overview and inquiry into life and business event services should, thus, be expanded to include the additional four coalition members.

The notion of life and business event (LBE) services was generally accepted as a viable direction of e-government development. All members of the D5 confirmed to have whether a definition for LBE's or a strategic set of activities that addresses the concept and development of LBE's. The implementation of LBE's is increasingly more often associated with a number of design principles. For instance, New Zealand has implemented a Digital Service Standard, Estonia has a number of guidelines based on real-life case studies, and the United Kingdom has implemented a Service Manual.

Together with the overview of their mindsets, D5 members also addressed the barriers in the service development process. Some of the main issues that were brought out were the need to use user-centric methodologies for service development, getting main stakeholders in the development process from the start, and mechanisms for dividing up the responsibility in the project. It was also brought out, that it is often not possible to focus on all the citizen groups equally and to identify the exact needs of people. The enablers of service development exemplified mainly the aspects of collaboration between different stakeholders, top-down political support and mindset of higher officials, and the already existing infrastructure.

The fourth case study confirmed that there is international political interest and concrete steps taken toward the development of life and business event services. As it was clarified in the section of related works, life and business event services and proactive public services are tightly interconnected, thus affirming the readiness from the public officials to support and prioritise the development of proactive services.

3.4.5 Main insights

As shown through the results of the questionnaire, a growing number of countries are focusing on implementing service design methodologies in their service delivery practices. Furthermore, implementing the life and business event (LBE) based logic allows collecting together the stakeholders and service providers from different fields in order to provide services based on person's lifecycle. The author argues that implementing the LBE logic, sets the foundation for the provision of proactive public services, as one of the fundamental prerequisites for LBE's is the unification and integration of information systems that, in turn, would enable the implementation of proactive public services.

3.5 Complementary analysis one: Technological prerequisites

3.5.1 Domain

EISA (Estonian Information Systems Authority) is responsible for maintaining and developing the national information infrastructure framework X-Road, which includes around 650 institutions and enterprises, around 500 public sector institutions, and around 52,000 organisations are indirectly using X-Road services. Altogether over 1600 interfaced information systems are implemented and the members of X-Road have installed over 370 security servers. Currently, the number of services that can be used via the database exceed 2600, and every party who provides services offers 8 services on average. Five most popular service providers include the following: Estonian Medical Prescription Centre, Worker's Registry TÖR, the X-Road sub-system for the Population Registry, the X-Road sub-system for the E-Health Information System (Digilugu), and the Income and Social tax, and Mandatory Pension system registry (X-Road, 2019).

3.5.2 Data collection and analysis

Interviews with three technical personnel from the Estonian Information Systems Authority (EISA) were conducted in order to find out what are the prerequisites and needs for building a proactive service ecosystem are. The analysis was conducted in order to help answer the SQ3: What are the prerequisites for proactive citizen-centric services?

The overall opinion from the interviews suggests that readiness for proactive services exists. However, there are a number of reasons why proactive public services are still not widely rolled out. For that reason, section covers the following issues of feasibility of creating proactive services together with the technical and motivational reasons why these services have not been already implemented more extensively.

3.5.3 Key quotes and excerpts from the interviews

- On the characteristics of the X-Road database:

"The database itself is not proactive, but the complementary solution could be proactive."

"Currently, we cannot be talking about a life event based architecture."

- What are the possibilities for creating proactive public services?

"If the data exists, it is possible to develop something based on that. /…/ If we are using X-Road, then how should we move on from there? /…/ Many members of X-Road could be interested in the same set of information/data, and if the database is able to forward that information somehow."

"Currently, the database is providing services. Everyone can make inquiries through that. Theoretically it is possible that all members of X-Road are service providers, who would host a service that would enable pushing services towards. Technologically it is entirely possible. However, best to my knowledge, nobody is doing it currently."

- On the reasons why this is not being done at the moment:

"Maybe the system is too complicated, as it expects that all members of the X-Road would implement a similar logic, which would actuate once a push message is received."

"Should you want to consume a message, which is pushed to you, then you should implement a logic process, that would actuate once you receive it. This is the only way to do it."

- The role of X-Road service providers:

Can service providers subscribing to data pushing?
"X-Road operates based on regular inquiries. Should you want to receive pushed messages, you need to implement a service that would be able to "hear" incoming messages. That can be done through mutual agreements with other members. Let's take the birth of a child for instance. We agree that all these who wish to "hear" about this event implement a service within their database. These services should all have the same specifications. And that data owner, who has information about the birth of a child, can push forward that message. /…/ Currently, that mechanism, how the recipient of a pushed message is chosen, is not covered with the X-Road. But if all relevant stakeholders make an agreement, it is possible. /…/ All members of X-Road will be able to be both service providers and service receivers in the X-Road V6 version. This means that they can agree upon their properties."

How can stakeholders make arrangements?
"Should someone wish to implement that kind of service, then they should collect information externally. This cannot be done through X-Road. Substantially, interested parties should be contacted one by one."

The reason for database keeper to push data to other stakeholders:
"Currently, the services are used in a way that allows polling. If at one point the database keeper discovers that the amount of polling has increased, he/she may decide that pushing these kinds of data sets makes more sense for it would strain his/her servers less than polling."

Event-based layer in X-Road:
"Currently, an event-based layer in X-Road does not exist. X-Road is functioning on a basic level. On one side, there is the customer, and on the other side, the server. If they have agreed upon a specific format, it would be possible to implement. However, it does now allow providing comfort services that allow subscribing to."

- On the plans of implementing an event-based layer in X-Road and the reasons why it would be difficult to implement:

"The event layer has not been developed unfortunately. Changing an already developed infrastructure, we cannot imagine it. Making changes and creating a new layer is not simple. One factor is also the GDPR (General Data Protection Regulation). /…/ I can bring out an analogue from the private sector. Each organisation is pushing out their advertisements. However, in the public sector we mostly have personal data. To push out information that a child is born, these are health data. These are delicate personal data. /…/ Consent services have become very relevant. There are problems associated with that. Do you understand what you are giving consent to? /…/ As an idea it is easy, you give your consent and it functions as an authorisation. /…/ The third thing is the motivation of organisations. If in the private sector everything that is not forbidden is allowed, then in the public sector it is just the opposite. Allowed is only what has been

clearly stated that it is allowed. And experimentation is not favoured in organisations. They have their fixed assignments."

About the possibilities:
"At the same time, I cannot see any obstacles if two or more organisations wish to implement it, because for them it maybe the source of efficiency to keep up and maintain services. Understandable, it might not be very easy."

"Also, for this kind of layer to be developed, a technical proposal should be made."

Proactivity as a concept in the public sector:
"Proactivity has been talked about in the public sector for some years now."

The reasons why proactivity has not realised so far:
"One needs to develop something new. However, often there is a lack of development expertise for that. For proactivity to be implemented, the service provider needs to realise services. However, it might not be rational for them, because they might already have functional and working services. He/she would have to do more work for that."

On the influence of politics on service providers:
"Politics influences, but it is still moving too slowly."

The difference proactive services would make for the public official:
"It does not make a difference for the public official if they are developing proactive or "regular" public services."

- Prerequisites and requirement for proactive services:

On the technical necessities:
"I think we should start from where data traffic already works. Even now, many organisations are asking from the Population Registry about someone who has died or been born. And these kinds of things could be transferred towards proactivity already now. This is where we should begin. EISA is also working on the consent service. /…/ Public sector can pull these pieces of data already now in order to carry out public-legal functions."

The predispositions for proactive services:
"Use cases are necessary. If we are developing systems or parts of systems, it needs to have associated use cases. Once you start figuring out how to use logs, then the work will become more concrete. Currently, the use cases are not that easily discoverable. I believe that politicians would make decisions based on "good" use cases. In that case money will not always be a problem."

Profiling and defining the target for proactive services:
"Yes, profiling is necessary. Currently, a unified model for a person does not exist. That model should be holistic and multi-faceted. It should include the person's work, social, family, and education profile, and other information. But the state information infrastructure has been built in a format that supports smaller databases instead of a "super-database". Each database contains just a small part of information, which is then

exchanged only if need be. That kind of a "super-database" would create deep data protective problems."

The meaning for developing proactive services:
"Proactive services exist already. It depends on the definition."

The role of collaboration in the proactive service development:
"It is crucial to collaborate. However, it can be complicated in the case of our distributed architecture, as we have siloes. We get together now and then, but then return to our siloes to continue working on our own problems, which are more critical than proactive services."

The cost of proactive service development in comparison with the "regular" public services:
"I don't think there is much difference."

The rationale for choosing a "new" or a "renewed" service:
"It is easier to develop a new than to re-develop an old service. At some points the old to too old and will lose its meaning."

As it can be seen in the excerpts of the interviews, proactive services in the public sector have been considered for years now. Problems of and prerequisites for the roll out of proactive public services were identified.
Problems included:

- Complexity of the system;
- The service logic among X-Road members is not homogenised;
- Motivation of service providers;
- Potential lack of development expertise.
- Requirements and opportunities included:
- Possibility to start the development from where data already exists;
- Make good use of use cases;
- Focus on profiling and understanding the citizen;
- Enforce collaboration between stakeholders.

The results of the complementary analysis one are discussed in conjunction with the other case studies in the Discussion chapter.

3.5.4 Main observations

Interviews with three technical personnel from the EISA were conducted in order to address the technological requirements and prerequisites for developing proactive public services. The examples were brought out based on the Estonian information infrastructure backbone, X-Road, which gives access to over 2600 services and connects together over 1600 interfaced information systems. Currently, the X-Road includes around 650 institutions and enterprises, and around 500 public sector institutions. Additionally, around 52,000 organisations use X-Road services indirectly.

During the interviews it was claimed that the database itself is not proactive, but it is possible to build a proactive and complementary solution or layer next to it. Even more so, at the moment, the database does not support the life-event-based architecture. However, it was confirmed that if the necessary data exists it is possible to build in the

system a proactive functionality. That proactive functionality would enable the members of the X-Road build services within the database that would be able to listen the messages other members are sending out for instance about a life event, e.g. a baby been born.

However, there are technological requirements for proactive functionalities to be implemented. Firstly, all members of X-Road would have to implement a similar logic that would actuate once a push message is received. Secondly, the member who wants to receive pushed messaged would need to implement a service that would be able to "hear" incoming messages. That can be done through mutual agreements between members. Thirdly, currently, the services allow polling. If at some point the level of polling increases, it may start making sense to push the data out instead as it strains the servers less. Fourthly, it is necessary to start the development process where data traffic already works, e.g. through the Population Registry. Fifthly, the utilisation of use cases should be considered to be used both in a technical and political setting. Lastly, once the previous steps have been considered or finished, profiling should be considered, which would give an understanding of the life experience of a person. This holistic and unified visualisation would act as a life-cycle model and would possibly enable to provide relevant and seamless services to the person.

3.5.5 Main insights

Technologically, the implementation of proactive services in Estonia is feasible. In order to implement proactive services, service providers, members of the X-Road, and other relevant partners need to develop and implement a similar service logic that would allow listening and pushing out messages to other members of the X-Road.

However, the limitations associated with the implementation do not stem only from the technological aspects. Although the X-Road system is claimed to be complex, social factors play also a role. The motivation of service providers and a potential lack of development expertise were brought out as potential barriers for the development of proactive services.

3.6 Complementary analysis two: Ethical and legal prerequisites

3.6.1 Domain

It is argued that intervention in human rights is only allowed based on the admission of the constitution. One of the examples is the NEET-young people. This is a group of 15-29 year olds who are Neither in Education, Employment or Training (NEET). According to the Statistics Estonia (2016), the number of NEET-youngsters in 2015 was around 29 000, which is about 12,5% of the age group in Estonia. Out of these 29 thousand people nearly a third were unemployed and two thirds not active (did not wish to work or were not capable of doing it).

This is a heterogeneous group of people with a diverse set of reasons for not working. The reasons can be divided roughly into four categories: firstly, a disability or illness; secondly, those who need to take care of children or family members; thirdly, the unemployed people; and lastly, those with all different reasons such as with a plan to continue their studies or who have quit looking for work opportunities (Statistics Estonia, 2016). Of course, many of the young people may not want to be involved in any of the before-mentioned activities, but there are some who could be in risk of being excluded from the society, and who would need an extra proactive approach to bringing back to the society.

In 2017 a study was conducted by the Youth Support Programme (Noorte Tugila) that claimed that if a country has information about young people who are in risk or could potentially become in risk, the information should be shared with organisations who are dealing with such people (Õpetajate leht, 2018). The methodological approach of the study was to contact NEET youngsters directly in order to find out what kind of help and support they need in order to return to the work environment or schools. The argument of the researchers was that young people should know that society cares for them and is willing to support the claim with actionable steps (Päevaleht, 2017). Furthermore, the Ministry of Social Affairs (2017) has supported the cause of including NEET youngsters by supporting the development of young peoples' support system. The IT systems will help local municipality officials find and contact NEET youngsters in a more targeted and systematic manner (Ministry of Social Affairs, 2017).

While from the social standpoint the proactive approach to solving the problems related to the NEET young may be acceptable, the response from the data protection viewpoint was rather not accepting. As also illustrated by the current analysis, the activities could be considered as contradictory to the constitution, even though the rationale behind the activities was to be socially inclusive.

3.6.2 Data collection and analysis

Interviews with three representatives of the legal and technical personnel from the Estonian Information Systems Authority (EISA) were conducted in order to find out what are the legislative and ethical restrictions and guidelines for developing proactive services are. The analysis was conducted in order to help answer the SQ3: What are the prerequisites for proactive citizen-centric services?

3.6.3 Key quotes and excerpts from the interviews

- Possibilities of service provision within the current legal framework:

"If the person has not expressed their will, then how could we impose on them? Here we have to emanate from the legal interpretation that the law permits us to intervene in human rights only if it is allowed by the constitution. This permission is only realised through an actual legal procedure. If we are talking about social benefits or services, then it is possible to argue that you are not allowed to interfere in person's private life if they have not expressed their will or interest in that."

- An example of a proactive service provision attempt:

"Let's take NEET (not in education, employment or training) young people who do not work or study. Can you go to them and provide services on your own initiative? In some sense this is a proactive approach. They have not done anything (to initiate a service). But they are approached and selected out through databases to provide them something. In this case the constitution is against you and claims that this cannot be done. This activity was unconstitutional."

- Limitations of the current circumstance:

"*It is not possible to change the constitution as it is based on the internationally accepted human rights documents. Privacy and autonomy of a person needs to be honoured. You cannot interfere with a person's private life however noble it might be."*

"If the person has not expressed their will for it, then the state has no right to intervene."

- On the essence of consenting:

"The question is, for what the consent is used for? In the public sector consent is not asked for the permission to process personal data, but for the provision of services. These are two entirely different things."

"If you agree to proactive services, then you will not be agreeing with personal data processing but with the fact that you will be provided proactive services."

- Possibilities for proactive services in the current legal framework:

"Proactive service means that the service will be provided without an application."

"The filter that needs to be considered is whether the intervention is acceptable in the light of the constitution or not."

- The steps that need to be taken:

"Firstly, you need to check if the constitution allows it. /…/ Constitutionality can be verified through a three-step structure, which includes appropriateness, necessity, and proportionality. /…/ The next question should the constitution allow it is whether it is socially acceptable or not? Is society supporting paternalistic or supremely individualistic tendencies? This is a paternalistic state that intervenes with person's private life."

- Appropriate way to assume will:

"How do we assume person's will? We assume on the basis of what the general public or a large part of the society thinks or deems fit. Assumptions are generated based on the way how the group thinks."

"We can imagine how it would work. We cannot imagine what it would bring about."

3.6.4 Main observations

Three technical and legal personnel were interviewed about the ethical and legal prerequisites for proactive public services. The concept of proactive public services states: "Proactive services are the direct public services provided by an authority on its own initiative in accordance with the presumed will of persons and based on the data in the databases belonging to the state information system. Proactive services are provided automatically or with the consent of a person" (State Gazette, 2018).

To understand what it means in the ethical and legal context the possibility of providing proactive services was investigated. One of the biggest issues that emerged was the unconstitutionality of interfering with person's private life. If the person has not expressed their will or interest in being contacted, then the state has no right to do it on their own initiative.

How would you then contact the person in regard to benefits, information, or services that could benefit the person? It was claimed that the question should be considered through the lens of whether intervention is acceptable in the light of the constitution or not. If the constitution allows it then the next stage is to consider social acceptability.

"We can imagine how it would work. We cannot imagine what it would bring about."

This complementary case study raised the questions about the ethicality and legality of proactive public services. It is easy to assume that one knows what is best for society more generally or individuals more specifically. In order to receive social validation for a technological solution the initiative for proactive services should come from both sides:

the state or government side, and the society or peoples' side. The goal for a proactive government would have to be communicated effectively in order for the people to accept the changes it would make in the society.

3.6.5 Main insights

Through this sub-chapter the rationale and legal and ethical prerequisites and limitations were discussed. It was shown that in order to roll out proactive public services and to comply with the society's legislative and ethical frameworks the developers of services need to take into consideration the restrictions and guidelines of the constitution.

Currently, there are a limited number of examples from the public sector about proactive contacting of citizens on a broader scale (NEET youngsters in Estonia). While it is an accepted practice in the private sector, public sector is limited to only what is explicitly allowed. In order to implement such proactive contacting mechanisms, the author argues that the citizens (or residents of a country) should be given the opportunity to opt in (and opt out) to the proactive provision of information from public organisations that, in turn, would allow providing proactive services more seamlessly.

4 Discussion and contribution

The main purpose of this dissertation has been to introduce and analyse the concept of proactive public services through the four main case studies both from Estonia, Australia, and D5 countries, and two complementary analyses conducted in collaboration with the Estonian Information Systems Authority. The novel example of proactive public service was chosen to showcase a possible new and incremental direction in the field of providing public services and serving the needs of people living in country's jurisdiction.

The following chapter is divided into two main parts. The first part addresses the discussion that stems from the analysis of related works and presented case studies. Firstly, the general insights from the case studies are drawn from the previous chapter case-by-case and presented in a cross-case setting. Main conclusions about each research domain are made. Secondly, the theoretical concepts of socio-technical systems, stages of e-government, and service design approaches are analysed through the results of the case studies. Thirdly, the research questions are answered.

The second part addresses the main contributions the dissertation makes in the proactive service design domain. Here, the four contributions are presented and expanded based on the before-mentioned research methodology. Links to theory and case studies are made.

4.1 Discussion

4.1.1 General take-away from the case studies

For the purpose of this dissertation four main case studies and two complementary analyses were analysed. An overview of the case studies is brought out in Table 11 below. While the purpose of this multiple case study was not to compare the very different contexts of each case, the main insights are brought out in a cross-case setting. By choosing a multiple case approach, it is possible to address an array of issues while following a similar presentation structure. Each case study presents a unique set of problems. However, by looking at the context of providing public services, each of them delivers a valuable insight.

Table 11 Main insights from case studies

Case study	Main insights from the case study
1. Birth and family benefit services in Estonia	The case study presented the author initial perspective into the proactive services domain in Estonian public sector. The case study illustrated that the concept of proactivity appeared to have changed since 2015. While during the exploratory case study proactivity according to the Social Insurance Board was considered as the possibility of providing services through a unified application in the planned and new SKAIS2 information system, then in 2018 the mentality of public officials was shifted towards a common understanding and readiness that proactive services should be rolled out in the society more widely.
2. Services for disabled children's parents in Estonia	The case study focused on presenting the life event of providing proactive public services to parents with disabled children. Through the case study it was concluded that in addition to the notion of life (and business) events, an additional layer and notion of complex life event should be introduced. The introduction of a complex life event concept would mean that a set of additional rules,

	regulations, and services would be applicable in a set of more complex circumstances. While the main or basis for the life event would still be the birth of a child, the situation where disability, illness or any other special circumstance is accounted for would enable or trigger a set of additional conditions that need to be considered when providing proactive services.
3. Homelessness services in Australia	The case study presented an interesting example that allowed the author of this dissertation to argue that proactivity could be looked at more like a scale or spectrum rather than a fixed point in service delivery. In addition to the before-mentioned definitions of proactivity in the related works chapter, the concept of proactivity is faced with a difficulty in the case of disadvantaged sector. Namely, promotional and proactive activities are difficult to conduct when the customer segment is not clearly defined nor understood. At the same time, these often the most sensitive groups in the society (e.g. homeless, victims of family violence, or disabled) are among the most necessitous groups and would benefit from proactive actions from the public sector.
4. Life and business event services in D5 countries	The case study showed that there is a growing interest in providing public services in a manner that puts the citizens and residents in the middle of the service design process. The author argues that by implementing the discussed life and business event logic the foundations for the provision on proactive services would be laid. One of the fundamental prerequisites for the appropriation of life and business event services is the unification and integration of databases and information infrastructures that in essence would enable the implementation of proactive public services.
5. Technological prerequisites	The first complementary analysis showed that although the X-Road technological solution is complex, it is still possible to implement service provision logic that would enable the provision and development of proactive public services. In order for the service providers and X-Road members to implement proactive services, all counterparts should execute a similar service logic that would allow listening and pushing out messages to other interested X-Road members. So far, one of the reasons why this has not been done is the possible lack of motivation of service providers that could be solved by wide-ranging communication activities.
6. Ethical and legal prerequisites	The second and final complementary analysis focused on the legal and ethical requirements for proactive services. It was shown that in order to roll out proactive services the compliance with the society's legislative and ethical frameworks should be ensured. Furthermore, the developers and designers need to consider the restrictions and guidelines of the constitution. However, the author argues that citizens should be given regularly the opportunity to opt in or opt out from getting notified about proactive services.

The main insight from each case study provide a valuable insight to the overall topic, however, this does not enable too much deeper analysis. While maintaining the argument that this is not a comparative multiple case research, a number of general requirements arose from the research. Through the four main case studies some general conclusions can be made through the analysed interviews and surveys.

- Information provision and accessibility is one of the key components for proactive service development. Although merely providing and pushing out information does not make a service proactive, it sets the foundations for information transparency and accessibility. This was illustrated by the case studies *one*, *two*, and *three*.
- Existing information infrastructure could be seen as a supporting factor for the implementation of proactive public services. The existence, reusability, and transparency of information would enable making the best use of already existing data based on which citizen-centric solutions can be built upon. This was illustrated by case studies *one*, *two*, and *three*.
- The decision for proactive service provision needs to: firstly, come from the top-level management, and secondly, from the community. Here, both top to bottom, and bottom to top activities need to happen at the same time. This was explicitly illustrated by the research activities in case study *one*, and case study *four*.
- *All case studies* argued that there is a need for service design methodologies to be implemented.

The level of proactivity in a service or system can be defined and described through multi-layered approach. Proactive can be an information service that includes all necessary information and links for the person into one designated place. At the same time, proactive can be some service that is provided automatically, invisibly, and "in the background" Reactivity-Proactivity Spectrum that is discussed more thoroughly in the following section on the contributions of the dissertation.

4.1.2 Theoretical observations

4.1.2.1 Socio-technical systems

Socio-technical theory is broadly regarded as one of the keys to information systems success (Bostrom and Heinen, 1997). Furthermore, it is claimed (Kling and Lamb, 1999) that the high failure rate of many information systems' developments is imbued in the fact that information technology is considered as a tool instead of a socio-technical system. There can also be seen a move from traditional socio-technical systems thinking towards digital socio-technical systems thinking (the comparison is brought out in Figure 1). The notion, socio-technical system, is a reminder that technology is always developed, designed, and used within a social context (Liker, et al., 1999). While social systems are not evolving as fast as technology and new business models, new approaches are needed to bridge the gap between technical and human elements of digitally enabled organisations (Winby and Mohrman, 2018).

The author argues, that while e-government has been widely recognised as a socio-technical system, where social requirements are shaping technologies, then it is also increasingly easy to witness the emergence of techno-social systems in which technological process are shaping society. The author believes that by implementing proactive public services and a life and business event logic in service provision, the acceptance of technologically assisted public sector services could amplify. Proactivity as a concept has both the human and technological factors. It involves the technological aspects of devices, information infrastructures, and data technologies, while including the human aspects of routines, habits, expectations, and work processes. It could be argued that in order to implement a technological solution, proactive public services, first the social aspects, such as expectations, attitudes, and work processes ought to be addressed.

4.1.2.2 Stages of e-government

Nolan (1973) claimed that stage theories (in organisational setting and in regard to implementing computing) are based on the premise that the system components move through a distinct set of stages over a period of time and that these stages can be described. Kuznets (1965) brought out two guiding characteristics for distinguishing a stage theory. Firstly, the characteristics of each stage should be distinct and testable. Secondly, the analytical relationship of any stage should be well defined in regard to its antecedent or descendant. Since then similar models have been developed to predict phases of government (see the overview in Table 2) The beginning of the 2000s saw the emergence of many government stage models (Layne and Lee, 2001, Reddick, 2004, United Nations, 2003, World Bank, 2003) while the virtually "second wave" of government models could be set around 2010s (Valdes, et al., 2011, Lee, 2010, Gottschalk, 2009, Gartner, 2017) together with the broader emergence and implementation of e-governance practices.

The author of this dissertation agrees with DeBri and Bannister (2015) who claimed that government models are hybrids, while many of the models' initial stages have been witnessed empirically and later stages could be seen as aspirational. Thus, it could be argued that the models presented in 2008, 2010, and 2011 (Klievink and Janssen, Lee, and Valdes, et al. respectively) saw the final stages of demand-driven and joined-up governance, e-governance, and integrated capability as aspirational. However, there is an interesting shift in the Gartner model (2017) that looks at the maturity of e-government from an entirely data-driven viewpoint. In their rendition, the levels of e-government are e-government, open governance, data-centric governance, fully digital governance, and smart governance. This model's applicability in the current context is even more supported by the notion that the third level, data-centric governance introduces the notion of proactivity in service delivery. The description of the stage claims that the focus of this stage is moved from simply listening (reacting) to citizens' or users' needs to proactively explore new ways to collect and leverage data. It is further stressed that it is important to remain focused on designing and implementing data-centric strategies and processes. While models merely try to imitate and describe real life, it is encouraging that the notion of proactivity has been observed more widely and recommended as a potential step for governments to consider.

4.1.2.3 Service design approaches

Lynn Shostack coined the term "service design" in 1982 and she considered service design as a responsibility of the management and marketing departments. Now, the concept of service design has been implemented widely in different fields across sectors, as it provides organisations, both public and private, valuable insight into what their customers need, want or expect. Service design uses techniques and research methods of different fields in order to create better, more usable and user-friendly services.

However, as argued by Venkatesh, et al. (2012) the design of user-centric e-government services will continue to be a challenging task, as citizens' needs and demands change. Proactive service design posits that citizens' needs should be addressed potentially even before these are realised. Furthermore, the goal of proactive service design is to build upon the already existing information, and based on a trigger, that could be a life event, an application or an inquiry from the citizen, or any other suggestion that the citizen would benefit and feel relieved due to a service. As Burrows, et al. (2018) argue that emotion-led goal modelling is often overlooked during the service

development process as technology developers focus more on the functionality of the application or service instead of the quality and emotional functionality. While one of the main goals of proactive service design is to provide a technologically secure, data-efficient, and functional service, the other aspects focus on providing the citizen a solution that would decrease their daily troubles, make them feel cared for by the government and society, and cater to their needs based on their current and relevant life events.

4.1.3 Answers to research questions

As mentioned in the beginning of this dissertation, one of the main values of this research lies in integrating an interdisciplinary research approach from analysing the concepts of socio-technical systems, the needs and wants of people, and proactivity to providing both novel academic contribution into the broader understanding in public service development to generating real-life guidelines for designing and developing proactive public services. This research fields borrows from a wide range of disciplines, such as political science, sociology, and software engineering, and, thus, raises awareness of the possibilities in designing such services from all these angles.

In the following sub-section, the answers to the research questions are brought out. The *SQ1*: What is the current state of service provision? focused on the essence and qualities of proactive public services. Sub-question one can mainly be answered based on case studies one and two. The research activities in the first case studies were designed around the inquiry about the quality of the service provision. It can be concluded that although there is an increasing interest in providing and utilising proactive services in the public sector, the actual effort from the public sector have just recently started to meet the expectations of the citizens. While in 2015 proactivity was not widely acknowledged and implemented, then in 2018 an increasing number of public officials and organisations have shifted the mentality toward proactivity. However, there are still a number of limitations that may hinder the development of proactivity. Firstly, information continues to be scattered between different websites, databases, and other sources. Secondly, the process how to provide proactive services is still unclear. Thirdly, technological requirements for proactive services have not been agreed upon. And lastly, legislative and constitutional frameworks may hinder proactive services' development.

SQ2: How to define the concept of proactivity? was analysed and answered based on the related works section and collated results of the case studies. Proactivity can be defined as a set of activities a public sector organisation makes from its own initiative in order to serve the public and cater for the society from a forward-looking point of view. The government's goal is to provide services that have a diverse but holistic nature as seen in Figure 9. These "good" services are in addition to being transparent and accessible, also seamless and proactive, and should anticipate citizen's needs. The anticipation of needs and provision of services should be executed based on the concept of life events, which happen in most peoples' lives, albeit often not in a consecutive sequence. The Figure 9 below is illustrated by using agent-oriented modelling visual language.

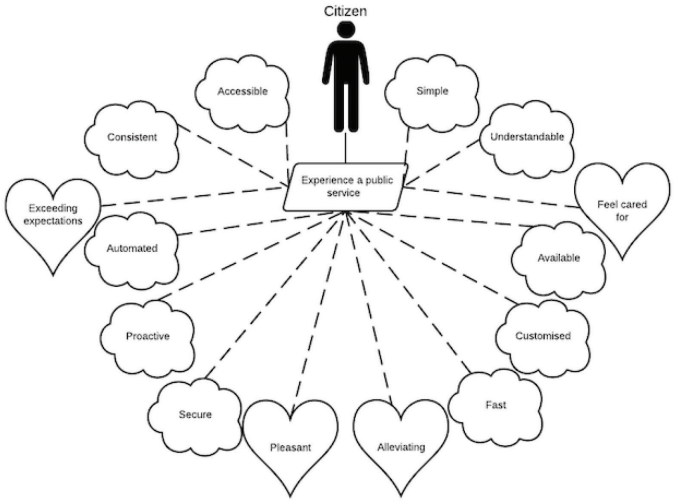

Figure 9 An example of a "good" service (in agent-oriented modelling)

SQ3: What are the prerequisites for proactive citizen-centric services? addressed the different requirements for proactive service provision. Although also touched upon in case studies one and two, the complementary analyses on technological and legal/ethical requirements for proactive services were directed towards answering this research question. The prerequisites for proactive services can be divided into two categories: human and structural/formal. Human prerequisites include the mentality and mindset of policy-makers and public officials, readiness of the society to accept proactivity as a potential future development, ethical considerations when approaching citizens proactively, and motivation of designers and engineers to consider proactivity as a valuable premise. The structural or formal prerequisites include the legislative framework, technological readiness, interoperability of information infrastructures, and cost-efficiency of new developments.

SQ4. What approaches or service design methodologies could be beneficial to consider when designing and developing proactive public services? The purpose of this sub-question was to determine if there are a number of expected steps or approaches that could aid the development of proactive public services. The need and importance to include the user in service design process has grown in the last few years. At the same time, responding to the needs has become increasingly complicated as users' expectations change. One of the key aspects of ensuring the satisfaction of citizens on a long run is the involvement and transparency of the activities. The author argues that in order to begin with the proactive service development the service designers together with public sector representatives should include the citizen in the process. The methodologies are varied, but the author argues that co-design, frequent testing of ideas, and clear communication should be considered as main approaches to proactivity.

SQ5: How to utilise this knowledge in the real world? To answer this sub-question the concept of socio-technical systems was analysed. As an extension of the discussion on socio-technical systems both human and technological factors were mapped out to describe certain attributes that could affect the outcome of proactive service design. The author of this dissertation argues that through implementing the guidelines of proactive service design the acceptance and motivation for designing proactive services has already been realised among the public sector practitioners. However, in order to

get validation for the academic ideas such as the Reactivity-Proactivity Spectrum, the concept of reactive-proactive service space, and the meta-model of proactive services more research is encouraged. The author argues that one of the more difficult aspects in regard to implementing new technological solutions is measuring the impact it makes on society.

Finally, the main RQ: How to design proactive services? was addressed as a concluding question and presented in a format of a visualisation (Figure 10) of the potential process of proactive public service design. For that agent-oriented goal modelling was used that takes into consideration both functional, quality, and emotional goals.

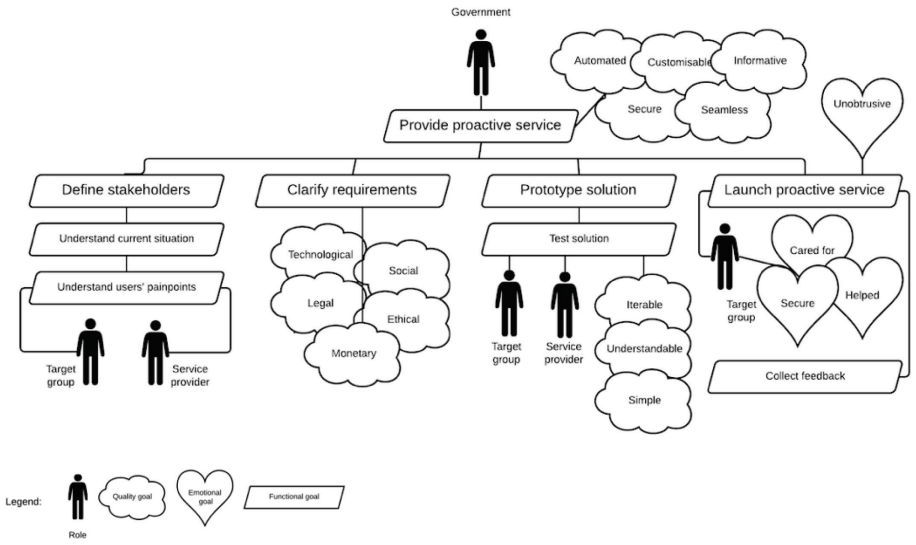

Figure 10 Process of proactive service design (in agent-oriented modelling)

According to this perspective, the government of a public service organisation is the initiator of the progress. The government has a functional goal to provide a proactive service that is automated, customisable, secure, informative, and seamless in its qualities. In order to fulfil the purpose, the main goal is divided into four sub-goals. The first stage is to define the stakeholders and their pain-points. The second stage includes clarifying the requirements for the service that stem from the following areas such as technology, society, finances, ethics, and legislation. In order to follow the process to develop further, all these aspects of proactive services need to be addressed. Thirdly, based on the input from the second stage the prototype of the solution should be developed and tested on relevant stakeholders. The prototype should be modifiable, understandable, and simple. Lastly, the fourth stage includes launching the proactive service. The goal of the service is to make the target user feel cared for, secure, and helped. Furthermore, the proactive service should include a feedback loop and hold the emotional quality of being unobtrusive.

4.2 Contribution

The current sub-chapter will analyse and give a detailed overview of the contribution this dissertation makes. The contributions of the dissertation are divided into four main offerings. Firstly, the conceptual meta-model for proactive services for understanding, characterising, and classifying such services will be provided based on the reactive-proactive space contribution. Secondly, the understanding and characterisation of the reactive and proactive space are discussed. Thirdly, public service design principles for the policy-makers that can be customised according to the requirements of the circumstances of the service ecosystem are presented with future recommendations in regard to its implementation. And lastly, the Reactivity-Proactivity Spectrum is presented and discussed, which provides a number of suggestions for addressing and understanding the concept of proactivity and proactive actions.

4.2.1 Conceptual meta-model of proactive services

E-governance is characterised by a high level of collaboration between different service users, service providers, and other related counterparts. At the same time understanding relationships between different agents is complex. Understanding the logic of communication between these stakeholders and institutions requires a simplified model of that interaction. For the purpose of understanding, characterising, and classifying proactive services, the conceptual space notion from agent-oriented modelling – AOM – (as in Sterling and Taveter, 2009) will be used. AOM is concerned with modelling systems that have multiple socio-technical agents, both human and technical, which in turn are interacting with a diverse assortment of software and hardware in a complex environment.

The conceptual space where proactive services lie should be considered as an open environment where new elements can be added, and existing ones deleted or replaced. According to AOM, the conceptual space consists of three layers: a motivation layer, a system design layer, and a deployment layer (p. 27). The motivation layer contains abstract modelling concepts that are needed for defining prerequisites and aims for a system. Here goals and roles of the system are defined. The system design layer consists of notions required for modelling and designing a socio-technical system. Here the concept of agents who are performing some type of activity is introduced. Lastly, the deployment layer represents the environment where agents and activities are situated (p. 28). Figure 11 represents the conceptual space as shown in Sterling and Taveter (2009).

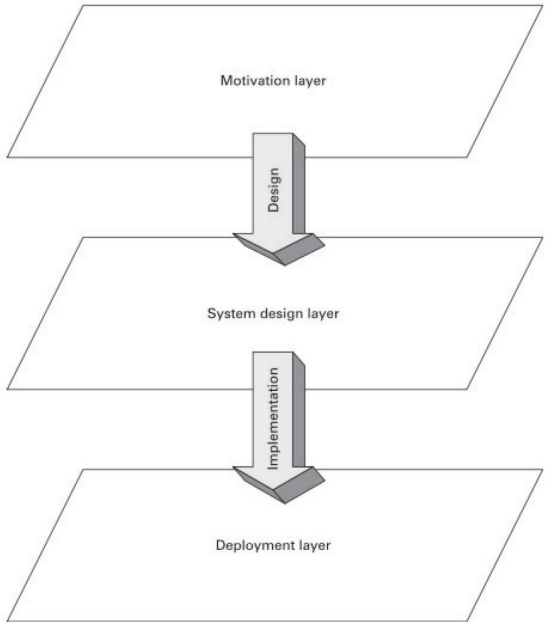

Figure 11 The layers and processes of conceptual space (Sterling and Taveter, 2009)

The current conceptual model builds on the previously generated knowledge of modelling complex systems such as e-government. It is important to understand the real world before attempting to create an abstraction of it. For that the analysis of the case studies provided with the input for the conceptual meta-model. Sterling and Taveter also propose a way of illustrating the relationships between different concepts, which can be seen in Figure 12 below.

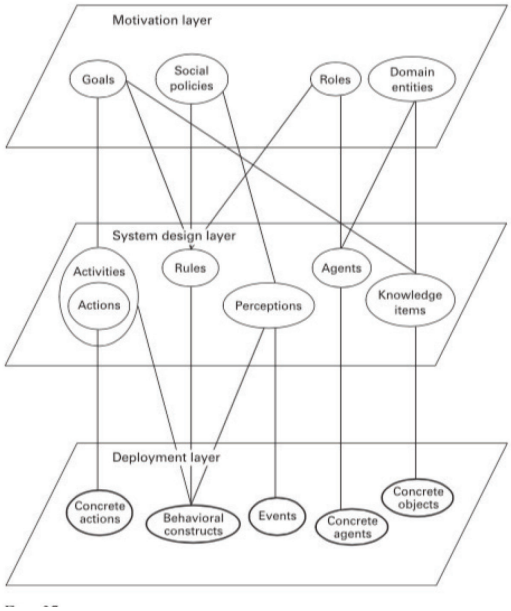

Figure 12 Relationships between concepts (Sterling and Taveter, 2009)

Sterling and Taveter (2009) present the reader with an illustration of the particulars of conceptual space, that contrary to the universals, represent the entities and events that respectively exist or occur in the real world. The entities and events are presented in Figure 13 below.

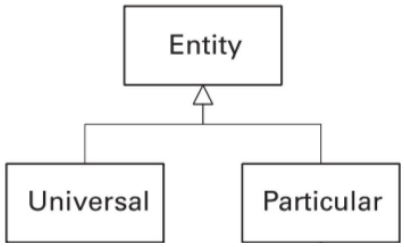

Figure 13 Universals and particulars of the conceptual space (Sterling and Taveter, 2009)

As said, particulars are entities and events that respectively exist of occur in the real world. According to AOM there are two kinds of particulars: endurants are entities that "are in time", such as a tree, a car, and the sun whereas perdurants are entities that "happen in time", such as a conversation, an activity or an historical event. Essentially, the endurants are things and perdurants are processes. While it is easier to classify object and things, the focus of this model development is on perdurants, the processes. It is possible to distinguish between different kinds of events in these processes. AOM distinguishes between atomic events (e.g. these happening instantaneously), complex events (e.g. these that are composed of other events), action events (e.g. these that are caused by someone), and non-action events (e.g. these that are not caused by actions). The full representation of the particulars is brought out in Figure 16. For the purpose of the proactive service meta-model creation, the author of this dissertation focuses on the

notion of complex events as these, according to the representation provided by Sterling and Taveter (2009), provide an analogous approach to characterising public services and life and business event services.

According to the author's treatment of the universals and particulars of the conceptual space by Sterling and Taveter (2009) the contribution to the meta-model of proactive services is the following. If we look at complex events as complex life events such as registering a birth together with submitting applications to kindergartens, then based on the reactive-proactive service space concept seen in Figure 16, life event triggers a proactive agent. In this case, it is possible to assume that a proactive agent could be a "Kratt", an artificial intelligent agent, an application, or less often a physical person. As the proactive agent is triggered, it needs to make a decision of which plan and task to carry out next. This raises a research question for future research of how to teach proactive agents make decisions based on the life event and all information about associated services and choices that triggered them?

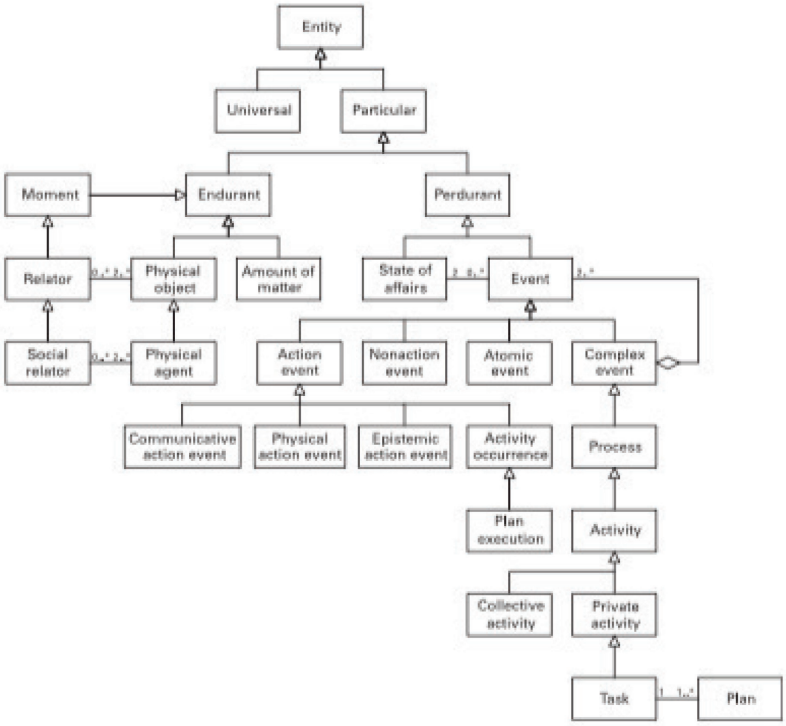

Figure 14 Particulars of the conceptual space (Sterling and Taveter, 2009)

Finally, the meta-model of proactive services is a simplification and a modification of the conceptual model seen in Figure 14. The final contribution of this dissertation is shown in Figure 15 below.

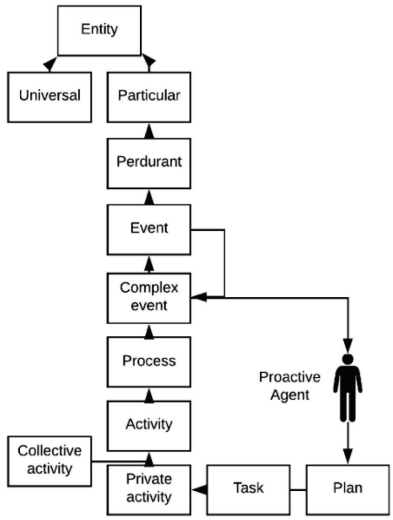

Figure 15 Meta-model of proactive services (modification by the author based on Sterling and Taveter, 2009)

4.2.2 Reactive-proactive conceptual space

As brought out in chapter about related works it is possible to distinguish between a set of reactive and proactive characteristics in any given service ecosystem. The main difference can be observed in when government pushes out services proactively and users are reactively looking for services. Based on the results of the case studies it is possible to draw a representation of the conceptual reactive-proactive space. This is illustrated in Figure 16 below.

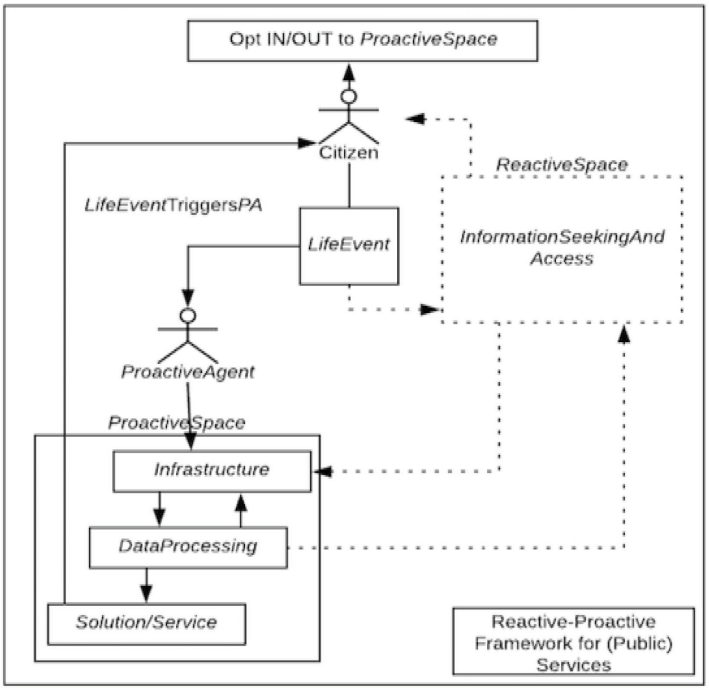

Figure 16 Reactive-Proactive conceptual service space (by author)

This conceptual illustration of the reactive-proactive space was created to illustrate the desired process for the provision of proactive services while taking into consideration the potential reactive pathway. It is suggested here, that once a life or business event (such as a birth, marriage, starting a school, or starting a business) takes place, there could be two options.

Firstly, the citizen may choose to seek the information about services related to the life event by himself/herself. This is represented in the Figure as *InformationSeekingAndAccess*. The latter then carries out information search in the Infrastructure that may contain but is not limited to databases, registries, information systems, and data exchange layers. Queries to the *Infrastructure* allow *DataProcessing*, which then provides citizens with a list of possible solutions – services – and relevant pieces of information. Or secondly, the citizen may choose the proactive route, where *LifeEvent* triggers a *ProactiveAgent* that in turn gathers information through *Infrastructure*, conducts *DataProcessing*, and lastly provides a finalised *Solutions/Services* package that is then presented to the citizen for immediate use.

Before any of these two paths can be taken, the citizen should decide whether or not he/she allows his/her data to be processed proactively, which is seen in Figure 12 as Opt IN/OUT to *ProactiveSpace*. Ideally, however, the opportunity to OPT IN/OUT should be given with directions at all stages of service provision.

OPT IN/OUT is not a functionality that has been implemented so far, however, the existence of this functionality has been prioritised by MEAC. It was also brought out in the first contribution as the possibility to opt out from services (point number 4). However, the author would like to extend this option to have the opportunity to enable both opting in and out should person's circumstances change.

Also, the concept of a proactive agent is novel, as it enables the introduction of "personal assistants". As discussed briefly in the previous sub-section under the fifth stage of the GraPro, an application, a caseworker or an artificial intelligent agent such as "Kratt" could register a life event. However, as the implementation of "Kratt's" is still underway, the author of this dissertation argues, that a proactive agent could be an application or a physical person. The rationale for this kind of proactive agent was also illustrated through case study two.

4.2.3 Public service design principles

Through analysing case studies and actively participating in the work of the Ministry of Economic Affairs and Communications in Estonia from the period of February 2018 until October 2018, a list of principles for the provision of proactive services was developed. Later the list of principles was extended into a questionnaire and validated with real life services in Estonia. The questionnaire (Appendix 3) was designed as a self-assessment tool for public service providers to aid them in assessing their readiness for providing life event based and automatic proactive services.

As stated above, Estonia has set a goal to provide services proactively with the least necessary contact between the user of the service and the government. Furthermore, these principles are designed to accommodate the essence of life and business event services together with proactive services. These are as follows:

1. *Wholesome* – Access to services is predominantly organised in an "invisible" manner, entirely automatically, or with single communication time. The trigger of a wholesome service is a life event occurring in a person's case or business event in an organisational setting.
2. *Proactivity and Once Only Principle* – Government is providing services proactively and on its own initiative by taking into consideration person's presumed will and by utilising the existing information in governmental databases. This is done automatically or per person's approval. Government will not repeatedly ask for information that has been previously given to them by the person.
3. *Accessible through digital channels* – Services are provided to persons preferably through digital channels and by taking into consideration the digital-by-default principle. At the same time, service is also provided in other channels per person's request and need.
4. *Possibility to opt-out* – Person has the possibility to opt-out from the e-service format, while also given the chance to always opt back in.
5. *Personalised and role and situation-centred* - The provision of services is carried out based on the preferences of the person and originating from the life events and personal situation.
6. *Intuitive and simple* – Service environment and service provision are designed in an intuitive and simple manner. This takes into consideration the style, design, and use of language in the service environment.
7. *Transparent* – It is clear to the person how the provision and processing of the service happens. Also, it is clear what are the obligations of all stakeholders, and how to give feedback on the experience.
8. *Recent and timely information* – Person has always access to the latest relevant information. Services have a reference to when the information was last updated and how and where it is archived.

9. *Reliability and security* – Persons trust the government sufficiently to allow its personal data processing. Person trusts the government not to abuse person's data and confidence.
10. *Multilingual access* – Services and related information is provided in all most widely used languages.

The author argues that by implementing the presented principles and gathering feedback with service development questionnaire for public service providers, it will be possible to firstly map the current situation of service provision across public sector, and secondly, give further guidelines that are customised according to the technological, structural, and societal needs of the service provider. The first contribution of this dissertation is even more valuable due to its real-life public sector implementation through the Ministry of Economic Affairs and Communications of Estonia.

4.2.4 Reactivity-Proactivity Spectrum

The last of the main contributions, the Reactivity-Proactivity Spectrum in the context of this dissertation refers to the distinguishable characteristics of activities that can be done under the concept of proactivity.

Based on the four case studies and two separate inquiries into the nature of proactivity a model can be outlined. Based on this novel model, it would be possible to determine on which proactive level a service is.

The Spectrum represents the following aspects of proactivity:

- Social – clarity and availability of information, promotion, readiness and will of practitioners to implement proactive services;
- Technological – databases, infrastructure, technical resources;
- Legislative – being in compliance with the constitution, having open, flexible, and contemporary legal system, presumed will of people to receive proactive services;
- Ethical – how are the changes in the service ecosystem communicated;
- Political – the mentality of management, political enforcement.

Based on the following aspects a scale can be presented (Figure 17). Here, the analysis that resulted in the Spectrum was done by the author based on the theoretical research on e-government stage models, and by seeking to connect the real-life examples with an

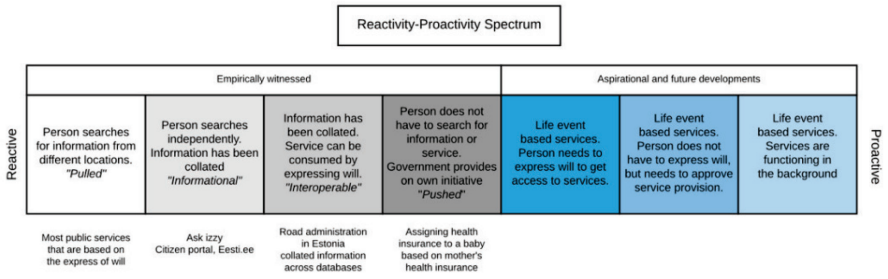

Figure 17 The Reactivity-Proactivity Spectrum (by author)

Stemming from the DeBri and Bannister (2015) argument that claimed that government models are hybrids, while many of the models' initial stages have been witnessed empirically and later stages could be seen as aspirational, the 7-step Reactivity-Proactivity Spectrum, the motion and successive steps from reactivity towards

proactivity, is provided. The first four stages are empirically witnessed through real-life examples as seen below. The first stage, Pulled, is characterised by fully reactive services such as searching for benefits or additional financial aid for the elderly or the disabled. The second stage, Informational, is characterised by the provision of information services, e.g. situations where person searches for relevant topics and receives information in a collated format. In this situation the government or any other service provider has already organised service descriptions and information under categories and supplemented the information service with Internet links to respective organisations or applications. Examples include services or portals such as Ask Izzy (case study three) or different citizen portals (e.g. eesti.ee). The third stage, Interoperable, is characterised by transactional design of services. In such cases information and services have been collated and service can be consumed by expressing personal will. The essence of interoperable services is that the only obstacle between a citizen and a service or a solution to a situation is the expression of will. The examples of such services include Estonian Road administration services, which collect information together through different databases (including the Digital Health Register and Estonian Motor Insurance Bureau) to deliver a solution to the citizen. The fourth stage, Pushed, is characterised by a situation where the person does not have to search for information or services. Government or organisation provides services on their own initiative. One of the examples is mother's health insurance in Estonia that is transferred automatically to a new-born baby. These examples exist already and can be considered empirically observed.

The next stage of the Spectrum introduces the notion of life events, and although the concept has been prioritised many countries already (case study four), the author of this dissertation argues that the notion could still be considered as aspirational. The aspirational and future developments' stages in the Spectrum include three further stages. The fifth stage suggests the development of life-event-based services that are triggered based on an occurred life event, which can be registered by an application, a caseworker, an artificial intelligent agent such as "Kratt". However, in order access the service, the person needs to express their will. The sixth stage continues to be based on life events, and while this stage does not involve the expressing of will, the final approval will come from the person. Lastly, the seventh stage symbolises full proactivity in which case the services are life event based and functioning invisibly in the background with no needed input form the person.

5 Conclusions

Research in e-governance is interdisciplinary in nature and requires the involvement of information scientists, political scientists, anthropologists, and other relevant parties to unite in order to understand the changes currently happening. E-government is a socio-technical phenomenon that needs to take into consideration both the human and technological factors. Through the dissertation the author argued for a solution for proactive service development.

This dissertation looked at four different case studies and focused mainly on the public sector examples through a multiple case research approach. Through these case studies the reader was presented with a diverse nature of the concept of proactivity, which led to a meta-model of proactive services that was built on the previously existing AOM conceptual space rendition by Sterling and Taveter (2009). The conceptual meta-model was followed by a conceptual reactive-proactive service space framework that was published and presented at the European Conference of Digital Governance in October 2018. While the first two contributions provided a more theoretical and conceptual approach to understanding and designing proactive services, then the third contribution, guidelines for designing proactive services, was developed and tested at the Ministry of Economic Affairs and Communications of Estonia. The set of guidelines was developed in by the author of this dissertation in and tested in cooperation with the MEAC colleagues. Furthermore, the guidelines provided a set of topics to inquire further with the help of a self-assessment questionnaire for the public sector service providers (Appendix 3). Finally, the last of the main four contributions was the Reactivity-Proactivity Spectrum, which serves as an aspirational development of e-government stage models. The input to the Spectrum was collected through studying previously published and accepted stage or maturity models in order to understand what the potential routes for development are. Here, a Gartner stage model (Gartner, 2017) proved especially valuable as it was one of the few models where the proactivity was introduced as a potential stage in development of e-government.

It is possible to determine a clear move towards the concept of life and business event services and the provision of proactive services in the public sectors worldwide. However, the academic research on proactive services is still limited. Hence, the dissertation seeks to make a contribution into the novel concept of proactivity in the public sector and contribute to the further development of service researchers. Here, the main research question of how to design proactive public services was addressed. The author extended the main research question through five sub-question, which each was answered through a set of research approached. Table 12 below seeks to give a comprehensive and condensed overview of the work done for this doctoral dissertation.

Table 12 Overview of the research questions, inquiry methods, and main outcomes

Research question	**Source of information**	**Main outcomes**
SQ1: What is the current state of service provision?	Desk research; case studies 1, 2, 3, 4;	Analysis of pain-points, limitations, and opportunities for proactive services; Reactivity-Proactivity Spectrum for future and aspirational development;
SQ2: How to define the concept of proactivity?	Desk research on proactive and reactive services;	Reactivity-Proactivity Spectrum;
SQ3: What are the prerequisites for proactive citizen-centric services?	Complementary analyses 1 and 2;	Guidelines for service providers;
SQ4: What approaches or service design methodologies could be beneficial to consider?	Desk research on service design methodologies;	Guidelines for service providers;
SQ5: How to utilise the knowledge in real world setting?	Case studies 1, 2, 3, 4;	Conceptual reactive-proactive service space
Main RQ: How to design proactive public services?	Desk research on socio-technical systems, service design methodologies, proactive services; case studies 1, 2, 3, 4;	Guidelines for service providers; visualised process of service design in AOM

In order to address the main research question, How to design proactive services?, the sub-questions need to be answered. A more comprehensive overview of the responses to the sub-questions can be seen in the previous chapter of Discussion and Observations. However, the author of this dissertation would like to bring attention to Figure 10 (also seen below as Figure 18) that illustrates a potential process of proactive service design as illustrated by using AOM and by stressing the importance of functionality, considering emotional qualities of a service, by taking into consideration different stakeholders and their needs, and a requirement of including both the feedback loop and access points for iterations.

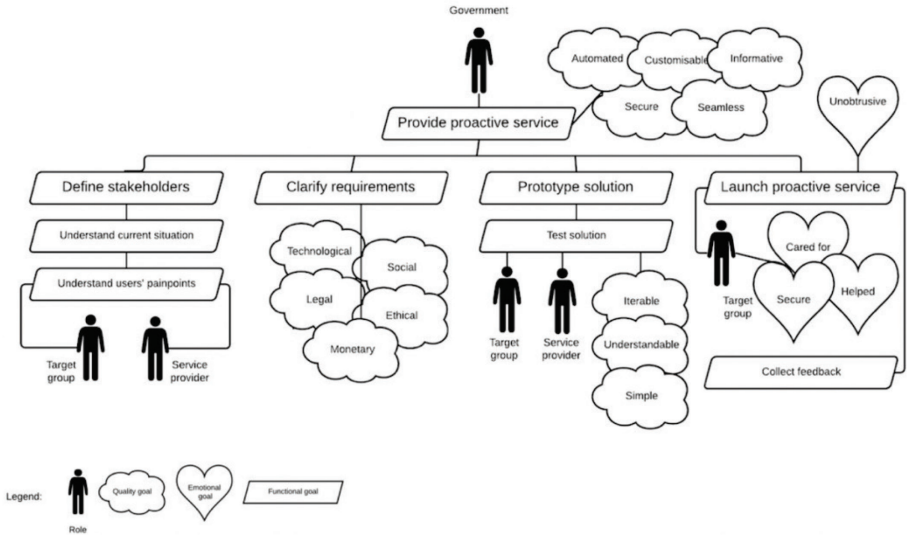

Figure 18 A potential process of designing proactive services

In a world where people expect more from their political leaders, countries need to stay competitive both in providing Government as a Platform and by giving access to those who would like to be associated with that. It is better to provide an enjoyable and inclusive experience than to deal with the consequences of negative occurrences and limitless hassle. By implementing proactive services governments could ensure their competitiveness and attractiveness.

6 Future work

The current dissertation looked into how proactive services could be designed in the public sector. The list of case studies was limited to only a small number of countries such as Estonia, Australia and the initial members of the D5 coalition. However, an increasing number of nations are now looking towards implementing the proactive service principles (e.g. Taiwan, Sweden, Denmark).

This dissertation opens a number of potential doors for future research.

Currently, the research is done by setting the citizen as the main focus of the study. However, it is necessary to understand the needs and requirements for service provision from other viewpoints as well to truly offer a service-oriented approach, both individual and organisational, to service design.

There is a need to extend the understanding of how different countries are working towards designing proactive services within their nation's circumstances and resources – expanding on the D5 case study and include the reminding 4 countries.

As a part of a longitudinal study, the role and impact of "Kratt's" on the implementation of proactive services should be assessed. This raises further questions about the acceptability of artificial intelligence overall in society, and more particularly in the public sector. The author is interested in understanding how well such services that involve an AI component received by the society?

The previous research problem introduces another topic of an understanding if there is a place for digital anthropologists within organisations, who would be able to meaningfully translate and explain the changes that disrupting technological approaches may bring in society and organisational setting. Furthermore, what are the technological and societal or ethical reasons why some technologies are accepted and some not. This research could be extended in the context of proactive public services and "Kratt" services once they have been implemented more widely and for a longer period.

The presented proactive public service principles together with the associated questionnaire results should be assessed in order to define and describe the causes and obstacles in proactive service design.

It would also be interesting to research if and how the regime of a country affects the development and implementation of proactive public services.

Proactive services in the public sector are a powerful concept as includes the notions of technological advancement and user-centric service design. The author hopes this dissertation contributes to the novel academic discussion by making an attempt to prove the value of proactivity in the public sector.

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Regina Erlenheim
2019

Abstract
Designing Proactive Public Services

In the light of the growing relevance of technology in society, it has become increasingly important to understand how to design, provide, and implement ICT-driven e-services efficiently. The recent years have seen the increase in the importance of proactive e-services within public sector. Their relevance is further expected to grow in the lift of artificial intelligence. Moreover, countries in a network of leading digital governments, e.g. these in the coalition of advanced digital nations, Digital 9 (D9, previously D5/D7), have strategically prioritised developing such services.

The concept suggests, that proactive e-services are provided by an agency on its own initiative with the presumed will of persons instead of persons having to initiate the service delivery process. However, little has been discussed how to best design and roll out proactive public e-services within society.

The novelty of this dissertation lies on the analysis based on the observation that there is an increasing interest from the governments to pursue the development and implementation of proactive e-services, but currently limited research on this area exists. The dissertation suggests that proactive public services would make the daily lives of people simpler, and less time would be spent on dealing with everyday bureaucracy.

Currently, although a growing interest in the development of such proactive public services has been perceived, the biggest problem in the subject area is observed in the complexity of compatible conditions. The dissertation witnessed a number of crucial factors, both social and technological, common for a socio-technical system such as e-governance, that need to be considered when designing proactive public services. The human factors included notions such as ethicality of proactivity in the society, the need to be taken care of by a state, and the need to be empowered to be self-sustainable and independent. On the technological side, the need for functioning information infrastructures and databases was brought out among other factors discussed in the dissertation.

The current research was conducted as a case study research, which on the one side took into consideration the software engineering subject fields, and on the other side allowed qualitative data analysis. As a supporting tool, the Agent-Oriented Modelling was used to illustrate the results of the case studies with visual models of goals, roles, and interactions. This doctoral dissertation was analysing and addressing the unique essence of four main case studies from different sectors and viewpoints from Estonia, Australia, and D5 (D7/D9) countries (United Kingdom, South Korea, Israel, New Zealand, and Estonia). Two complementary analyses were conducted in order to understand both the technological and ethical requirements for proactive service design in more detail. The dissertation focused mainly, but not solely, on the design and development of proactive e-services while touching upon the socio-technical factors influencing the field.

This dissertation makes a contribution in four main areas. Firstly, a meta-model for proactive services is presented that builds upon the previous knowledge of modelling services the conceptual reactive-proactive service space is introduced. Secondly, the conceptual reactive-proactive service space is introduced. Thirdly, the dissertation contributes by presenting a novel set of guidelines for designing proactive services in the public sector. And lastly, the Reactivity-Proactivity Spectrum is introduced, a novel approach to understanding and classifying proactivity in the context of public service provision.

Lühikokkuvõte
Proaktiivsete avalike teenuste disainimine

Arvestades tehnoloogia üha kasvavat tähtsust ühiskonnas, on muutunud üha olulisemaks mõista, kuidas IKT-põhiseid e-teenuseid tõhusalt disainida, pakkuda ja rakendada. Viimastel aastatel on suurenenud proaktiivsete e-teenuste tähtsus avalikus sektoris. Eeldatakse, et nende tähtsus kasvab tehisintellekti rohkemal rakendamisel. Peale selle on juhtivate digitaalsete valitsuste võrgustik Digital 9 (D9, varem ka D5 / D7), seadnud selliste teenuste arendamise strateegiliselt prioriteediks.

Mõiste viitab sellele, et avalik sektor pakub ennetavaid ja proaktiivseid e-teenuseid omal algatusel eeldatava tahte järgi selle asemel, et isikud peaksid ise teenuse osutamise protsessi algatama. Siiski on siiani vähe arutatud, kuidas disainida ja levitada ühiskonnas proaktiivseid avalikke e-teenuseid.

Käesoleva väitekirja uudsus seisneb analüüsis, mis põhineb tähelepanekul, et valitsused on järjest enam huvitatud ennetavate ja proaktiivsete e-teenuste arendamise ja rakendamisest. Samas on sellel alal veel teadustöö piiratud. Käesolev doktoritöö viitab sellele ja eeldab, et proaktiivsed avalikud teenused muudavad inimeste igapäevaelu lihtsamaks ja igapäevase bürokraatia lahendamiseks kuluks vähem aega.

Kuigi on täheldatud üha suuremat huvi proaktiivsete avalike teenuste arendamise vastu, on suurim probleem antud valdkonnas seotud ühilduvate tingimuste keerukusega. Käesolevas doktoritöös vaadeldi sotsiotehnilisi süsteeme, näiteks e-valitsemist. Selliste sotsiotehniliste süsteemide puhul on võimalik välja tuua olulisi faktoreid, nii tehnoloogilisi kui inimkeskseid, mida tuleb proaktiivsete avalike teenuste kavandamisel arvesse võtta. Inimfaktorid sisaldasid selliseid mõisteid nagu proaktiivsuse eetilisus ühiskonnas, vajadus olla hoolitsetud riigi poolt ja samas ka vajadus olla iseseisev ja sõltumatu. Tehnoloogilisel poolel toodi doktoritöös välja vajadust toimiva infoinfrastruktuuri ja omavahel ühilduvate andmebaaside järele.

Käesolev töö viidi läbi uuringuna, mis kätkes endas interdistsiplinaarse metodoloogiaga juhtumianalüüsi komponente. Ühelt poolt võeti arvesse tarkvaratehnika valdkonna uurimisvaldkondi, teiselt poolt kasutati ka kvalitatiivset andmete analüüsi. Abivahendina kasutati ka agent-orienteeritud modelleerimist, et illustreerida tulemusi eesmärgimudelite ning rollide ja interaktioonide visuaalsete mudelitega. Käesolev doktoritöö analüüsis ja adresseeris nelja peamist juhtumiuuringut Eestist, Austraaliast ja D5 (D9) riikidest (Ühendkuningriik, Lõuna-Korea, Iisrael, Uus-Meremaa ja Eesti) erinevatest sektoritest ja vaatenurkadest. Lisaks sellele viidi läbi kaks täiendavat analüüsi, et mõista nii proaktiivsete teenuste kavandamise tehnoloogilisi kui eetilisi ja juriidilisi nõudeid. Doktoritöö keskendus peamiselt, kuid mitte ainult, proaktiivsete e-teenuste kavandamisele ja arendamisele, kuid puudutas ka valdkonda mõjutavaid sotsiotehnilisi tegureid.

Käesolev doktoritöö annab oma panuse neljas põhivaldkonnas. Esiteks esitletakse proaktiivsete teenuste meta-mudelit, mis põhineb eelneval agent-orienteeritud modelleerimise lähenemisel (Sterling ja Taveter, 2009). Teiseks tutvustatakse kontseptuaalset reaktiivset-proaktiivset teenusruumi. Kolmandaks aitab väitekiri kaasa proaktiivsete teenuste disainimiseks avalikus sektoris pakkudes välja nimekirja konkreetsete valdkondlike juhistega. Lõpuks tutvustatakse reaktiivsus-proaktiivsuse spektrit, mis on uus lähenemisviis proaktiivsuse mõistmiseks ja klassifitseerimiseks avaliku teenuse osutamise kontekstis.

Appendix 1 – D5 Questionnaire

D5 PAPER ON LIFE & BUSINESS EVENT SERVICE DESIGN AND DELIVERY

Life and business event services are services provided jointly by several agencies to allow people or enterprises to perform all the obligations and exercise all the rights conferred on them due to an event or situation. A life or business event service compiles several services related to the same event into a single service for the user.

Proactive services are services provided by an agency on its own initiative in accordance with the presumed will of persons and based on the data in the databases belonging to the state information system. Proactive services are provided automatically or with the consent of a person.

The proposed paper will map the existing practices, plans and conceptual ideas from D5 countries on how to design and deliver such services – in order to assist the individual efforts in countries in this direction.

QUESTIONS:

1. **Policy**
   - 1.1. Does a policy statement on life and business event services exist in your country? If yes:
   - 1.2. Please define the life and business event services in your country's context?
   - 1.3. Please explain how has this policy formulated – e.g. what level of decision / document?
   - 1.4. Which goals/targets have been set?
   - 1.5. What priorities if any are featured (in terms of addressed organizations, type of services or target groups of end users)?
   - 1.6. Have you considered only public services or integration with private services as well?

2. **State of play/State of art**
   - 2.1. What is the current state of play in the provision of life and business event services in your country?
   - 2.2. Have you developed any life or business event services?
     - 2.2.1. If yes, please describe which services exactly have been developed?
     - 2.2.2. What is their status / development stage?
     - 2.2.3. Why were these chosen?
     - 2.2.4. What were the results?
     - 2.2.5. How long has the process taken from idea to completion?
     - 2.2.6. Have you undertaken integration with private services as well?
   - 2.3. Do you have any potential use-cases for life or business event services in mind?
     - 2.3.1. If yes, which ones?
     - 2.3.2. Why would you choose these?

3. **Design principles** for life and business event services

3.1. Have you adopted or compiled any design principles for life and business event services?
    3.1.1. If yes, please elaborate upon these principles – what is included among them?
    3.1.2. Are you including service designers into your work?
3.2. To which extent is proactivity taken into account or should be taken into account among the principles?

4. **Service channels**
4.1. Which service channels are used to provide life and business event services in your country?
    4.1.1. Which ones are planned to be used or could potentially be used?
4.2. Which service channels are preferred/prioritised and why?
4.3. Are there any life or business event services provided by the private sector or through the public sector channels?
    4.3.1. If yes, which and how were these chosen?
    4.3.2. If no, would it be feasible and possibly considered?

5. **Development process**
5.1. What methods you used for design and initial development process of life or business event services?
    5.1.1. Any special tools or processes (vs siloed digital design and building)?
5.2. What were the biggest lessons learned in the development process?

6. **Technological platforms**
6.1. Do you have necessary technological platforms to enable the provision of life and business event services in your country?
6.2. If yes, please precise which ones?
6.3. If no, what is still needed?
    6.3.1. Are you planning to develop them?

7. **Governance model**
7.1. How are the life and business event services governed and managed?
7.2. Who is responsible for what?
    7.2.1. In design process?
    7.2.2. In development process?
    7.2.3. After the development process (during the lifecycle of the service)?
7.3. Who is the owner of the service?
7.4. How is the service owner decided?
7.5. Who has the ultimate responsibility for delivery quality and improvement of the life and business event services?
    7.5.1. How were / could be these owners selected?

7.6. What is the basis for such services in legal systems?

7.6.1. Are there any limitations to life and business event services in the legislation?

7.6.2. Do you plan for any steps in this regard?

7.7. How is the organisational cooperation between different stakeholders managed?

7.8. How is the budget (e.g. development funding or state fees for transactions) allocated?

7.9. Do you collaborate with non-governmental parties (private-public partnership, academics, NGOs etc.)?

7.9.1. How does this collaboration look like?

8. In summary, what are the biggest **barriers or enablers** to life and business event services you see? List max 5 barriers and max 5 enablers.

Appendix 2 – Observations from the D5 Questionnaire

Policy observations: Both New Zealand and South Korea have stated whether through the ICT strategy or the National agenda respectively, that creating contemporary public services is their goal. However, South Korea has stated explicitly that life-cycle services have been a priority since 2015. Israel does not have a specific definition of life event services, but they do focus on life events such as nursing and starting a business. UK has implemented the Government Transformation Strategy, which focuses on the continuous delivery of public-facing digital public services. Policy is formulated in the format of standard operating procedures in South Korea, Government ICT Strategy and the portfolio of Government Digital Services in New Zealand, government resolutions in Israel, and state regulations in Estonia. Overall, the goals of each government is to improve the interaction with government, increase digital transactions, reduce effort to work with agencies (New Zealand), create cross agency teams and task forces (Israel), and have a concrete number of life/business event services by 2018 (Estonia). Public and private sector integration is strong both in Israel and New Zealand, while in Estonia it is still a goal to include private sector.

State of the art observations: Israel is still in the discovery phase, for New Zealand the concept of life event is still new but focusing on customer-centred design and service design and service development initiatives. South Korea has stated that they have very specific birth and death life event services with feasibility studies carried out, and Estonia is focusing on three main areas (business registration, family services, birth). SmartStart in New Zealand (together with considering end of life, becoming a victim, becoming a senior, entering tertiary education, moving to NZ, finding a healthy rental home, rates rebate scheme.), birth and death life events are developed in South Korea, Israel still claimed to be in the initial phases, Estonia has chosen previous three to be developed in 2018. United Kingdom focuses on Learning to Drive and Starting a Business. Services with a big impact and influence factor have been chosen so far, also focus on customer insights and pain points are considered.

Observations on design principles: New Zealand has a draft digital service standard, Estonia a number of guidelines, that can be applied to life/business event services but working on a unified guideline for all. All are focusing on user centricity, but both Israel and New Zealand focus more generally on service design, and Israel more specifically on customer journey methodology. United Kingdom has implemented a Service Manual to guide the development and implementation of digital services with the focus on user-centred service design. One of the similarities is that service (interaction) designers are widely used in the development process. Israel, Estonia, UK and New Zealand are focusing more concretely on proactivity, but South Korea emphasises the need for seamless services.

Service channel observations: A variety of channels are used with the focus on digital. The channels are diverse as these are depending on the needs of the citizen (or life event). New Zealand and South Korea focus on digital inclusion; Estonia on developing digital channels, but also creating physical one-stop-shops, as these do not exist right now; Israel has decided to consider incorporating case managers. UK refers to GOV.UK as the main point of entrance and service channel. Private partners are more involved in New Zealand and Israel, Estonia is not currently involving private sector.

Development process observations: South Korea and New Zealand focus on citizen-centricity and user-centricity, Israel on cross-agency/cross-sector task forces and agile development, Estonia on problem-based and case-based management with the goal of developing task forces that are suitable from the design and user-centricity view point.

User-centricity is considered by the UK, and the main guidelines are defined in Service Manual and Technology Code of Practice. Some of the limitations that have arisen are administrative management and responsibility division (Estonia), difficulty to get main players on-board from day one (Israel), cross-agency working (New Zealand).

Technological platform observations: All D5 countries have technological solutions in place, but New Zealand is more undefined. However, cloud is being prioritised and reusable components are being investigated. South Korea and Israel have a concrete number of concrete platforms. Estonia's state infrastructure and data exchange layer will provide the necessary technological platforms, and additional specific platforms are not planned to be developed.

Governance model observations: External resources (designers and know-how) are used in the design process (by New Zealand, Israel, and Estonia). Outsourced partners and joint task forces with multiple stakeholders are a common practice. Finding an owner for a service is more complicated in Israel and Estonia, however South Korea and New Zealand have allocated organisations for respective life event services. In the UK's case, each delivery department is responsible for its services, and cooperation with non-governmental parties is viable depending on the need or service. Legislation can be a barrier for development, but all members are set to fix the problems once they come up.

Barriers and enablers of life and business event services: Many of similar barriers include siloes within public sector, the level of maturity of life/business event services, legislative barriers, allocating the owner for a service. Many of similar enablers include having a capable team in place and supporting/not limiting leadership.

Appendix 3 – Self-assessment service development questionnaire for public service providers

For the purpose of this dissertation a summarised overview of the questionnaire will be provided.

Wholesome (with one instance of communication):

1. What is the service you are focusing on in this questionnaire?
2. With what life event his service is associated?
3. How many times was the service used in the last year?
4. How many steps are included in the service?
5. Is it possible to provide the service without the will of the person or proactively?
6. If no, explain the essence of limitations.
7. Is it necessary to cooperate with other organisations in order to provide the service (queries, ask for additional information, check the status, etc.)?
8. Is information exchange happening automatically?
9. If and how often have citizens contacted you to receive additional information about the service?

Availability in digital channels:

1. Which is the most interactive channel used for service provision?
2. Is the service channel use described or assisted?
3. Has the difference between different channels been explained to the citizen?

Possibility to opt out of the e-service:

1. Is it possible to opt out from the e-service?
2. If no, then why?
3. Has it been explained what does it mean to opt out?
4. Have the benefits of using an e-service been explained?

Proactivity and Once Only Principle:

1. What is the format of e-service provision?
2. Do you ask for additional or repetitive data?
3. If yes, then for what?
4. Is it possible to receive that data from any other database or location?
5. Is it possible to pre-fill applications without citizen's information involvement?
6. Are data saved during the application process?
7. Is data collected from different databases?
8. If no, then why?

Personalised:

1. Is it possible to sign into the e-service through a homepage or self-service portal?
2. Is it necessary to log into the portal in order to access the information service?
3. What authentication methods can be used to log in to the service?
4. What actions can be done without logging in regarding the chosen service?
5. What actions cannot be done without logging in regarding the chosen service?
6. Is it possible to change the user role during the same session?
7. Does the service environment remember the last used role?

Intuitive and simple:

1. Have you implemented a unified style and design handbook for the service website?
2. Do you consider the simple language principles when designing websites?
3. How many references to legal texts and regulations are included in service descriptions?
4. How many times during the last year people have turned to you in regard to the style and design of the website?
5. How many times during the last year people have turned to you in regard to a certain problem on the website?

Transparency:

1. Do you collect client feedback?
2. How is feedback used?
3. Are the feedback mechanisms clear?
4. Are citizens included in the service design process?
5. How are citizens included in the service design process?

Relevant information:

1. Is it clear through the website when the information was last updated?
2. How is data relevancy ensured?
3. Do all links work?

Safety and reliability:

1. Can the citizen check who and when last accessed their data?
2. Can the citizen update their data on their own?
3. Has it been clarified how the citizen should act if they notice unusual activities with their data?

Multi-lingual:

1. Is the service provided in all most common languages of Estonia?
2. Does the service “remember” the last used language?
3. Is the translated page in accordance with the Estonian language page?

Appendix 4 – Associated paper 1

Publication I

Sirendi, R. (2016). Designing proactive public services as sociotechnical systems by using agent-oriented modelling. *Proceedings of the 16th European Conference on e-Government (ECEG) : Ljubljana, Slovenia, 16-17 June 2016.* Ed. Decman, M.; Jukic, T. Reading, UK: Academic Conferences and Publishing International Limited, 308−316.

Designing Proactive Public Services as Sociotechnical Systems by Using Agent-Oriented Modelling

Regina Sirendi
Tallinn University of Technology, Tallinn, Estonia/Swinburne University of Technology, Melbourne, Australia
Regina.sirendi@gmail.com

Abstract: Multiple stakeholders need to be taken into consideration when designing and implementing public sector services and processes. It will be asked here whether agent-oriented modelling could be beneficial to understand the interactions between these stakeholders and to support the design of proactive services of e-government. We propose a methodology for service design that can help to design better and more proactive services and hereby promote service design thinking in the public sector. For this on-going research, we take a look into how the family benefits service works in Estonia. To aid this task, structured interviews were conducted with the officials of the Social Insurance Board. The current paper makes a contribution to a new way of approaching the design and development of public electronic services.

Keywords: e-governance, service design, agent-oriented modelling, proactivity, public services

Introduction

User centricity is generally acknowledged as a key concept in service design (Stickdorn and Schneider, 2011). However, the term "user" has been over-employed and is also misleading because it implies all service users being very much alike each other. As this is not the case, it makes more sense to discuss stakeholders of services rather than just users. Indeed, each service comes with at least two kinds of stakeholders: service consumers and service providers. Stakeholders take on different roles. Furthermore, broadly speaking, three kinds of roles can be distinguished among service consumers: citizen, public servant, and representative of an organisation, such as company or non-governmental organisation (NGO). Citizens, in turn, can be divided into groups depending on the roles they take in the society (Mead, 1934).

Multiple stakeholders need to be taken into account when designing and developing public sector services and administrative processes supporting them. The nature of these stakeholders contributes to an increasingly complex system of services and processes. There is a need for verifiable, justifiable and repeatable concepts and methods for dealing with such complexity. This paper claims that by efficiently modelling stakeholders' roles, goals, interactions, and knowledge, better public services can be designed and the efficiency and productivity in the public sector can be increased. Agent-Oriented Modelling (AOM) methodology, as proposed by Sterling and Taveter (2009), is used in this research for service design. AOM has been successfully used for designing artefacts that consider the interests of various relevant stakeholders (Miller et al, 2014). The methodology has been adopted here to design and develop public sector services and processes, notably including the users of

the services to be designed performing their respective roles. Moreover, AOM also lends itself to fast prototyping of services to be designed and simulation of potential service scenarios in their social context. This paper is confined to addressing the usage of AOM models of one particular kind – goal models – for facilitating discussions between different stakeholders.

On the other hand, the increasing complexity and growing capacity of technology and its use in the public sector has now created a situation where the computational power that we possess should be harnessed to truly serve the citizens and pre-empt their needs. However, all stakeholders do not have the same needs and levels of satisfaction (Hamilton et al, 2011). The goals, needs, and levels of satisfaction associated with different services may depend on the role citizens are taking, be it in a public sector, private sector or NGO, or looked at as an individual citizen. In this paper we argue that designing proactive services of e-governance should be seen as the next stage in service design for e-governance. In our opinion, proactive public electronic services should be designed in a way that supports the automation and intelligent processing of already available information to reflect the purpose of meeting the needs of different stakeholders yet maintaining a people-first policy. For designing proactive services, AOM is again instrumental because as *agent*-oriented, it intrinsically supports the notion of proactivity, which is one of the main characteristics of agents or active entities, in addition to reactivity and social nature (Sterling & Taveter, 2009).

Finally, it is proposed in this paper that governments should introduce and implement the concept of service design thinking in the public sector in order to create public electronic services that would truly and purposefully meet the needs of citizens, businesses and non-governmental organisations. It is argued here that adopting service design thinking in the public sector can be facilitated by AOM.

It has become increasingly important to understand how to design and provide ICT-driven public services efficiently. We plan to obtain that understanding by combining sociological qualitative research, interdisciplinary case study methods, and software engineering approaches in the research on service design thinking in the public sector. The overall research method used by us is Action Design Research. This paper seeks to address the aims of service design and proactivity and service automation through the example of the family benefits system in Estonia.

The current paper is structured as follows: literature review is followed by a short overview of the research methodology and the description of a case study on the current status of family benefits service in Estonia. The findings of this research are given thereafter.

The current paper also serves the purpose of demonstrating the author's main activities in conducting her PhD studies and creating the basis for the interdisciplinary research through analysing the domains of service design, design thinking and information technology.

The paper illustrates the case of service design thinking and its relevance in the context of e-governance. The methodology of AOM is proving to be a valuable tool for approaching the design of proactive public services. The author of the idea would like to share that notion and get valuable validation for the current proposition.

Literature review

The role of the state is constantly changing and the functions of a government accumulate as increasingly more services are expected to be delivered in a more efficient manner (Sirendi, 2012) and to offer benefits to citizens in order to grant easier access, more information or higher quality of public organisations' offerings (Axelsson, Melin and Lindgren, 2013). Consequently, electronic government, a concept that initially emerged in the public administration of industrial countries (Schuppan, 2009), developed as a reaction

to these expectations. E-governance has become increasingly prevailing in delivering services and public value efficiently and in a timely manner (Sa, Rocha and Perez Cota, 2016).

The last couple of decades have brought along significant changes in how public sector organisations are run (Bode, 2012), what technologies are implemented, and what management styles are relevant. The wide-ranging adoption of ICTs and the diffusion of the Internet among the general population have contributed into an increasing level of comfort and familiarity with the technologies in various contexts (Ebrahim and Irani, 2006). Information is the catalyst and ICT impacts the way the world connects and knowledge is networked (Frasheri, 2003). Countries have never been connected to one another to this magnitude before (Sirendi, 2012). Furthermore, as one of the most recent developments, Linders et al (2015) showcase three illustrative case studies that support that proactive e-governance and proactive service provision will extend the magnitude of information interoperability even further.

A number of authors (Layne and Lee, 2001; Reddick, 2004; Andersen and Henriksen, 2006) and organisations (Baum and Di Maio, 2000; United Nations, 2012) address and describe the perceived phases of government. These models, describing the development of (e-) governance, allow us to make some subjective generalisations, by dividing the development into four general categories: cataloguing – governments focusing on establishing their Web presence; transactions – where a government's focus is on connecting "the internal government system to online interfaces and allowing citizens to transact with government electronically" (Layne and Lee, 2001) and providing enhanced information in the portal and to interact with the government (Fath-Allah et al., 2014), vertical integration – which refers to the connectedness on a local, state, and federal level (Layne and Lee, 2001) and which allows citizens to interact and transact with the government (Fath-Allah et al., 2014); and horizontal integration – where integration takes place across and between different functions and services (Layne and Lee, 2001) and allows citizen to transact through an e-portal that is personalised and integrated according to their needs (Fath-Allah et al., 2014).

Pressure on public expenditure sets a demand to keep on finding ways to increase productivity, while at the same time addressing the needs of the citizens (Karwan and Markland, 2006). There is an increasing demand on countries to make use of the allocated resources in a progressively efficient manner (Lindgren and Jansson, 2013). The importance of service design in the public sector has arisen. The customers of the public services are progressively seen as valuable co-creators within the bigger service ecosystem (Trischler and Scott, 2016). Additionally, increasingly more service managers must design and re-design services in order to keep their offerings competitive, fresh, and desirable for customers. After each re-design, staff must re-learn to use a modified service system to deliver a high-quality customer experience (Heim and Ketzenberg, 2011). Effective service design requires careful attention on different factors such as costs, service levels, efficiency, sales, profits (Narasimhan et al, 2005), and human aspects. Human factors, in turn, may raise new challenges for service design and innovating public sector, as appropriate methods are required (Teixeira et al., 2012) for understanding the motivation, goals, interactions, and processes that consumers, as active value co-creators, are influenced by.

The recent couple of decades have brought insight into the changing concept of service design (Shostack, 1982; Shostack, 1984; Gummesson, 1990, Gummesson, 2007; Ostrom et al., 2010; Kimbell, 2011). Now a closer look into service design in the public sector will be taken (Karwan and Markland, 2006). Service design uses techniques and research methods of different fields: ethnography, interaction design, and information science (Stickdorn and Schneider, 2011), to name a few. The field seeks to understand and design methodologies for both the front and back office of an organisation in order to create better, more user-friendly, more usable, and appropriate services (Smith and Fischbacker, 2002). Effective

service design involves developing a service concept that appeals to end-users while reflecting on operational limitations (Dixon and Verma, 2013).
In public services literature a distinction is often made between the "product-dominant logic" and "service-dominant logic" (e.g. Osborne, 2010a; Osborne, 2010b; Osborne, Radnor and Nasi, 2013). Unlike a product, service components are often not physical entities, but rather a combination of processes, skills, and resources that must be integrated properly in order to result in the planned and designed service (Goldstein et al, 2002). Furthermore, different techniques and methodologies may be used to reach to a newly designed service (Trjschler and Scott, 2015). When (re-) designing services, managers, designers, community members, and other stakeholders must make decisions about each component of the service, thus creating a situation where numerous decisions are made even for the simplest services as the involved processes are continuously on-going (Goldstein et al, 2002). This kind of complexity may create both benefits and limitations (Scholl, 2001). The variety of stakeholders and their changing missions leave public agencies unable to conclusively achieve efficiency in their operations (Karwan and Markland, 2006).
However, there is a growing focus reflected by an extensive amount of literature on the needs of users and growing interest in user-centric services even though little attention is paid to understanding users' preferences (Venkatesh et al, 2012). The design of user-centric e-governance services will continue to be a challenging task, as citizens' demands and needs change (Venkatesh et al, 2012).
The methodology chosen by the author, AOM, has been successfully used in requirements modelling for engaging diverse stakeholders (Miller et al, 2011; Miller et al, 2014). When attempting to understand human issues in service design, a range of consumer emotions (Cook et al., 2002) and interaction between ranges of human, organisational, and technical elements, and processes need to be considered (Radnor et al., 2014 in Trischler and Scott, 2015). Agent-oriented modelling can also be used to address these issues (Miller et al, n.d.). It will be argued here that by using agent-oriented modelling in the service design context, it would be possible to address human aspect and gain a better understanding of the existing issues in public electronic services.

Research methodology

It has become increasingly important to understand how to design and provide ICT-driven public services efficiently. We plan to obtain that understanding by combining sociological qualitative research, interdisciplinary case study methods, and software engineering approaches in the research on service design thinking in the public sector. The overall research method used by us is Action Design Research (Maung et al, 2011). We have chosen Action Design Research (ADR) because it is a research method for generating prescriptive design knowledge through building and evaluating interrelated ICT artefacts in an organisational setting. In our project this has a specific meaning of working out a repeatable method for designing proactive e-governance services in collaboration with their stakeholders. The ADR method consists of four stages. At Stage 1 the problem is identified and described in collaboration between researchers and stakeholders. At Stage 2 an artefact, which in our case is a prototypical implementation of the proactive family benefits service, is iteratively built and evaluated by stakeholders. At Stage 3 the artefact is rebuilt based on the results to apply to a broader class of problems. At Stage 4 the outcome is further generalised to design principles of proactive services of e-governance. This section describes Stage 1 of the case study in this PhD research project. Stage 1, in turn, consists of the following steps:

1. Interviewing stakeholders in Estonia's family benefit area.
2. Analysing interviews by means of qualitative research (structured interviews).

3. Modelling the hierarchy of goals with the associated roles of stakeholders and quality goals by AOM to describe the "ideal" service of family benefits.
4. Using the resulting goal model for facilitating further discussions with stakeholders and obtaining feedback from them.

For accomplishing Step 1, we carried out three initial structured interviews with four stakeholders in Estonia's family benefit area to investigate the perceptions of the interviewees about the potential areas of development for the family benefits service. The interviews were designed to understand the access points for increased effectiveness in providing the family benefits service to eligible persons and improving the service. The interviews were conducted with the employees of the Estonian Social Insurance Board. They were questioned regarding the involved stakeholders, potential improvements in efficiency, and the current situation with family benefits. As the debate on proactivity in the public sector is currently under way in Estonia, the interviewees were also questioned about the possibility of providing family benefits service proactively, as initiated by the Estonian Social Insurance Board. Future stages and iteration of the case study research will also include other stakeholders, such as citizens and other authorities, in the discussion.

Case study: Family benefits service in Estonia

As it was described in the previous section, the Estonian National Social Insurance Board was chosen as an example for this paper on the current PhD research. Estonia has developed into a novel example of a state able to implement practices in e-governance and other information technology solutions in a short period of time. This was done without having any substantial information infrastructure support (Sirendi, 2012). Now, Estonia ranks among the first twenty countries in the world in e-governance development (United Nations, 2014; United Nations, 2012; United Nations, 2010).

In Estonia, currently more than 170 databases are offering services via X-Road, the architectural backbone of e-Estonia, a data exchange layer that was launched in 2002, which allows the nation's different e-services' databases, both public and private, to function in an interoperable fashion. Through that, estimably over 2000 services are available for use over X-Road (E-Estonia, 2016).

However, only a fraction of these services are truly proactive, most notably the service of e-taxation. There is little to nothing written about proactive services in the public sector. Taking into consideration the ever-evolving nature of information technology that is embedded in the domain, it is becoming increasingly important to address proactivity in the public sector, and especially in the context of public services (Püüa, 2008; Taveter, 2014; Tallo, 2015). There is an increasing demand on countries to make use of the allocated resources in an efficient manner (Lindgren and Jansson, 2013).

This paper seeks to address the aim of proactivity through the example of the family benefits system in Estonia. The case study was chosen because it is a widely used service in Estonia. Family benefits are provided by the Social Insurance Board (Social Insurance Board, 2016a) and are available to permanent residents and foreigners that have a temporary residence permit or the right of residence (Social Insurance Board, 2016b).

The list of family benefits includes the following social benefits: childbirth allowance; adoption allowance; child allowance; childcare allowance; single parent's child allowance, conscript's child allowance or child allowance of a person in alternative service, foster care allowance, allowance for a start in independent life for person with no parental care, and allowance for big families with seven or more children (Social Insurance Board, 2016b). An additional, needs-based family benefit is granted and paid by the local municipality (State Gazette, 2016).

The application process is available through different channels both online and off-line. The standard process of applying for family benefits includes submitting the applicant's passport or ID card and residence permit, if applicable. Depending on the type of allowance, one or more documents of the following types may be necessary: a certificate of employment, a Certification of Defence Forces or the Defence Resources Agency, a document regarding the declaration of a parent to be a fugitive, judgment on the establishment of guardianship or foster care contract, or a certificate of social welfare institutions or a school for children with special needs (Social Insurance Board, 2016b).

Research findings

The interviews were designed to address the following list of topics: the stakeholders involved in the family benefits service, the efficiency of the service (both online and offline); potential points where an increase in efficiency is possible; the preference in the use of a channel by service users; and the potential weaknesses and constraints of the family benefits service.

The interviewees identified a diverse range of stakeholders, such as those covering support functions, procedural activities, e-service hosting on the state portal eesti.ee, and different registries on X-Road. A number of stakeholders are involved whether in the application procedure or covering the support functions: the Social Insurance Board, the Ministry of Social Affairs, the Estonian Information System's Authority, different registries, service developers, and different officials at the Social Insurance Board, who are working on the procedural aspects of the service.

The interviews revealed that increasing the efficiency of the service, both online and offline, would involve moving from an e-service (which currently enables submitting an application by electronic means) to an automated e-service (allowing to gather information from different registries and databases). Also, the offline service would benefit from switching from a service-specific application to a unified application, where the user of the service would be able to apply for a number of services at once to save time on doubling the provided by him/her application data.

Although the e-service is available on the state portal, it turned out from the interviews that only an average of 40% of the service users are currently opting for that. The numbers vary from city to city, reaching up to 50% in bigger cities (Tallinn and Tartu), whereas only around 10% of families are currently using the e-service in the North-Eastern part of the country. The interviewees pointed out that a stronger focus on promoting the service and delivering clarifications in different languages would be beneficial.

The interviews showed that the current situation, where the necessary data is available in the registries, allows the application process to be relatively seamless and quick, taking from 15 to 20 days to process an application. However, should the applicant have been previously working or living abroad, the process would be longer, as each situation would usually be looked at case-by-case.

Currently, the use of the family benefits service requires an individual to show initiative and apply for the benefit. According to the interviewees, proactivity in the provision of family benefits service may be hindered by the fact that different stakeholders may be eligible for the same service (e.g. both parents may apply for the childcare allowance). However, a proactive proposal could anyway be made to both.

As explained in the previous chapter, the application process is currently available through different channels both online and off-line. Depending on the type of the allowance or benefit, a different set of documents is needed (Social Insurance Board, 2016b). As explained by the interviewees, the necessary data is available in public authorities' registries to some extent, thus allowing the application process to be relatively quick and seamless.

This creates an environment for the “pull” approach that is appropriate for traditional e-governance while the “push” approach of proactive e-governance stays unexploited.
Currently, it appears from these initial interviews that the Social Insurance Board has overlooked the opportunity to capitalise from the situation where the technological capabilities and computational power possessed by the public authorities and their information systems is not used to its full potential and thus failing to implement the notion of proactivity in its service provision practices.
Figure 1 represents a goal model describing the “ideal” proactive service of family benefits that was designed for further discussions with stakeholders.

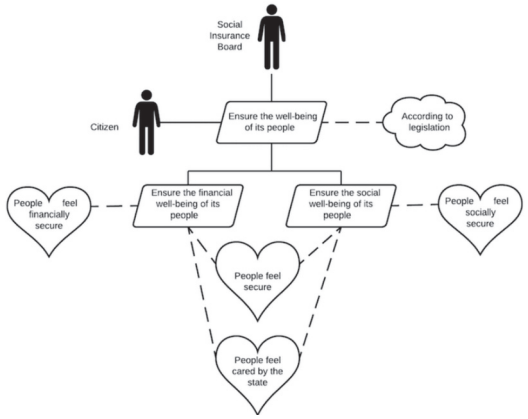

Figure 1. The first draft of the AOM goal model, affiliated with the Stage 3 of the ADR method.

Conclusions

It has become increasingly important to understand how to design and provide ICT-driven public services efficiently. The author plans to obtain that understanding by combining sociological qualitative research, interdisciplinary case study methods, and software engineering approaches in the research on service design thinking in the public sector. This paper gave an overview of the relevant literature that shapes this PhD student’s research and an introduction into the domain in which the research on proactive service provision is examined.
The future activities of the PhD student include the following: *firstly*, by defining the notion of proactivity. Proactivity, in the context of public services, service design, and e-governance, is still fairly scarcely discussed and analysed. Currently, the most relevant discussion regarding proactive public services and proactive government has been initiated regarding the Taiwan’s fourth e-governance policy (Linders et al, 2015), which claims that instead of the current “pull” approach of traditional e-governance where citizens must seek out government services, a “push” approach should be implemented where government proactively and seamlessly delivers timely, customised, and relevant services to its citizens.
Technological advancements have opened up new possibilities for developing public services, e.g. personalised government services (Pieterson et al, 2007), which bases its core thesis on designing services around citizens needs, not around the needs of the service provider. However, the author believes that the technological environment and current computational capacities would make it possible to take personalisation of public services to a next, “proactive”, level.
Secondly, the notion of service design thinking in the public sector will be analysed and discussed more thoroughly. As described above, service design thinking plays an increasingly

relevant role in the development of public sector and public services. The author has planned to cooperate with two service design and development companies, one in Estonia and one in the United Kingdom. This ensures access to first-hand practical know-hows of the service design professionals, who have years of experience designing and developing public sector services.

Thirdly, the research roots its main design approach in the AOM methodology (Sterling & Taveter, 2009). This approach is concerned with modelling sociotechnical systems that are associated with multiple agents. To be put into the current context, the approach is suitable, as it allows designing services that are associated with many different stakeholders. AOM lends itself to analysing problem domains of services and their stakeholders through different lenses. It allows analysing these through the goals, roles, domains, interactions, and behaviour, among others, that are associated with them. AOM is also geared towards the notion of proactivity, which is one of the three fundamental characteristics of an agent. Additionally, as showcased in Miller et al (n.d.), AOM also includes the emotional dimension of modelling stakeholders' relationships, which makes it especially useful in the service design context, where user-centred approach predicates greatly on emotional dimension.

Fourthly, the PhD research will be based on three case studies. The first case study describes the family benefits system in Estonia and has been mentioned above. Following activities, such as focus group interviews, in-depth interviews with the employees of the Social Insurance Board, and business process re-design by using the AOM methodology, are planned for September-November 2017. The second case study focuses on the Digital Transformation Office (DTO) in Australia (Digital Transformation Office, 2016a). DTO is an organisation that is created to lead the Australian government service transformation in order to improve the public service experience. DTO focuses on services and improvements that are most urgently needed, and re-design these services from ground up (Digital Transformation Office, 2016b). The third case study centres on service design companies' offerings. As mentioned, two service design and development companies will be looked at during the analysis of the service design thinking concept. Companies' methods, experiences, and design practices will be measured and analysed against the chosen AOM methodology (Sterling & Taveter, 2009), and the appropriate methodological recommendations will be made to the companies.

The chosen approach, analysing service design thinking and proactivity in the context of public service provision and through the lense of the AOM methodology, allows the author to synthesise the already existing information into a conceptual model that would provide mainly public sector organisations, but also other stakeholders such as private companies and NGOs, an approach that would help them concentrate on the needs of the citizens and users of the service, playing different roles. The new approach, proactive service design, would facilitate automation of e-governance and enable maximum usage of information that is already stored in different registries and information systems. Through the research, that will be done during this PhD degree, it will be defined whether or not AOM and service design thinking could be the solution for building greater proactivity in the public sector.

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Appendix 5 – Associated paper 2

Publication II

Sirendi, R. and Taveter, K. (2016). Bringing service design thinking into the public sector to create proactive and user-friendly public services. HCI in Business, Government, and Organizations: Information Systems: Third International Conference, HCIBGO 2016, Held as Part of HCI International 2016, Toronto, Canada, July 17-22, 2016, Proceedings, Part II. Ed. Nah, F. F.-H.; Tan, C.-H. Springer, 221−230.

Bringing Service Design Thinking into the Public Sector to Create Proactive and User-Friendly Public Services

Regina Sirendi(✉) and Kuldar Taveter

Tallinn University of Technology, Akadeemia tee 15a, Tallinn, Estonia
regina.sirendi@ttu.ee

Abstract. Multiple stakeholders need to be taken into consideration when designing and implementing public sector services and processes. It will be asked in this article whether agent-oriented modeling could be beneficial to understand the interactions between these stakeholders and to support the design of proactive, user-friendly, and usable services of e-government. We propose a methodology for service design that can help to design better and more proactive services and hereby promote service design thinking in the public sector. For this on-going research, we take a look into how the family benefits service works in Estonia. To aid this task, structured interviews were conducted with the officials of the Social Insurance Board. The current article makes a contribution to a new way of approaching the design and development of public electronic services.

Keywords: E-governance · User-centric public services · Service design · Agent-oriented modeling · Proactivity

1 Introduction

User centricity is generally acknowledged as a key concept in service design (Stickdorn and Schneider 2011). However, the term "user" has been overemployed and is also misleading because it implies all service users being very much alike each other. As this is not the case, it makes more sense to discuss stakeholders of services rather than just users. Indeed, each service comes with at least two kinds of stakeholders: service consumers and service providers. Stakeholders take on different roles. Broadly speaking, three kinds of roles can be distinguished among service consumers: citizen, public servant, and representative of an organization, such as company or non-governmental organization (NGO). Citizens in turn can be divided into groups depending on the roles they take in the society (Mead 1934).

Multiple stakeholders need to be taken into account when designing and developing public sector services and administrative processes supporting them. The nature of these stakeholders contributes to an increasingly complex system of services and processes. We need verifiable, justifiable and repeatable concepts and methods for dealing with that complexity. This article claims that by efficiently modeling stakeholders' roles, goals, interactions, and knowledge, better public services can be designed and the efficiency and productivity in the public sector can be increased. We use as our methodology for service design Agent-Oriented Modeling (AOM),

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as proposed by Taveter and Sterling (2009). AOM has been successfully used for designing artifacts that consider the interests of various relevant stakeholders (Miller et al. 2014). In this article, AOM has been adopted to designing and developing public sector services and processes, notably including the users of the services to be designed performing their respective roles. Moreover, AOM also lends itself to fast prototyping of services to be designed and simulation of potential service scenarios in their social context. This article is confined to addressing the usage of AOM models of one particular kind – goal models – for facilitating discussions between different stakeholders.

On the other hand, the increasing complexity and growing capacity of technology and its use in the public sector has now created a situation where the computational power that we possess should be harnessed to truly serve the citizens and pre-empt their needs. However, all stakeholders do not have the same needs and levels of satisfaction (Hamilton et al. 2011). The goals, needs, and levels of satisfaction associated with different services may depend on the role citizens are taking, be it in a public sector, private sector or NGO, or looked at as an individual citizen. In this article we argue that designing proactive services of e-governance should be seen as the next stage in service design for e-governance. In our opinion, proactive public electronic services should be designed in a way that supports the automation and intelligent processing of already available information to reflect the purpose of meeting the needs of different stakeholders yet maintaining a people-first policy. For designing proactive services, AOM is again instrumental because as *agent*-oriented, it intrinsically supports the notion of proactivity, which is one of the main characteristics of agents or active entities, in addition to reactivity and social nature (Taveter and Sterling 2009).

Finally, it is proposed in this article that governments should introduce and implement the concept of service design thinking in the public sector in order to create public electronic services that would truly and purposefully meet the needs of citizens, businesses and NGOs. We claim that adopting service design thinking in the public sector can be facilitated by AOM. By modeling stakeholders' goals, and through different service design methods, such as ethnography, creating personas, stakeholder maps and expectation maps among others (Stickdorn and Schneider 2011), it would be possible meet the needs of the stakeholders in order to provide high quality customer experience.

It has become increasingly important to understand how to design and provide ICT-driven public services efficiently. We plan to obtain that understanding by combining sociological qualitative research, interdisciplinary case study methods, and software engineering approaches in the research on service design thinking in the public sector. The overall research method used by us is Action Design Research (Maung et al. 2011). This article seeks to address the aims of service design and proactivity and service automation through the example of the family benefits system in Estonia.

The current article is structured as follows: literature review is followed by a short overview of the research methodology and the description of a case study on the current status of family benefits service in Estonia. The article illustrates the case of service design thinking and its relevance in the context of e-governance. The methodology of AOM is proving to be a valuable tool for approaching the design of proactive public services.

2 Literature Review

The role of the state is constantly changing and the functions of a government accumulate as increasingly more services are expected to be delivered in a more efficient manner (Sirendi 2012). Consequently, electronic government, a concept that initially emerged in the public administration of industrial countries (Schuppan 2009), developed as a reaction to these expectations. E-governance has become increasingly prevailing in delivering services and public value efficiently and in a timely manner.

The last couple of decades have brought along significant changes in how public sector organizations are run (Bode 2012), what technologies are implemented, and what management styles are relevant. Information is the catalyst and ICT impacts the way the world connects and knowledge is networked (Frasheri 2003). Countries have never been connected to one another to this magnitude before (Sirendi 2012).

A number of authors (Layne and Lee 2001; Reddick 2004; Andersen and Henriksen 2006; Lee 2010) address and describe the perceived phases of government. These models, describing the development of (e-)governance, allow us to make some subjective generalizations, by dividing the development into four general categories: cataloguing – governments focusing on establishing their online presence; transactions, where a government's focus is on connecting "the internal government system to online interfaces and allowing citizens to transact with government electronically" (Layne and Lee 2001), vertical integration, which refers to the connectedness on a local, state, and federal level; and horizontal integration, where integration takes place across and between different functions and services (Layne and Lee 2001). Although these models may explain e-governance development in many countries and may cover the basic features of e-governance growth, these do not explain the potential phases conclusively.

Constant and strong pressure on public expenditure sets a demand to keep on finding ways to increase productivity, while at the same time addressing the needs of the citizens (Karwan and Markland 2006). There is an increasing demand on countries to make use of the allocated resources in a progressively efficient manner (Lindgren and Jansson 2013). The importance of service design in the public sector has arisen. Many service managers must design and re-design services in order to keep their offerings competitive, fresh, and desirable for customers. After each re-design, staff must re-learn to use a modified service system to deliver a high-quality customer experience (Heim and Ketzenberg 2011). Effective service design requires careful attention on different factors such as costs, service levels, efficiency, sales, profits (Narasimhan et al. 2005), and human aspects.

The recent couple of decades have brought insight into the changing concept of service design (Shostack 1982, Shostack 1984; Scheuing and Johnson 1989; Gummesson 1990; Hollins 1993; Kimbell 2011). Now a closer look into service design in the public sector will be taken (Karwan and Markland 2006). Service design uses techniques and research methods of different fields: ethnography, interaction design, and information science (Stickdorn and Schneider 2011), to name a few. The field seeks to understand and design methodologies for both the front and back office of an organization in order to create better, more user-friendly, more usable, and appropriate services (Smith and Fischbacher 2002). Effective service design involves developing a

service concept that appeals to end-users while reflecting on operational limitations (Dixon and Verma 2013). The notion of a "service concept" as initially described by (Sasser et al. 1978) in (Karwan and Markland 2006) could be described as a "bundle of goods and services sold to the customer and the relative importance of each component to the consumer" (p. 14).

Unlike a product, service components are often not physical entities, but rather a combination of processes, skills, and resources, that must be integrated properly in order to result in the planned and designed services (Goldstein et al. 2002). When (re-)designing services, managers, designers, community members, and other stakeholders must make decisions about each component of the service (Goldstein et al. 2002). This way numerous decisions are made even for the simplest services as the involved processes are continuously on-going (Goldstein et al. 2002). The variety of stakeholders and their changing missions leave public agencies unable to conclusively achieve efficiency in their operations (Karwan and Markland 2006).

However, there is a growing focus reflected by an extensive amount of literature on the needs of users and growing interest in user-centric services even though little attention is paid to understanding users' preferences (Venkatesh et al. 2012). The design of user-centric e-governance services will continue to be a challenging task, as citizens' demands and needs change (Venkatesh et al. 2012).

As one of the most recent developments, Linders et al. (2015) showcase three illustrative case studies that support that proactive e-governance will be the future for the public sector.

The methodology chosen by us, AOM, has been successfully used in requirements modeling to engage diverse stakeholders (Miller et al. 2011, 2014). AOM enables to capture functional requirements in the form of functional goals for the service to be designed, which are arranged into a hierarchy. In the hierarchy of functional goals, non-functional requirements are represented as quality goals attached to the corresponding functional goals. Moreover, when attempting to understand human issues in service design, a range of consumer emotions need to be considered from the extremes of "customer delight" to "customer outrage" (Cook et al. 2002). Agent-oriented modeling can also be used to address these issues in the form of emotional goals attached to the relevant functional goals (Miller et al. n.d.). It is argued here that by using agent-oriented modeling in the service design context, it would be possible to address more precisely human aspect and gain a better understanding of the existing issues in public electronic services.

3 Research Methodology

It has become increasingly important to understand how to design and provide ICT-driven public services efficiently. We plan to obtain that understanding by combining sociological qualitative research, interdisciplinary case study methods, and software engineering approaches in the research on service design thinking in the public sector. The overall research method used by us is Action Design Research (Maung et al. 2011). We have chosen Action Design Research (ADR) because ADR is a research

method for generating prescriptive design knowledge through building and evaluating interrelated ICT artifacts in an organizational setting. In our project this has a specific meaning of working out a repeatable method for designing proactive e-governance services in collaboration with their stakeholders. The ADR method consists of four stages. At Stage 1 the problem is identified and described in collaboration between researchers and stakeholders. At Stage 2 an artifact, which in our case is a prototypical implementation of the proactive family benefits service, is iteratively built and evaluated by stakeholders. At Stage 3 the artifact is rebuilt based on the results to apply to a broader class of problems. At Stage 4 the outcome is further generalized to design principles of proactive services of e-governance. This section describes Stage 1 of the case study in the research project undertaken by us. In our case study Stage 1 consisted of the following steps:

1. Interviewing stakeholders in Estonia's family benefit area.
2. Analyzing interviews by means of qualitative research (structured interviews).
3. Modeling the hierarchy of goals with the associated roles of stakeholders and quality goals and emotional goals by AOM to describe the "ideal" service of family benefits.
4. Using the resulting goal model for facilitating further discussions with stakeholders and obtaining feedback from them.

For accomplishing Step 1, we have carried out three structured interviews with four stakeholders in Estonia's family benefit area to investigate the perceptions of the interviewees about the potential areas of development for the family benefits service. The interviews were designed to understand the access points for increased effectiveness in providing the family benefits service to eligible persons and improving the service. The interviews were conducted with the employees of the Estonian Social Insurance Board. They were questioned regarding the involved stakeholders, potential improvements in efficiency, and the current situation with family benefits. As the debate on proactivity in the public sector is currently under way in Estonia, the interviewees were also questioned about the possibility of providing family benefits service proactively, as initiated by the Estonian Social Insurance Board. Future stages and iteration of the case study research will also include other stakeholders, such as citizens, in the discussion.

4 Family Benefits Service in Estonia

As was described in the previous section, the Estonian National Social Insurance Board was chosen as an example for this article on the current research by us. Estonia has developed into a novel example of a state able to implement practices in e-governance and other information technology solutions was done without in a short period of time. This having any substantial information infrastructure support (Sirendi 2012). Now, Estonia ranks among the first twenty countries in the world in e-governance development (United Nations 2010, 2012, 2014).

In Estonia, currently more than 170 databases are offering services via X-Road, the architectural backbone of e-Estonia – a data exchange layer that was launched in 2002 – which allows the nation's different e-services' databases, both public and

private, to function in an interoperable fashion. Through that, estimably over 2000 services are available for use over X-Road (E-Estonia 2016).

However, only a fraction of these services are truly proactive, most notably the service of e-taxation. There is little to nothing written about proactive services in the public sector. Taking into consideration the ever-evolving nature of information technology that is embedded in the domain, it is becoming increasingly important to address proactivity in the public sector, and especially in the context of public services (Püüa 2008; Taveter 2014; Tallo 2015). This parallels with an increasing demand on countries to make use of the allocated resources in an efficient manner (Lindgren and Jansson 2013).

This article seeks to address the aim of proactivity through the example of the family benefits system in Estonia. The case study was chosen because it is a widely used service in Estonia. Family benefits are provided by the Social Insurance Board (Social Insurance Board 2016a) and are available to permanent residents and foreigners who have a temporary residence permit or the right for residence (Social Insurance Board 2016b).

The list of family benefits includes the following social benefits: childbirth allowance; adoption allowance; child allowance; childcare allowance; single parent's child allowance, conscript's child allowance or child allowance of a person in alternative service, foster care allowance, allowance for a start in independent life for person with no parental care, and allowance for big families with seven or more children (Social Insurance Board 2016b). An additional, needs-based family benefit is granted and paid by the local municipality (State Gazette 2016).

The application process is available through different channels both online and offline. The standard process of applying for family benefits includes submitting the applicant's passport or ID card and residence permit, if applicable. Depending on the type of allowance, one or more documents of the following types may be necessary: a certificate of employment, a Certification by the Defense Forces or the Defense Resources Agency, a document regarding the declaration of a parent to be a fugitive, a judgment on the establishment of guardianship or foster care contract, or a certificate by social welfare institutions or by a school for children with special needs (Social Insurance Board 2016b).

The interviews were designed to address the following list of topics: the stakeholders involved in the family benefits service, the efficiency of the service (both online and offline); potential points where an increase in efficiency is possible; the preference in the use of a channel by service users; and the potential weaknesses and constraints of the family benefits service.

The interviewees identified a diverse range of stakeholders, such as those covering support functions, procedural activities, e-service hosting on the state portal eesti.ee, and different registries on the architectural backbone for Estonia – X-Road. A number of stakeholders are involved whether in the application procedure or covering the support functions: the Social Insurance Board, the Ministry of Social Affair, the Estonian Information Systems' Authority, different registries, service developers, and different officials at the Social Insurance Board, who are working on the procedural aspects of the service.

The interviews revealed that increasing the efficiency of the service, both online and offline, would involve moving from an e-service (which currently enables submitting an application by electronic means) to an automated e-service (allowing to gather information from different registries and databases). Also, the offline service would benefit

from switching from a service-specific application to a unified application, where the user of the service would be able to apply for a number of services at once to save time on doubling the provided by him/her application data.

Although the e-service is available on the state portal, it turned out from the interviews that only an average of 40 % of the service users are currently opting for that. The numbers vary from city to city, reaching up to 50 % in bigger cities (Tallinn and Tartu), whereas only around 10 % of families are currently using the e-service in the North-Eastern part of the country. The interviewees pointed out that a stronger focus on promoting the service and delivering clarifications in different languages would be beneficial.

The interviews showed that the current situation, where the necessary data is available in the registries, allows the application process to be relatively seamless and quick, taking from 15 to 20 days to process an application. However, should the applicant have been previously working or living abroad, the process would be longer, as each situation would usually be looked at in a case-by-case way.

Currently, the use of the family benefits service requires an individual to show initiative and apply for the benefit. According to the interviewees, proactivity in the provision of family benefits service may be hindered by the fact that different stakeholders may be eligible for the same benefit (e.g. both parents may apply for the childcare allowance). However, a proactive proposal could anyway be made to both.

Figure 1 represents an *initial* goal model describing the "ideal" proactive service of family benefits that was designed for further discussions with stakeholders. The figure represents the main goal of the family benefits service – ensure the well-being of the

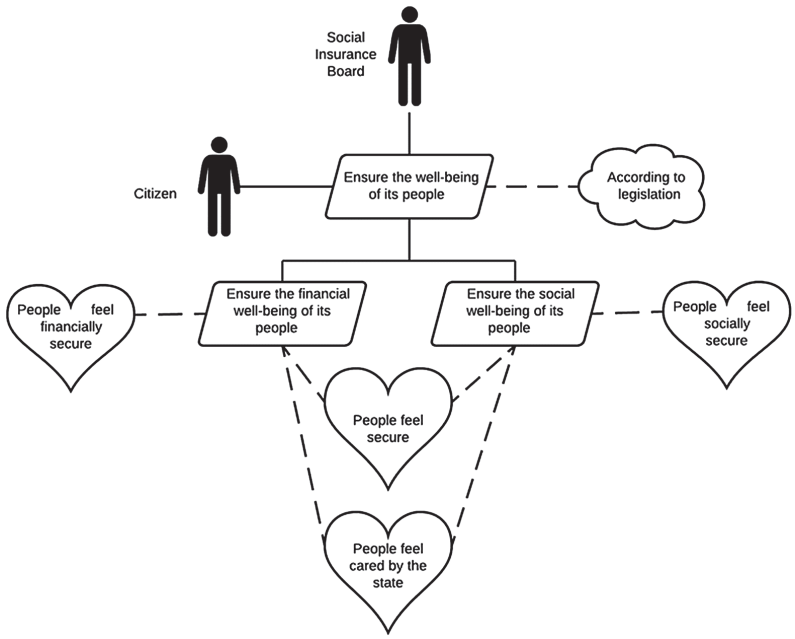

Fig. 1. The first draft of the AOM goal model, affiliated with Stage 3 of the ADR method

people living in a country – with its two sub-goals, representing the financial and social aspects of ensuring the well-being. Attached to the goals are the quality goals and emotional goals, applying to the corresponding goals. Figure 1 also shows the two stakeholder roles Citizen and Social Insurance Board.

5 Conclusions and Future Research

It has become increasingly important to understand how to design and provide ICT-driven public services efficiently. The authors have planned to obtain that understanding by combining sociological qualitative research, interdisciplinary case study methods, and software engineering approaches in the research on service design thinking in the public sector. The overall research method used by us is Action Design Research.

Technological advancements have opened up new possibilities for developing public services, e.g. personalized government services (Pieterson et al. 2007), which bases its core thesis on designing services around citizens' needs, rather than around the needs of the service providers. However, the author believes that the technological environment and current computational capacities would make it possible to take personalization of public services to a next, "proactive", level. Currently, the most relevant discussion regarding proactive public services and proactive government has been initiated regarding the Taiwan's fourth e-governance policy (Linders et al. 2015), which claims that instead of the current "pull" approach of traditional e-governance, where citizens must seek services provided by government, a "push" approach should be implemented where government proactively and seamlessly delivers timely, customized, and relevant services to its citizens. In our opinion the key to achieving proactive and public services lies in tailoring the ICT infrastructure of a state for the needs of citizens, businesses and NGOs rather than for supporting ministries and governmental organizations *per se*. The design of targeted proactive and personalized services requires a method for modeling sociotechnical systems that are associated with multiple agents. The AOM approach is suitable for this purpose, as it allows designing services that are associated with many different stakeholders. Moreover, AOM lends itself to analyzing problem domains of services and their stakeholders through different lenses, such as the goals, stakeholder roles, problem domain knowledge to be represented in registries and databases, interactions, and behaviors. Also, AOM is geared towards the notion of proactivity, which is one of the three fundamental characteristics of an agent. Additionally, as showcased in Miller et al. (n.d.), AOM includes the emotional dimension of modeling stakeholders' attitudes, which makes it especially useful in the service design context, where user-centered approach predicates greatly on emotional dimension.

The chosen approach – analyzing service design thinking and proactivity in the context of public service provision and through the lenses of the AOM methodology – allows the authors to synthesize the already existing information into a conceptual model that would provide mainly public sector organizations, but also other stakeholders such as private companies and NGOs, with an approach that would help them concentrate on the needs of the citizens and users of the service, playing different roles. The new approach – proactive service design – would facilitate automation of e-governance and

enable maximum usage of information that is already stored in different registries and information systems run by government. Future research will seek to define how AOM and service design thinking could be the solution for building greater proactivity into the public sector.

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Appendix 6 – Associated paper 3

Publication III

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A Conceptual Framework for Effective Appropriation of Proactive Public e-Services

Regina Sirendi[1], Antonette Mendoza[2], Mariane Barrier[1], Kuldar Taveter[1] and Leon Sterling[2]
[1]Department of Software Science, School of Information Technology, Tallinn University of Technology, Estonia
[2]Department of Computing and Information Systems, University of Melbourne, Australia
regina.sirendi@ttu.ee
mendozaa@unimelb.edu.au
mariane.koplimaa@gmail.com
kuldar.taveter@ttu.ee
leonss@unimelb.edu.au

Abstract: In the light of the growing relevance of technology in society, it has become increasingly important to understand how to provide and implement ICT-driven e-services efficiently. The recent years have seen the increase in the importance of proactive e-services within public sector. Their relevance is further expected to grow in the light of the development of artificial intelligence. Moreover, the countries in a network of leading digital governments (Digital 7 – D7) have strategically prioritised developing such services. The concept suggests that proactive e-services are provided by an agency on its own initiative with the presumed will of persons instead of persons having to initiate the service delivery process. However, little has been discussed how to best design and roll out proactive public e-services within society. By analysing and comparing two case studies in the disadvantaged context from Estonia and Australia we were able to gain deeper understanding about the effectiveness in rolling out and providing such services. The knowledge about investigated services was used to design a conceptual reactive-proactive framework for a desired process of proactive e-services appropriation. The reactive-proactive framework allows identifying alternative service management and utilisation routes once a life or a business event occurs. It also provides a conceptual understanding of the requirements for a reactive-proactive service space. Case study and qualitative research, e.g. in-depth interviews, were conducted in order to gain deeper understanding of the disadvantaged context and provide a visual representation of the field. The conducted analysis showed that merely publicising information is not enough to ensure the effective appropriation of such services. Instead, these ought to be supported by integrated infrastructure, such as existing databases and data exchange layers. Additionally, organisations are expected to push out services proactively and automatically. By taking into consideration the results of the research, we were able to create guidelines for introducing proactive e-services. The guidelines will provide practical recommendations for public agencies and decision-makers to aid the future appropriation of proactive e-services.

Keywords: e-government, e-services, proactive e-services, technology appropriation, life and business event services, agent-oriented modelling

1. Introduction

With the growing relevance of technology in society, it has become increasingly important to understand how to provide and implement ICT-driven e-services efficiently. The functionality, requirements, and goals of stakeholders vary according to the roles they take in the e-service ecosystem. Nevertheless, clear guidelines for realising these transformations are lacking (Linders, et al. 2015). Furthermore, prior literature in the field of technology appropriation discusses how and why people adopt systems, and focus on the affordances of such technologies. Both reactive and proactive services have been covered previously in the public sector context (see Scholta, et al. 2017). However, little is discussed about how best to design and roll out proactive e-services within society, let alone appropriation of such e-services (OECD 2013).

This article addresses and makes a contribution in the field of technology appropriation of proactive e-services in a social services setting. Consequently, the research question addressed in this paper is "*How to design a framework for effective appropriation of proactive e-services*"? To this effect, a case study research approach is used (Runeson, et al. 2012, Yin 2014) where two publicly provided services in the disadvantaged context were analysed to gain deeper understanding about the effectiveness of these services. This knowledge is used to model and design a conceptual framework for effective appropriation of proactive e-services.

The structure of the paper is as follows. The brief background of the field is followed by a short overview of the research methodology and the case studies. After that, the research findings are presented and their

implications are analysed. Finally, we draw conclusions and provide some possible directions for future research based on the current research outcomes.

2. Background

The constantly changing role of the state ensures that people's expectations in public services are shifting and more services need to be delivered in an increasingly efficient manner (Sirendi 2012). Electronic government - e-government, a concept that initially emerged in the public administration of industrial countries (Schuppan 2009) developed as a reaction to these expectations. E-government has become increasingly prevailing in delivering services and public value efficiently and in a timely manner across several public service contexts. Furthermore, there is an increasing demand on countries to make use of the allocated resources in a progressively efficient manner (Lindren and Jansson 2013). Hence, e-government is gaining momentum in many countries. It is enabling and empowering citizens to have better access to information, increased transparency and service delivery, and closer participation in government affairs (Veeramootoo, Nunkoo and Dwivedi, 2018).

The recent years have shown increasing focus on the needs of users and growing interest in user-centric services even though little attention is paid to understanding users' preferences (Venkatesh, et al. 2012, Jansen and Olnes 2016, European Commission 2017b). There has long been an ideal of personalised government services. These are services that through the use of technology would give citizens choices around their needs, not around the service providers' needs (Linders, et al., 2015). However, the design of user-centric e-government services will continue to be a challenging task, as citizens' demands and needs change (Venkatesh, et al. 2012). It is believed (Pieterson, Ebbers and Van Dijk, 2007) that inferring, predicting, and even influencing users behaviours and needs is possible. However, such transformation is complex with no universal solution (Klievink and Janssen, 2009).

One of the latest developments has shown that governments are increasingly requested to "push" services towards citizens, instead of getting them to "pull" services from the government. Such a phenomenon is now noted as proactive e-government. The citizen must not seek information or services from government, but the government proactively and seamlessly delivers services to the citizen (Linders, et al. 2015). For instance, a proactive service can be triggered upon the occurrence of a life event, e.g. a marriage, childbirth, or starting a new business. That approach to service provision is even introduced through the Estonian Stage Gazette in the Principles for Managing Services and Governing Information (State Gazette, 2018).

At the same time services based on life events are becoming increasingly prevalent. This is also shown by the recent focus of the European Commission to promote across Europe electronic services based on life events (European Commission 2017a, European Commission 2018). Several authorities provide life event services jointly, so a service beneficiary would be able to perform all tasks and exercise all rights conferred on the person due to an event or situation. Such services are compiled together into one holistic service of different services, components that are related to the same event (State Gazette, 2018). There is clear indication from the Digital 7 countries as well as others (Linders et al., 2015) that proactive e-government is becoming increasingly relevant, as the rapid uptake of mobile technologies, i.e. smart phones, tablets, and wearable technology, will create a possibility for the government to communicate with its citizens more efficiently.

The social and technical aspects in providing technology appropriation have been widely studied before (Davis 1989, Rogers 1995, Mendoza, et al. 2010). However, there has been little to no exploration to understand how e-services, both reactive and proactive, are appropriated to meet the needs of service users. Some of the more prevalent theories are Technology Acceptance Model (TAM) by Davis (1989) and the Diffusion of Innovation Theory (DOI) by Rogers (1995). One additional factor that could impact citizens' intention to use e-government services is the perceived trustworthiness (Carter and Belanger, 2005). These examine the process of adoption and implementation of innovations through the lenses of perceived usefulness and ease of use together with how innovation is communicated through different channels over time among the members of a society of a social system. Furthermore, technology appropriation models ought to be updated to take into account the new ways in which people consume and interact with information through smart phones, tablets, and wearable technology.

In this article we are particularly interested in understanding the main aspects that limit an effective appropriation of proactive e-services. With the results of the case studies we will be able to create an initial

conceptual model for addressing the scope for both proactive and reactive service space that, in following research, upon which we are able to build a meta-model of proactive e-service design.

3. Research methodology

The aim of this paper is two-fold: (1) to explore how e-services are used by people, particularly to capture their attitudes and perspectives about e-services especially in the disadvantaged context; and (2) with the knowledge we gain from users of such services, be able to design the before-mentioned framework. To this effect, this study uses a case study approach to understand the how and the why people use or do not use e-services. On one hand, case study methodology is a widely used research approach in social sciences, as it is applied in many situations to contribute to the body of knowledge related to organisational, social, group, and individual phenomena (Yin 2014). However, on the other hand, it has also been used in software engineering and information systems (IS) research (Runeson, et al. 2012). Software engineering is distinctive in the combination of diverse topics and the range of stakeholders that all undertake various activities, such as requirements analysis, development, operation, maintenance, and appropriation of technologies (Howard, et al. 2008). The focus of the current study is directed towards appropriation of proactive e-services as socio-technical systems (Sommerville 2009).

For this article, two case studies in the context of the disadvantaged context were described and analysed. The first case study was conducted in Estonia, while the second case study was carried out in Australia. In addition to descriptive case studies, in-depth interviews with the relevant stakeholders were conducted. Table 1 shows the number of participants in each case study together with their roles.

Table 1: Overview of case studies – participants and sample coverage

Case study	Case Study One	Case Study Two
Number of participants and the type of the study	Eleven, in-depth interviews	Thirty, in-depth interviews
Roles (sample coverage)	Parents, Doctors, Social workers, Therapists, Policy advisors, Civil servants, Service providers	Homeless and Ex-Homeless, Service providers, Software owner

3.1 Case study one

The first case study investigated the situation of providing services for the parents of disabled children. In the first case study, the problems of design and solutions of three chosen services were presented through using eleven in-depth qualitatively analysed interviews and descriptive overviews, primary information sources, and Agent-Oriented Modelling (AOM) (see Sterling and Taveter 2009) for understanding the context and representing the findings. Firstly, the application process for yearly allowance for a disabled child in the city of Tallinn was described, modelled, and analysed. Secondly, the application process for special nutrition or food support for a disabled child was described, modelled, and analysed. And lastly, the application process for day-care for a disabled child was described, modelled, and analysed. These case studies were chosen to illustrate how the system of submitting the relevant applications and providing the parents of disabled children with relevant information is not as coherent and seamless as it would be expected. The analyses of the available services were supported by eleven in-depth interviews.

The themes of the interviews were divided into the following topics:

- Access to information – knowing about the benefits and services;
- Speed of receiving the service or benefit;
- Suggestions for a new system;
- State plans for a new system;
- Time plan for the development of a state-planned new system.

3.2 Case study two

The second case study investigated the situation of providing services for the homeless through a mobile web-application Ask Izzy. Thirty in-depth interviews were conducted with wide sample coverage. With adults from

the homeless and ex-homeless participant groups, both young and elderly people were interviewed together with people affected by family violence, mental and emotional difficulties, drugs and alcohol problems, and people with children in stable living conditions, and in unstable living conditions. In the service provider participant group, official service providers including organisations funded by the government and charities were interviewed. And lastly, the software owner was interviewed.

The themes of the interviews were divided roughly into the following topics:

- Questions about the application – What users thought about the application, about its features, and barriers to its usage?
- Questions about restrictions or barriers: Why did they not adopt the application?
- Questions about appropriation: How did they perceive using the application?

4. Results

This section will examine two case studies in the sector of services for the disadvantaged that were briefly introduced in the previous section. These examples illustrate the importance of information quality and how it is presented to the target group and also emphasise the need for organisations to proactively push the relevant services to their users. The section presents both case study through the lens of simplicity of providing services and information together with granting access to the services.

4.1 Case study one – providing services for the parents of disabled children

Eleven interviews were conducted with stakeholders to gather feedback and opinions about the current situation of informing and providing services for parents who have disabled children. The focus of the interviews was mainly on how can necessary information be found, how satisfied were the families with information provision, what is currently missing from the information provision, how could medical doctors' involvement be described, and what were the current plans by the state. For the purpose of this article, we will focus on the information provision and potential developments for a proactive solution.

Information provision was seen as a wide problem that affects people in different life situations, including those with disabled children:

> "The lack of information starts from already an early stage when a child is born with disability. /…/ One must be very aware by himself/herself to cope."

One of the stakeholders brought out that the application process for different disability services was still complicated and unclear:

> "The current situation is not good and is complicated for the parent. The parent needs to send application to different places and even within one office, several applications are needed. It is not a clear system."

Furthermore, another interviewee, a specialist at the MoSA, emphasised that the needs of children with special needs were not considered separately from the needs of children with no special needs:

> "All the resources that the state has are at the moment divided between everybody equally, no matter what is the need. But the plan is to re-divide everything /…/."

The interviewees were also asked about time-sensitive services. In this area it was brought out that services are not provided in a timely manner, although the information exchange between organisations is allowed:

> "There still should be someone dealing with these children to inform city government that a disabled child was born or was diagnosed and help should be provided. /…/ For the child it is really important that the services should reach the child as soon as possible, urgently. Every parent has experience with 'if I only had heard about it before'."

Furthermore, it was claimed by one of the stakeholders that information should be provided in an efficient and timely manner according to the current situation of the family and the disabled child in particular:

> "/…/ Personal approach should be the solution. All packages should be "delivered" by this person to the family. No matter if it is a service by the state or the local government. The problem is also that the person cannot accept too much information at the same time. There should be good

> reasoning behind the system – what comes first, primarily. Information comes in vertically and horizontally. It should be linked to new information automatically. /…/ There should be offers for services that the child may need. All should be connected and holistic. Now all is separated."

Interestingly, it was emphasised by another interviewee that acquiring information also depends on the capabilities of the parent:

> "Sometimes it all depends on the activities of the parent. Parents who are not that active and educated reach to undergo the rehabilitation plan later and then it may be the case that the child does not get the needed service."

One of the stakeholders, a representative of SIB, pointed out that there have been plans for a new system of e-service provision by the state:

> "The web will be new and we will start to measure more service usage, how information is read, received, used and to see the customer behaviour, how the need develops, and how people use it. How well the channel is used and if it is used. SKAIS2 (SIB's updated Information System) will be a new SKA (SIB's old Information System) with a new website and self-service portal. /…/"

One of the parents said that, in addition to the online tool, a case manager is needed in order involve necessary people in the rehabilitation plan:

> "The case manager role is important, online tool alone does not help. The experts can suggest what the parent needs to know."

One of the stakeholders from the Ministry of Economic Affairs and Communications claimed that currently the legal system does not support the provision of proactive services:

> "Today providing a public service is based on a voluntary will. It you do not want a service, it is not provided to you because actually there are people who do not want a service because, for example, they do not want to admit the disability of their child. There needs to be some type of classificatory feature in between, before the state can proactively provide the service. /…/ Here is the trick with proactive service and free will. But for the developed and changed system, it should be seen, what part of the work is possible to automate with an intelligent information system. The answer should come from the service owner if there is a need for a person – case manager – and why the part of this person cannot be automated, what is the extra value this person brings to the system, especially with respect to sharing information."

It can be seen from the excerpts of the interviews that the current situation with information gathering has been unclear and divided. More active parents have been able to find information through different sources and by sharing information amongst them. A strong emphasis is put on the future information system that would be able to pull together information proactively through different databases in order to empower parents to make informed decisions about their disabled children's welfare.

4.2 Case study two - providing services for homeless people

The second case study was providing services for homeless people through a mobile web-application Ask Izzy. For this case study, thirty interviews were conducted with the purpose to understand the main pain-points in adopting and using the Ask Izzy web application. The platform serves as a one-stop-shop where the users of the service are able to search for necessary information based on their needs. The categories of interest vary from housing to medical, from everyday things to legal, and from technology to counselling to name a few.

The interviews focused mainly on two aspects. Firstly, what did the interviewees think about the Ask Izzy web-application, and secondly, what would be the best ways for anyone to promote it? For the current paper of proactive service provision, we will mainly address the issues of information provision and the roll out of Ask Izzy to its potential users.

It was pointed out by one of the interviewees that for a homeless person, or for anyone in the disadvantaged sector, information is the most important:

> "Information has been the biggest issue apart from housing. /…/ You never expected to be homeless and sometimes you just assume that it's taken care of by someone./…/ it's like I want to

> see information, I want to know when I become homeless, where I can go, who can help me, what can they do./…/ Because they need so much information, they need so much connection."

Search engine optimisation for homelessness services plays a crucial role in rolling-out Ask Izzy. When a Google search on homelessness was done, Ask Izzy did not come up at all.

It was pointed out by one of the participants that one of the main strengths of the web-application is its infrastructure.

> "I think that one of the strengths of Ask Izzy as a tool is that it piggybacks on that existing infrastructure."

However, it was also emphasised that Ask Izzy is limited in scope in a way that it does not provide a complete solution for a person who is searching for housing, rather simply provides basic information about the service provider:

> "It will provide you with the phone number for where you can go to go get that help, but of course it can't do more than that, and so that in a way was one of the limitations it's not you know of itself that's not the fault of the product obviously."

It was also pointed out that the role of a case manager could close the gap between the information what Ask Izzy provides and how people are able to use it:

> "A case manager can do the practical things, let's look at where the library is, alright let's get in the car and let's go to the library."

Another interviewee, a service provider, mentioned that it can be difficult to roll out the service to the target group if it has not been defined precisely who are the end users:

> "I think one of the challenges for something like Ask Izzy, who is the end user? If it was someone for instance if it was someone with a disability, it's really clear. /…/"

It was also emphasised by them that there is a need for designing a system of communication:

> "In terms of how would you get information to those people though, that's I think probably the key one for me if I was designing a system of communication to that would be the point at which they meet the homelessness system. So I would do two things, I'd make sure there was information about ASK IZZY at every entry point. They know where they are, they're clearly identified, as I said there's eighteen or twenty in Melbourne and then twenty or thirty ones that are sort of out posts of those organizations."

The more general function of AskIzzy was seen by a service provider to be preventative or reactive rather than proactive.

> "So more in the way of thinking of ASK IZZY as a preventative thing rather than as a response to someone who's homeless only but as a way of a future proofing yourself or skilling you up to know how to search for what you need to make sure that you see a doctor when you need to see a doctor, know where they are, all those sorts of things."

A statement was also made on working together with other partners and stakeholders to publicise information about Ask Izzy:

> "What's happening at the moment is that the marketing team in conjunction with the CEO /…/ has actually picked that up and working with Real Estate Australia and News Corp around how we actually get the word out. /…/ The second thing is working."

5. Framework

Based on the results of the interviews, we can draw a table with the conclusions from the case studies. The results show crucial overlap in two main areas. Firstly, the existing infrastructure was prioritised as the main underlying component for providing efficient services. Secondly, it was brought out that a proactive marketing plan is needed for the purpose of providing information to the disadvantaged user group.

Based on the conclusion in Table 2, we can draw a conceptual framework for public service provision in the reactive-proactive space as shown in Figure 1 below. The conceptual model was created to illustrate the desired process for the provision of proactive services. This model suggests that once a life event, (e.g. a birth, marriage,

or starting a school) occurs in the life of a person, there are two possible options. Before any of these two paths can be taken, the citizen should decide whether or not he/she allows his/her data to be processed proactively, which is seen in Figure 1 as *Opt IN/OUT to ProactiveSpace*.

Table 2: Conclusions from the case studies

Identified issues from the findings	Case Study One – CS1	Case Study Two – CS2
The process of information provision has been unclear	*	
Information is presented sparsely and often requires additional learning how to use the found information	*	
Many stakeholders are involved in providing services, receiving applications, and ensuring that correct information is provided to the users of the service	*	
The process of providing a service has not been automated	*	
Infrastructure has been identified as one of the key components in providing efficient services	*	*
It has been identified that infrastructure exists to some extent	*	*
Infrastructure has not been used to its full potential	*	
Personalised approaches are needed to address the needs and circumstances of people in the disadvantaged sector	*	
A proactive service can be provided through a one-stop-shop, a personalised website, and often by the help of a case manager	*	
A holistic service repository with the support of some form of infrastructure is a valuable tool for empowering the people struggling with homelessness.		*
If the tool is not proactively marketed to the target group, it will not be able to serve its purpose of providing information.		*

Deriving from that decision, the citizen may choose to seek by himself/herself information about the services and information related to the life event, which is represented in Figure 1 as *InformationSeekingAndAccess*. The latter then carries out information search in the *Infrastructure* that may contain but is not limited to databases, registries, information systems, and data exchange layers. Queries to the *Infrastructure* allow *DataProcessing*, which then provides citizens with a list of possible solutions – services – and relevant pieces of information. On the other hand, the citizen may choose the proactive route, where *LifeEvent* triggers a *ProactiveAgent* that in turn gathers information through Infrastructure, carries out *DataProcessing*, and lastly comes up with a finalised *Solutions/Services* package that is then presented to the citizen for immediate use. A *ProactiveAgent* can be a physical person (e.g. a case manager) or a computer application – software agent – that based on the *LifeEvent* makes a query to the *Infrastructure* to start the process of finding and providing a personalised solution for the citizen.

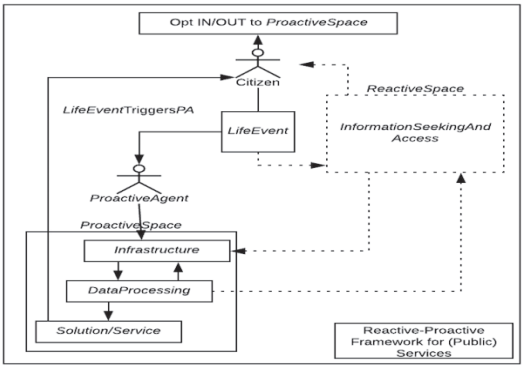

Figure 1: A conceptual framework for reactive-proactive public services

6. Conclusion

Through the two case studies in the problem domain of dealing with the disadvantaged, we learned that having an infrastructure, e.g. a data exchange layer with service descriptions, in place is one of the most important parts

in starting efficient service provision. We can conclude the following: (1) Pre-existing infrastructure needs to be integrated; and (2) Even if you have an integrated infrastructure, services of e-government still need to be marketed for the target groups.

There is a need to bring together information through a customised and personally directed one-stop-shop or a no-stop-shop - a personalised service, or through a *ProactiveAgent* (a case manager or a software agent). This solution would be able to make decisions based on the data analysis performed using the pre-existing infrastructure. The *ProactiveAgent* should be able to provide a finalised solution to the citizen in a timely and personalised manner. In the *ReactiveSpace*, the *ProactiveAgent* will not play a role. However, in the *ProactiveSpace*, the *ProactiveAgent* serves the purpose of analysing the existing information and providing the relevant solution to be used promptly. The end goal is to ensure that the infrastructure is well integrated, so that the *ProactiveAgent* can become completely automated. However, we are aware that it is a challenge to integrate different databases, registries, and information systems because they belong to different ministries and governmental organisations. A unifying interface for all different kinds of databases, registries, and information systems is needed, such as the data exchange layer X-Road in Estonia. Although some countries have proactive solutions that are working effectively, there is a high need for furthering proactive services that are connected to a bigger context, such as the medical data, legal data, data on social and employment areas, etc.

The current conceptual model of proactive-reactive services focuses on two areas: the *ProactiveSpace* and *ReactiveSpace*. Although both are illustrated, it could be argued, that the *ProactiveSpace* is preferable. It would enable saving on human resources both from the service provider's and service user's side, it would help service user to receive a full solution, a package of services or necessary information from one place, and allow optimising service delivery processes from the organisational side. One the one side, for organisations to provide such solutions a thorough audit of current situation and capabilities is needed. Furthermore, strong political support to transformation and transparency is required. On the other side, for users to accept such solutions, they need to keep their sense of control over their data. In order to trust their government, they must always be able to opt out from *ProactiveSpace*, learn how their data is or has been used, and have control over who can see their sensitive information.

As a result of the two case studies, we learned the following. For instance, case study research methodology proposes a great opportunity to analyse and dissect chosen cases from a close perspective. It allows understanding the problems and opportunities related to proactive service provision and appropriation in the disadvantaged sector in more detail. However, because the cases about the novel concept of proactive services were evaluated in the chosen sector, it may prove difficult to generalise the results on a wider selection of areas. Thus, to develop a common framework for the appropriation of proactive services a more wide-scale study that comprises various sectors needs to be conducted.

Our future work focuses on understanding how a wide range of countries (Digital 7 (D7) – South Korea, Israel, Estonia, United Kingdom, New Zealand, Canada, and Uruguay) conduct or plan proactive services based on life events. To this effect, we will be able to design and appropriate effective proactive services to have a wider effect and scope.

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Appendix 7 – Associated paper 4

Publication IV

Kõrge, H., Erlenheim, R. and Draheim, D. (2019). Designing Proactive Business Event Services: A Case Study of the Estonian Company Registration Portal, [Will be presented at EGOV2019 – Joint conference EGOV – CeDem – ePart 2019, San Benedetto Del Tronto, Italy, September 2019]

Designing Proactive Business Event Services

A Case Study of the Estonian Company Registration Portal

Helena Kõrge[1], Regina Erlenheim[2], and Dirk Draheim[3][0000−0003−3376−7489]

[1] Department of Information Society Services Development
Ministry of Economics and Communication
Suur-Ameerika 1, 10122 Tallinn, Estonia
helena.korge@mkm.ee
[2] Software Science Department
Tallinn University of Technology
Akadeemia tee 15a, 12618 Tallinn, Estonia
regina.erlenheim@taltech.ee
[3] Information Systems Group
Tallinn University of Technology
Akadeemia tee 15a, 12618 Tallinn, Estonia
dirk.draheim@taltech.ee

Abstract. In the last decade, effectiveness, efficiency and quality have been main objectives in the transformation of government services. Citizen orientation can be seen as the crucial driver behind these objectives. A contemporary theme in all of this is about proactive services. Proactive services switch the service delivery from reactive to proactive, thereby, promising a yet unforeseen level of quality. In this paper, we ask how to successfully design proactive business event services in the Estonian company registration portal. We investigate current problems of this e-service as encountered by Estonian entrepreneurs. We conduct qualitative interviews with experts from the government and micro-business owners that use the registration portal. Based on the findings, we give a set of recommendations for designing proactive business event services in the public sector.

Keywords: e-government, proactive services, life events, service design

1 Introduction

All major life and business events, such as acquiring education, getting a job, starting a family, or starting a company, demand for interactions with the government via various separately developed services that are provided by different state agencies or local governments. Thus, the citizen needs to communicate with multiple authorities and needs to visit various web-portals to get things done. Due to the overall demand for government services to become more efficient and customer-oriented, countries with more advanced e-governments such

as Estonia [1], New Zealand [2–4], and Taiwan [5–7] have started to look into providing *proactive services* based on and triggered by life and business events. A proactive service groups together several services related to the same life event or business event, so that, for the service user, they appear as a single service that ideally functions automatically or with a minimum of interaction.

Proactive services are a contemporary topic in e-government service provision. As early as in 2011, the *e-Government Program of Taiwan 2011-2016* [5] contains proactive services as a strategic element:

> *"Proactive One-stop Service: We are simplifying service processes and integrating interagency services from a life cycle and overall service perspective, which let us provide the public with one-stop end-to-end government services."* [5] (1)

In Estonia, the notion of proactive service entered regulations. Since May 2017, it appears in regulation no. 88 (Principles for Managing Services and Governing Information) as follows:

> *"§2(3) Proactive services are the direct public services provided by an authority on its own initiative in accordance with the presumed will of persons and based on the data in the databases belonging to the state information system. Proactive services are provided automatically or with the consent of a person."* [8] (2)

Despite all of this, only a few studies exist on the subject; and theories on proactive services are emerging only recently. In this paper, we aim at determining the necessary requirements for successfully designing proactive business event services. Estonia strategically aims at developing proactive services, compare with [8, 1]. One behalf of this, it is planned to renew the already existing *company registration portal* (CRP) by 2025. An objective of our research is to support the designers of the new CRP services, so that the new CRP would adhere better to the needs of the users. We claim that many of the findings are of general nature, so that they can be useful also for other countries that want to develop proactive services.

We target the following *overall* research question:

- How to design proactive business event services for the new Estonian company registration portal?

In service of the *overall* research question, we aim at answering the following *auxiliary* research questions:

- What requirements should proactive business event services meet?
- What features stakeholders expect from the future service?

For the purpose of this research, we have conducted in-depth semi-structured interviews with experts from the four public agencies that are involved as stakeholders in the renewal of the company registration portal, i.e., the *Ministry of*

Finance (MoF), the *Ministry of Economics and Communications* (MoEC), the *Ministry of Justice* (MoJ), the *Centre of Registers and Information Systems* (CRIS) and, furthermore, with three owners of micro businesses who use the company registration portal.

We start with a discussion of related work in Sect. 2. In Sect. 3, we provide an overview of the Estonian company registration portal. In Sect. 4, we aim at answering the *auxiliary* research questions. In Sect. 5, we aim at answering the *overall* research question. We briefly discuss future research directions in Sect. 6 and finish with a conclusion in Sect. 7.

2 Related Work

In the emerging notion of *proactive service*, two established concepts of e-government service design are amalgamated, i.e., the concept of *life/business events* and the concept of *proactivity*. Estonian regulations distinguish between *proactive services* and *event services*, where the concept of *event service* is used to gather certain aspects of proactive services, compare also with (2), as follows:

> *"§2(4) Event services are the direct public services provided jointly by several authorities so that a person would be able to perform all the obligations and exercise all the rights conferred on the person due to an event or situation. An event service compiles several services (hereinafter component service) related to the same event into a single service for the user."* [8] (3)

Henceforth, we rather do not want to use the term *event service* and want to speak about *proactive services* only. However, we still want to talk about *proactive business event services* as opposed to *proactive life event services*. Also, our interviewees use the term *event service*.

Wimmer [9] and Wimmer and Tambours [10] explain *life events* or *life episodes* as an important service design metaphor that helps to increase citizen orientation of e-government services. The events in this metaphor include not only "human" life events but also *business events* that are also called *business situations* in [9, 10]. The orientation towards life/business events is a convenient requirement elicitation tools for e-services, but not only; beyond that, it provides a metaphor for structuring e-services portals. Orientation towards life/business events is an essential ingredient of proactive service design [6, 7, 11–14].

In [15], Vintar and Leben report on the prototypical implementation of a life-event portal for the Republic of Slovenia. The quality of the Slovenian life-event portal has also been analyzed by Vintar et al. [16], compare also with [17].

The case study of e-government in Singapore [18] by Srivastava and Teo reveals that proactive provision of information is a main factor in increasing citizens' trust in e-government services.

For Dunleavy et al. [19] pro-activity is part of transcending *new public management*. Here, proactivity is about anticipating citizens' needs, e.g., "*using feasible algorithms, agencies can then proactively try to match their services to meet citizens' needs or the key risks to policy*"[19]. In [20], Linders identifies

"*proactive information dissemination*" [20] as a key ingredient in moving from a stage of customer-to-government (C2G), or "*citizen sourcing*" [20], to a stage of government-to-customer, or "*government as platform*" [20].

Linders, Liao and Wang [6, 7] explain that proactive services are about transforming e-service delivery from a *pull to push* model. They identify administrative effectiveness and efficiency, quality of e-services and, on behalf of this, quality of life for citizens as the objectives for introducing proactive services. They report on three cases of e-government initiatives in Taiwan: (i) the so-called *e-housekeeper* initiative, an integrated messaging platform of the government agencies, (ii) the proactive citizen hotline of the city of Taipei [21], and (iii) a pilot program in decreasing digital divide.

In [11, 12], Sirendi and Taveter conduct a concept study on proactive service design, including a prototypical implementation, for the family benefits system of the *Estonian National Social Insurance Board*. A main objective of the proactive service design in [11, 12] is user centricity as a key rationale of service design [22–25]. In [13], Sirendi et al. analyze two concrete e-government services with respect to current shortcomings and their potential for proactive service design. The first is about providing services for parents of disabled children in the Estonian e-services portal[4]; the second is the Australian mobile web-application *Ask Izzy*[5] that provides services and support for the homeless. On the basis of this analysis, guidelines for introducing proactive e-services are created.

Schuppan and Köhl [14] consider research in proactive services (*proactive government*) in [14], as relevant for meeting citizens' expectations towards e-government services and e-government service portals.

3 The Estonian Company Registration Portal

Estonia is strong in providing public e-services for businesses. Almost everything can be done online – quick and easy – starting a business, declaring taxes, changing data etc.[6] However, the provision of business services is decentralized and distributed over multiple agencies and portals. In order to fulfill all of their legal duties, business owners need to move between several platforms and registries, each with a different design and requirements. One of the most used platforms is the company registration portal of the *Centre of Registers and Information Systems* (CRIS), that provides a secure and convenient platform for entrepreneurs to start a business, submit documents and change information to the e-business register. The system holds information on all legal persons registered in Estonia. It allows private persons to start a company and legal persons to establish new enterprises. All Estonian citizens can log into the CRP with their ID-cards or mobile IDs and, soon, also with smart IDs[7]. The CRP is available since 2007;

[4] www.eesti.ee
[5] https://askizzy.org.au/
[6] https://e-estonia.com/
[7] As of May 2019, there are around 127.600 active enterprises and 9.500 apartment associations in Estonia.

but it is not required to use the CRP for starting a company, i.e., it is still possible to do this the conventional way via a notary; although, this is much more expensive and time- consuming (it takes around five days to set up a company instead of two hours).[8]

Figure 1 shows the current, rather simple process of establishing a private limited company – the most common type of business in Estonia. Upon entering the portal, the user needs to start an application for registering a new enterprise. He needs to specify its type (private limited company, sole proprietorship, limited partnership, general partnership, or non-profit). Then, the user needs to provide additional information such as the name of the business, its statute, persons involved, or the main area of activity. The application must be signed digitally, and state fee needs to be paid electronically. Upon that, an entry into the business register is made.

However, the overall process is not as simple as it appears on first sight – and this deserves some remarks. In addition to the CRP registration, companies need to fulfill more obligations with respect to other agencies and portals such as registering in the e-taxation portal, getting a VAT number or registering their employees. If the area of business is subject to specific regulations as, e.g., in the construction industry or the food industry, a business need to submit also a notice or needs to apply for a license in the *register of economic activities*. Furthermore, registering a company in the CRP is only possible if all the persons that have been involved in its establishment (members of the management board, founders etc.) are able to digitally sign the establishing application and the respective documents – otherwise, the registration has to be done with the notary.

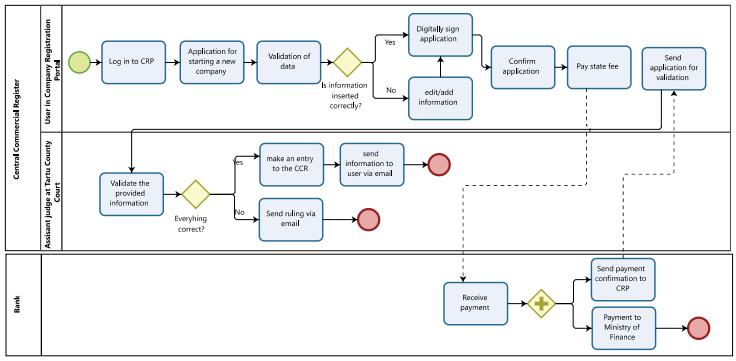

Fig. 1. *As-is* model of starting a company in the Estonian company registration portal.

[8] https://www.rik.ee/en/international/e-business-register

4 Results

We have conducted in-depth semi-structured interviews with the Estonian deputy governmental CIO from the *Ministry of Economics and Communications* (MoEC), a project manager from the *Ministry of Finance* (MoF), an e-governance team leader from the *Centre of Registers and Information Systems* (CRIS), and a further expert from the *Ministry of Justice* (MoJ). Furthermore, we conducted three additional interviews with owners of micro businesses who use the CRP, in order to understand the needs and expectations of one of its main target groups. The interviews have been conducted in November 2018. All but one interview have been conducted one-on-one, face-to-face. One interview has been conducted via email. All interviews have been conducted in Estonian to simplify communication and to avoid translation errors. Afterwards, the interviews have been transcribed and translated.

We analyzed the interviews with respect to five areas: (i) the state of business service provision, (ii) the functionality of the CRP, (iii) event-based service provision, (iv) level of bureaucracy and (v) barriers to further improvements.

One of the main issues confirmed by all interviewees is that services are distributed over multiple agencies and platforms, which makes the service provision less user-friendly for entrepreneurs. The interviewee from the MoF claimed that, due to the many websites, entrepreneurs can easily get confused about where to find the desired information: "*The main problem is that services are dispersed and that is not user-friendly. The entrepreneur has to orientate himself in different websites and sometimes does not even know where to go or does not know all his obligations.*"

A few interviewees brought out that the CRP works pretty well, but that it is old. The interviewee from the MoEC was rather critical and claimed that the portal is outdated: "*It is not great – according to today's standards. It was built in 2008 or something. It is old and can become much better. But it is going to be great, they are moving towards it.*"

With respect to event-based logic, the interviewees seemed to have a good idea of what can be achieved with this. The interviewee from the CRIS explained how event-based service provision can help to offer personalized services: "*The idea is that the environment is so clever that it can provide services that are important to that company. For example, I am interested in Harju county or enterprises with more than a million Euro turnover. With these indicators, we can provide a very personalized approach to utilizing all the information in order to gauge the best contact and relevance to the business.*"

Then, we asked the entrepreneurs about the level of bureaucracy. In general, the interviewees do not feel that the state asks too much information. At the same time, since proactive service provision has not been discussed widely, people generally do not know how things could be done differently. However, two interviewees mentioned that both of them have already forgotten some deadline, which indicates that the notification system could be improved.

With respect to barriers to the introduction of proactively, three project members mentioned the importance of data security. This indicates that it needs

extra attention on that. One project member mentioned that a similar in the past project suffered organizational issues such as lack of clear communication. This should be kept in mind for any project that aims at introducing proactive services. The interviewee from the MoE stated: "*The Data Protection Inspectorate (DPI) is the key player in creating event services. Things need to be talked through on how to do thing. Data protection must be in the focus.*"

Not all characteristics of good service design [22–25] have been implemented in the CRP. There is need for a change. However, the issues can be fixed by providing proactive event-based services. As a conclusion, we summarize benefits of implementing proactive business event in Table 1.

Table 1. Benefits of implementing proactive business event services.

Benefit	*Explanation*
Improved business environment	Proactive and automated services allow entrepreneurs to focus and to invest more time and effort into their core competencies, i.e., freeing them from dealing with administrative obligations.
Better user experience	A precondition of proactive event-based service provision is better cooperation of state agencies and their information systems. Better interoperability of state information systems [26, 27] allows for designing a convenient one-stop-shop service.
Once-only principle [28, 29]	Duplication of data is reduced. Entrepreneurs do not have to submit the same data several times, as cross-usage of data increases.
Better data quality	Since state agencies automatically gather data from companies, the change also increases the data quality. This enables policy makers to make decisions based on more accurate data. Anonymous data should be shared with them as well, so that entrepreneurs can also benefit from this.
Increased awareness of service provision	Information and services can be found in a single place which makes life easier for all associations.
Better overview of companies	Since all the information is in a single place, entrepreneurs have a better overview of the current status of their company.

Table 1 lists the benefits of proactive services with respect to service quality. There might be some further, more indirect benefits on behalf of the improved service quality. First, the convenient and simple business environment could attract more people to become entrepreneurs. Second, it is advantageous for the reputation of Estonia: using an innovative approach such as proactive services is in line with Estonia's standing as a leading-edge IT-country. Furthermore, the resulting simpler business environment could attract foreign capital and more e-residents [30, 31].

5 Recommendations

When it comes to the introduction of proactive e-services, it is important that all stakeholders interact with each other throughout the project to gain a mutual understanding of their needs. For a proactive business event service, in order to be effective, a single sign-on authentication process should be used. Furthermore, the *once-only principle* (TOOP) [28, 29] should be followed. All technical aspects take considerable time; that is why it is recommended to tackle these issues early. At the same time, it is important to keep data security in mind, which plays a large role in creating interactive portals. It is advised to involve a data security officer early. The portal should have a scalable design so that new features can be easily integrated. Furthermore, it is advised to have a state-wide agreement that clarifies which services are grouped under which event. This enables easier communication between the involved state agencies and enables a clear schema for users. A similar agreement should be used for the *triggering points* of proactivity. With respect to this, is also advised to divide business services into three categories: (i) services that are provided automatically, (ii) services that allow for opting out, and (iii) services that require to opt in. If the state could divide all services into such categories in its regulations, the implementation of proactive services would become much smoother.

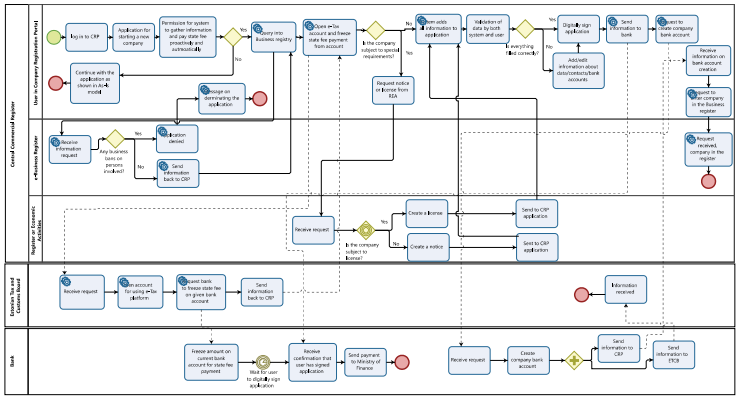

Fig. 2. *To-be* model for starting a company in the Estonian company registration portal.

Figure 2 proposes a *to-be* process model of starting a company in the CRP, compare also with the *as-is* process in Fig. 1. As the first step, the user needs to provide basic information (company name, area of activity etc.). Then, the system asks whether it may gather information from other state databases. If

not, the user can proceed with the application as shown in the *as-is* process in Fig. 1. Such opt-out from proactive service provision is important – at least if the system is in its early phases. In case that a foreigner wants to start a company, such opt-out is essential. Otherwise, i.e., it the user agrees, the system queries multiple other databases and registries. The system checks whether any company stakeholders have any business bans. If not, the system automatically makes a request to the *Estonian Tax and Customs Board*'s (ETCB) system to open an e-taxation account and freeze state fee payment from the bank account provided to the ETCB. The payment will not be made immediately, i.e., not before the user digitally signs the application. As the next step, the system checks whether the company operates in a field that is subject to special requirements and must be registered in the *Register of Economic Activities* (REA). If so, it provides a possibility for making the necessary amendments. The system moves on to a validation and, possibly, correction of the data. Then, the system asks the user to digitally sign. Then, the system sends a notification to the bank to unfreeze the state fee. Then, it sends another request to create a company bank account. After the company bank account is created, the system sends a request to the e-business register for entering a new company. Here, it is necessary to agree with the private sector, i.e., the banks, to keep the system as functional as possible.

6 Future Directions

Proactive services have been described as a paradigm shift *from pull to push*. A closer look reveals that this is a slightly odd metaphor. In established portals, the citizen pulls the service from the government, whereas, with proactive services, the government pushes the service to the citizen. But, in that narrative, a change of perspective happens, i.e., from the citizen to the government. If the story is told, consistently, from the citizen's perspective, the essence of the proactive service paradigm should be coined as *from pull to pushed*. Of course, *from pull to pushed* does not sound so nice any more. But that is exactly the point: What we see, based on previous experience [32], is, that we should care to consider the user not merely as a *consumer/customer*, but also as a *citizen*. There is a need for deep and discoursive [33] research of user adoption of proactive services. In user adoption studies it can easily happen that we are biased in favor of project success, i.e., we consider user concerns as critical for the project but sometimes stop in analyzing the concerns *behind* the concerns [34].

As a concrete next step in this direction, we will conduct a survey[9] on the impact of digital initiatives. We are interested, in how much and in what respect digital transformation will impact our societies, governments, economies, and daily lives and work. Among other recent digital initiatives, we will ask this, in particular, with respect to proactive services, including emerging topics such as smart business processes [35–37] and automatic decision making (ranging from basic administrative tasks to automatic court case decisions).

[9] together with Capgemini Germany (Business & Technology Solutions Public Sector), Mitshubishi UFJ (Research & Consulting)

7 Conclusion

In this paper, we investigated the current situation in business e-service provision in the Estonian company registration portal, in order to be able to understand the requirements for designing proactive business event services. The current situation shows direct negative factors such as a high level of bureaucracy and little user-centricity. Seven interviews with stakeholders have been conducted to learn about these issues, i.e., with four members of government authorities plus three micro business owners, who are considered as main beneficiaries of the system. The interviewees provided relevant feedback on stakeholders' needs and for requirements of future proactive services.

Life events are an established metaphor that helps to increase the citizen orientation of e-government services and portals. As such, they are not about triggering services. It can be said, that only with proactive services, life events become *live*. Proactivity is an established e-government best practice in the design of government information portals. Only with proactive services, proactivity is used transactional – beyond mere dissemination of information. Therefore, it can be said, that only with proactive services, proactivity becomes *active*.

Proactive services have been characterized as paradigm shift from *pull to push*, however, actually, from the citizens' perspective, it is a paradigm shift form *pull to pushed*. Therefore, further research is needed in user adoption of proactive services. This research needs to be deep and discoursive, in particular, we must take care that the user is not only considered as a *consumer* in such research, but also as a *citizen*.

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Appendix 8 – Associated paper 5

Publication V

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Designing Effective Chatbot Solutions for the Public Sector: a Case Study from Ukraine

Yulia Petriv, Regina Erlenheim, Valentyna Tsap(✉), Ingrid Pappel, Dirk Draheim

Information Systems Group
Tallinn University of Technology
Akadeemia tee 15A, 12619 Tallinn, Estonia
{yulia.petriv,regina.erlenheim,valentyna.tsap,
ingrid.pappel,dirk.draheim}@taltech.ee

Abstract. The goal of this paper is to identify the concerns of various stakeholders as well as limitations and enablers that affect the design of chatbots in the public sector. We are looking into a case from Ukraine, the LvivCityHelper bot solution, and describe the surrounding conditions and factors that determine the chatbot performance. The outcomes of the study are based on a comprehensive analysis of the state of the art and twelve interviews with experts who are involved in the LvivCityHelper bot project. The derived data is then exhibited as an exhaustive interpretation of stakeholders' concerns on various aspects of chatbot application in public e-services. The key findings from the interviews are compared with existing work, and inclusive and exclusive crucial factors in effective chatbot services are defined. Finally, we provide suggestions and recommendations on how to fill the detected gaps that may improve the design, implementation and functioning of chatbot solutions that serve citizens' needs.

Keywords: chatbot, e-services, service design, participation.

1 Introduction

Democratic societies are shaped by interactions between citizens and governments. Traditionally, the role of citizens has been quite passive, and citizen's primary activity was mainly limited to participation in elections. In recent years, however, modern democracies have started to recognize the importance of active engagement of citizens in decision-making processes. Enhanced civic engagement relies on information and collaboration, therefore, governments should aim to ensure that citizens are enabled with means to enhance their participation [16]. Two-way communication is equally important in public service design. Engaging citizens in co-production of public services helps to achieve effectiveness and build citizen satisfaction by increasing trust and developing a sense of "ownership" of the provided services [21].

In the Ukrainian society, the lack of an effective two-way communication between government and citizens leads to growing mistrust and dissatisfaction. Public authorities tend to operate in organizational silos, and slowly respond to the needs of

citizens with regards to openness and transparency. Negative experiences of citizens and businesses in Ukraine with the government as a service provider may shape a negative opinion on its credibility and capability to deliver quality public services [14]. To prevent this, we suggest that the Ukrainian government should look into the adoption of new tools to inform and engage citizens in decision-making processes, including those related to public service design.

One possible solution to enhance communication between citizens and government is to use chatbots as an additional channel of communication. Chatbots are conversational agents that are designed to simulate a human-like conversation with a user on a certain domain or topic using natural language [34]. Chatbots became a popular communication tool in the public sector due to the development of natural language processing (NLP) that improved the quality of conversations, rise in use of messaging applications and also due to a growing demand for a better customer service [17].

Chatbots have many potential benefits for governments, as they allow for better service discovery and information and save manpower expenses by delivering service 24/7 [9]. Chatbots also encourage public participation by collecting feedback from citizens. This feedback can be later used for decision-making purposes as evidence of citizen's needs. Chatbots allow to fully utilize the potential of open data. Citizens will be encouraged to utilize chatbot as a tool to extract particular knowledge from open data and react to it in a form of feedback.

At the same time, public authorities have to understand that chatbots are designed to cater to the needs of a specific group of people in a specific organization [34]. This means that when designing a chatbot for public service one needs to prioritize stakeholders and their needs over the technology.

The LvivCityHelper bot solutions serves as a unique case worth investigating. Current developments in Ukraine create a setting where implementation of such innovation is influenced by a combination of political, economic, technological and societal factors. Morever, due to the relative novelty of chatbot solutions in public sector, especially in Ukraine, it is a notable opportunity of learn lessons from one of the country pioneer projects applying this technology.

Therefore, within this research, we aim to determine what the concerns of stakeholders are as well as what the major limitations in and enablers of the chatbot development in public sector are. We will also distinguish the most significant factors affecting chatbot design. Moreover, having provided the outcomes of our analysis, we will suggest our vision on the future of these solutions.

In Section 2, we delve into the state of the art. In Section 3 we explain our research methodology. In Section 4, we describe the case of the LvivCityHelper chatbot solution. In Section 5, we present our analysis of the interview outcomes. We proceed with a discussion of the main results in Section 6 and finish with a conclusion in Section 7.

2 State of the Art

This section provides an overview of the state of the art in the field of chatbot solutions application in public sector.

Recent advancements in Artificial Intelligence and Machine Learning and increased digital presence of governmental institutions introduce new possibilities to use of chatbots in public sector. In [15], five use cases of chatbots in public sector were identified: answering requests (e.g. responding to frequently asked questions), filling out and searching documents (e.g. filling out petitions and appeals), routing requests (e.g. classifying request and forwarding person to right office), translation (e.g. real-time translation of public information) and drafting documents (e.g. using Natural Language Generation AI to draft documents based on data).

Adroutsopoulou et al. (2019) suggested that advanced intelligent chatbots powered by natural language processing, machine learning and data mining technologies should be used as a "new "richer" and more intelligent digital channel of communication between citizens and government" [2].

Implementation of chatbots in public sector faces a number of challenges, stemming from nature of public sector and from technology itself [6]. The first challenge is that public service is restricted by existing legislation when it comes to regulating the status of public employees. The automation brought by AI-powered chatbot may lead to restructuring or eliminating some processed that are usually executed by certain categories of officials - this means that officials themselves may potentially become reluctant to support this technology. Legislation also affects availability of data. Public sector is limited by privacy legislation in its work, and often cannot use data from private sources [7]. This limits the possibilities of chatbot development. Another issue is accountability. Data analysis can serve as a basis of evidence-based decision making in public field. This may cause an effect in political processes on different levels. Therefore, political will (or rather unwillingness) of public sector officials may appear as an obstacle. The last challenge is equal service provision. This requires the chatbot design to take into account factors like a) digital divide b) interests and needs of various categories of citizens c) neutrality of developers of AI systems to prevent bias [7].

The technological factors affecting introduction of chatbots are predominantly related to data quality, management, availability and intake [7]. Relevant data needs to be available at all times, effectively structured, integrated and updated. Updates are essential due to technological advancements and changing platform-specific requirements (e.g. changes in privacy and data protection policies). This also applies to IT infrastructure being updated [7]. Digital divide also affects the adoption of chatbots, as lack of technical skills, lack of access to high-speed internet connection and smartphones will chatbot acceptance, particularly, in the field of finance or those that deal with sharing their personal information, as research suggests [19, 33].

2.1 Factors Affecting the Introduction of Chatbots in the Public Sector in Ukraine

Legislation on Public Service and e-Service Development. In an effort to improve state of public service provision, Ukrainian government defined priority services to be digitized listed in the Decree on adoption of Concept of development of system of electronic services in Ukraine [8]. The Concept includes a three-stage implementation process aiming to develop an effective system of electronic services in Ukraine to satisfy the interests of physical persons and legal entities though development and support of transparent, accessible, secure, anti-corruption, least expensive, fast and convenient electronic services [8]. Neither this Concept nor other Ukrainian legislation mention notion of proactive or invisible services - services initiated by the state itself rather than by the citizen. Government also does not have any set guidelines on online communication and digital presence. This means that although various institutions might be represented in social media (usually Facebook and Twitter), they are not seen as official channels and are not obliged to follow unified rules on information provision for citizens.

The Law on Electronic Trust Services in Ukraine provides a simplified definition of electronic service or e-service as any service provided through information communication system. This definition includes any administrative or other public services provided to physical persons or legal entities in digital form. This means that e-services in Ukraine are often focused on service delivery, not taking into account service mediation - that is, there is a larger focus to achieve the overall goal of providing a service rather than improve the quality of technology that allows to mediate this service. Additionally, although the number of public e-services in Ukraine is constantly growing in recent years, these services largely rely on existing outdated business processes and paper-based interactions. This means that despite the efforts new e-services will continue to carry administrative burden and be subject to corruption [29].

Ukraine also lacks legislation with regards to public digital registers as the draft of respective law is still being under parliamentary review [32]. This creates an obstacle for effective use of state data and for designing integrated e-services based on them [30]. Lack of interoperability between registries negatively affects quality of data that chatbot uses to respond to citizens. In addition, lack of policy with regards to communication of public authorities with citizens using digital channels, means that public authorities might be discouraged from integrating chatbots to their official social media accounts.

A unified state portal of administrative services in Ukraine that provides a list of services available for citizens and businesses. At the same time still remains limited, and majority of these services only provide information about the service rather than allow user of this service to digitally identify itself in order to receive service fully online. This is due to the fact that majority of e-services in Ukraine still remain at first or second level according to the maturity model defined in the Concept mentioned above [29].

With regards to introduction of chatbots in public sector in Ukraine, legislative barriers will serve as limitations to integration of chatbots since many services are not

digitized. An improved legislation and sharing the best practices with regards to policy on e-services between various countries and organizations could increase trust in technology and serve as a prerequisite for wider adoption of new technology, like chatbots, in public sector [4].

Social and cultural barriers. Culture shapes perception of desirability and value of services due to its influence on citizen's attitude towards others and society [13]. Based on Hofstede's approach, Ukraine remains a centralized country, in which there is an acceptance of unequal distribution of power [10]. This means that organizations tend to follow a strict hierarchy, and political willingness will be one of the key factors to affect development and implementation of new technology like chatbots. As members of a feminine society, Ukrainians tend to stand out less from the crowd and highly value caring for others. Therefore, new e-services are often evaluated on a basis of their value to a society as a whole, rather than on their profitability [13]. An example of such value-centricity over profitability is that Ukrainian government has prioritized many social services as the first services to be digitized in the Concept of development of system of electronic services in Ukraine mentioned before [8]. Therefore, authors presume that chatbot value in public sector may also be evaluated against its societal value. Tendency to avoid uncertainty affects development of public e-services in Ukraine due to high reliance on detailed planning [10]. Business processes in public organizations tend to be restrained by regulations, as it was already mentioned before. Lack of flexibility may negatively affect service design process of chatbot that relies on iteration, co-production and user-centricity. As a collectivist society, Ukrainians rely on relationships when obtaining information or engaging negotiations. This follows that public authorities in Ukraine must establish a trustful and authentic communication style to motivate citizens to use new technology like chatbot (Ibid.).

Lack of trust to public authority is also among factors that negatively affect e-participation process [20]. In Ukraine, state institutions have the lowest level of trust among other institutions (-63% in 2018), which negatively affects perception of trustworthiness of chatbot as a service [12]. A survey about attitudes of Ukrainians to e-services has shown that 79,3% of respondents do not know about existence of public e-services, and only 29% of respondents trust e-services, whereas majority (64%) remains skeptical about their use [31]. This means that chatbots in public sector in Ukraine may not be considered trustworthy by citizens, which would negatively affect their use and development.

Technology and infrastructure barriers. Technological advancements affect public sector and urge them to adapt to respond to the needs of citizens. Ukraine remains behind European countries when it comes to digital skills. For example, according to Google Consumer Barometer survey (2018), only 66% of Ukrainians had access to Internet (48% of which daily), whereas in Estonia this number is 82% and 72% respectively. At the same time, the data is not true for all categories of Ukrainians. Among younger generation (under 25), 98% have Internet access, and 89% access Internet daily.

Development of e-government services in Ukraine faces a number of technical and infrastructural obstacles according to expert survey conducted by [5]. The experts noted insufficient financing, lack of IT qualifications among public employees, inconsistency in information systems and low computer literacy of citizens among the problems among the negative factors. Additionally, organizational silos and lack of interoperability as well as outdated data infrastructure has been marked as the most common barriers with regards to adoption of new e-services.

Chatbot development and use in public sector is largely affected by technical infrastructure in place and digital skills of both citizens and public officials [18]. Familiarity with the technology affects trust and encourages use [1]. Ukrainian government must invest in both technical infrastructure (to ensure availability of fast-speed Internet in certain areas, availability of computers and other technology in public libraries and recreational areas that can be accessed by citizens) and digital skills training (to ensure that citizens and public officials know how to use technology) to increase quality of e-services and ensure trust among various groups of citizens [5].

2.2 Application of Chatbots in Ukraine

Despite those factors negatively affecting the development of e-services in Ukraine, there have been a few examples of successful introduction of chatbots in public sector. The most famous example is Opendatabot that currently has over 300 000 users (as of December 2018), with 40 000 daily requests in chatbots [24]. Opendatabot uses open data to monitor changes in registry of Ukrainian companies and changes in judicial registry. It is available on four platforms: Skype, Telegram, Facebook Messenger and Viber, and offers free and paid accounts options with different level of access to various services. The founder of Opendatabot has stressed on the importance of collaboration with government with regards to open data: "Public authorities do not publish data on time, this data is often unstructured, is in a wrong format, etc. We all have to collaborate with state at all times" [11]. Opendatabot provides an example of successful implementation of chatbot that uses open data due to its popularity among people. The author believes that popularity of service is closely linked to overall desire for increased transparency and openness of government in Ukraine, and convenience of chatbot due to its availability on many messaging platforms has encouraged many citizens to use chatbot as the preferred tool to access open data.

Another popular chatbot in Ukraine is RailwayBot that allows users to monitor tickets, check schedule and even purchase tickets of national railway transportation company - Ukrzaliznytsia (Укрзалізниця). The chatbot is available on Facebook Messenger and Telegram. At the moment, RailwayBot team received investment from Ukrzaliznytsia to integrate chatbot with other services and improve its functionality. The author believes that popularity of RailwayBot is attributed to its convenience as compared to the official website of Ukrzaliznytsia. The chatbot allows monitoring of tickets, which eliminates the need to manually check if the new tickets have appeared in the system [28].

We believe that successful examples of chatbot implementation in public sector in Ukraine serve as a precedent for a wider use of chatbots. Citizens perceive chatbots as

a convenient tool to interact with government or state-owned enterprise. It can be also assumed, that despite the limitations described in the previous chapters, citizens are encouraged to use chatbots as they seem to better address their needs.

3 Methodology

We use a single case-study method to conduct research. 12 semi-structured interviews were conducted. We have selected interviewees with a variety of backgrounds in order to achieve depth and comprehensiveness of outcomes to address our research objectives. Such backgrounds included public sector representatives (both public officials and NGO members directly cooperating with public authorities), members of the LvivCityHelper bot team, and private sector representatives. The interviews took place in March 2019. All interviews were conducted face-to-face. The language of interviews was Ukrainian, except one that was conducted in Russian. Interviews were recorded and later transcribed into text and translated into English prior to further analysis. Interviewees were provided with the copy of transcripts in order to correct, clarify or expand particular answers, and thus ensure the validity of the study [26]. Section 5 will provide more details on the positions of interviewed experts.

The interviews were first analyzed using quasi-statistical approaches. Quasi-statistical methods are similar to quantitative methods and help identify macro topics. These methods have been used to analyze stakeholder's concerns [25]. According to Runeson and Höst (2009), editing approaches "include few a priori codes, i.e. codes are defined based on findings of the researcher during the analysis" [27]. These approaches allowed to look into detail of the biggest concerns of stakeholders as they help to understand them semantically. This analysis reflected on important remarks according to each stakeholder's group.

Interviews were analyzed using Nvivo 12. This allowed organizing interviewees' responses for better comparison and categorization in thematic analysis) [3]. Simultaneously, the limitations of the software product still required a manual data interpretation to better understand patterns in interviewees' responses.

4 The Case of LvivCityHelper Bot

This section provides an overview of the case study of LvivCityHelper bot with an emphasis on formulating main problems the project faced during its introduction and current development. The case study was chosen because chatbot is a relatively new service and current scientific literature mostly focuses on technical side of the technology. There is a need for a comprehensive research on practical cases, particularly with regards to the application of chatbots in the field of public sector.

4.1 Overview of the Project

In 2018, a second Open Data Challenge organized as a part of USAID/UK project "Transparency and Accountability in Public Administration and Services" with support from State Agency for E-government in Ukraine and in partnership with Eastern Europe Fund and 1991 Open Data Incubator.

20 projects were selected as finalists to participate in a 2-months accelerator program [23]. Among the winners was LvivCityHelper bot - a fast and easy-to-understand solution to obtain publicly available data of the city of Lviv.

The project team declared the mission of LvivCityHelper as "making finding information from Lviv City Council just as fast and easy, as it would be from a colleague or a friend" [22].

The project was presented to the general public and became available for testing on September 12, 2018 [36]. Initially, the chatbot was only available in Telegram, but, as of February 2019, the chatbot is also available for Facebook users [36].

At the moment, LvivCityHelper bot project team consists of 3-5 full-time employees (some developers are engaged in the project on part-time basis) of Lviv Communal Enterprise "Center of Information Technology of the City. LCE CCIT is also responsible for Lviv Open Data Portal that contains information from different departments and offices of Lviv City Council and other institutions of Lviv in an open data format. Altogether LCE CCIT collaborates with 105 data owners and categorizes data into 18 different groups, from budget to healthcare [35]. Chatbot uses data from Open Data Portal to answer citizen's requests, and some of the chatbot team members are also actively engaged in work of Open Data Portal. As a communal enterprise, LCE CCIT has established communication with data owners that provide data to Open Data Portal; this ensures the availability and the quality of data that is used by chatbot.

In an interview of the project team to 1991 Open Data Incubator, the team explained the motivation behind the project being the lack of understanding how to use Open Data Portal by the general public. The team saw their main task in "designing a convenient way to obtain answers to urgent typical questions".

LvivCityHelper bot's goal is to enable convenient use of open data by Lviv residents and visitors. Currently, four main categories are available according to the official page of LvivCityHelper bot on Facebook and official Telegram channel @LvivCityHelper bot:

a. Infrastructure and its improvement:

   - arrival time of public transportation;
   - transport schedule for various types of transport based on route number;
   - repairs of roads and pavements, educational establishments, playgrounds, buildings and networks based on the street name;
   - maintenance of houses based on a street name and a house number.

b. Education:

   - contact information of kindergartens, schools, and out-of-school establishments based on name of educational establishment;

- information about acceptance to first grade of secondary school based on residence.

c. Permissions. This category allows users to check information from register of conditions and limitations on construction in the city and to check permits for summer terraces based on address. It also provides link to Lviv City hotline Facebook page and to Lviv City Council official website with a form to file an electronic appeal. This is used to simplify complaint process for citizens and enhance their political participation using digital solutions.
d. Structure of Lviv City Council. This category allows to search contact information of various departments and offices in Lviv City Council and its employees based on last name, position, field of work or full name of department.

5 Outcomes of Interview Analysis

This section explains how we interpreted the collected empirical data from the conducted interviews. The accumulated total length of interviews is 6:34:32.

We divide the outcomes in three blocks on the basis of the quasi-statistical approach (see the description in Section 3).

Interviewees were divided into three groups:

- members of LvivCityHelper bot: 1) project manager, deputy director, LCE CCIT; 3) open data analyst, LCE CCIT; software developer, LCE CCIT;
- private sector specialists: 1) managing director/co-founder; 2) project manager; 3) business development manager; 4) node.js developer; 5) founder of Chatbots.Studio;
- public and non-governmental service representatives: 1) head of Smart services and communication bureau of IT office in Lviv City Council; 2) chief specialist of E-governance bureau of IT office in Lviv City Council; 3) project manager of e-Democracy lab of PARD NGO, former member of Public council at SEGA; 4) founder of NGO "Institute of Innovative Governance", Public Information Assistant at UN office in Ukraine.

Three interviews with LvivCityHelper bot team (sector A) were conducted to get a first-hand opinion about limitations and enablers that affected the chatbot development in their public service. Another five interviews were carried out with private sector (sector B) representatives who are directly engaged in chatbot development in various positions. This allowed to get a better understanding of how the chatbot service design process is affected when working with the public sector. Lastly, four interviews were conducted with public and non-governmental sector (sector C) representatives to get a better understanding of limitations and enablers that affect the development of chatbot in the public sector from the public sector perspective. The interview questions were slightly adjusted for each sector to better reflect on their experiences.

Table 1 displays the result of the quasi-statistical approach on stakeholders' concerns using matrix coding query in Nvivo 12. Each node is created based on the interview questions and each number in the cell is divided by the number of column population

(shown in each column name) to compare equally. The number in a cell indicates the number of tim8es stated for the node during the interviews. Hence, it can be seen that the greater the number, the higher the interest of each stakeholder. For better visualization, the result is displayed on a green scale.

Table 1. Result of quasi-statistical approach on stakeholders' concerns.

Node	A : sector:= LvivCityHelper (3)	B : sector:= Private (5)	C : sector:= Public&NG (4)
Effect of technology on decision making	1,7	1,2	3,5
Communication	2	0,6	1,5
Chatbots in Ukraine	/	/	/
Popular chatbots	1	0,8	0,8
Factors affecting the introduction	/	/	/
Technical limitations	2	2,4	1,5
Responsibility and political will	1	0,6	2,3
Marketing and interest of citizens	0,7	1,2	4,5
Local changemakers	0,7	0,6	1,5
Legislation	0,3	1,6	2,3
Finances	1	1	1,3
Digital divide	0,7	0,4	3,5
Decision-making process	0	2,6	0
Data privacy	0,7	1	1
Factors affecting the development of technology	/	/	/
Technical capacity	1,3	1,6	0,3
Teamwork and project planning	3,7	2,8	1
Specifics of platforms used	8	0,8	0
Quality of open data	3,7	1	0,8
Political will	0,3	0,6	0,3
Marketing and UX	7,3	3,2	1
Financial	1	0,2	0,5
Collaboration with other organization	4,3	0,2	1

It is clear from Table 1 that the concerns of each stakeholder are well dispersed. We will further explore significant comments related to the top 3 cells (marked dark-green) for each sector and nodes to classify them as limitations or enablers. Table 2 shows the distinguished concerns that are grouped by sector and node. The last column contains an attribute (i.e. "E" for "enabler"; "L" for "limitation") for each of the concerns.

The qualitative analysis allowed to highlight some of the factors mentioned by interviewees that did not get assigned with a high value, though we found them worth to be noted. The experts have stated that among one of the limitations is an incomplete legislation on data protection and privacy. If the regulation does not define any sanctions if rights or obligations are violated hence there is no sense to adhere to it. Further comment related to the legal field concerns a need for a regulative mechanism similar to GDPR. However, as there is no legislation on data protection on a national level, it also causes low awareness of public on security of data and how their data is handled in general. A technical limitation has been noted since there are difficulties in processing and recognition of Ukrainian natural language. With regards to enablers, an initiative in implementing innovative solutions as chatbots that comes from a few politicians is both beneficial for public who receive value services as well as the former who improve their image and PR. Lastly, volunteers were distinguished as enablers due to their significant help in developing chatbot solutions.

We proceed with interpreting and discussing the findings, its applications, and solutions in the next section.

Table 2. Results of semi-quantitative and semi-qualitative analysis of interviews.

Sector	Node	Item	Type
A	Specifics of platform used	Service expansion	E
		Ease of use	E
		Limited functionality	L
	Marketing & UX	Expansion of market	E
		Lack of evaluation methods	L
	Collaboration with other organizations	No unified format for data sharing	L
		Unsynchronized update of data	L
		Communication issues	L
		Use of open data	E
B	Marketing & UX	Data-driven decision making	E
		No guaranteed user feedback	L
	Teamwork & Project Planning	Human-centered approach	E
		Agile approach	E
		Uncertainty	L
		Public vs. Private sector motivation gap	L
	Decision-making process	Lack of common vision in public sector	L
		Speed	L
		Mere following of trends	L
C	Technology impact on decision-making	Quick problem identification	E
		Complexity	L
		Communication bridge for citizens and	E
		Low trust for new technology	L
	Marketing & citizens interests	Affinity with other services	E
		Low awareness due to early adoption stage	L
		User value	E
	Digital Divide	Growth of internet users	E
		Lack of resources	L
		Low education level	L

6 Results and Discussion

In this section, we are providing an aggregated set of results received from the analysis of theories found in literature and interview. We present the holistic view of these findings dividing them into limitations and enablers. At the same time, we are indicating which of them are inclusive (both mentioned in theories and by practitioners) and exclusive (mentioned either in theories OR by practitioners). The difference between the exclusive enablers and limitations we identify as a gap and suggest potential solutions on filling them.

Starting with limitations, we can see that both sources of evidence include the following: limited accessibility, digital divide, lack of technical skills and education; lack of trust and low awareness; level of infrastructure development; common vision of technology and innovation and their adoption manifested in governmental policies and strategies.

The limitations mentioned only in theories are organizational silos, lack of agility, grasping stakeholder interests, lack of service design thinking, costs, cultural values, lack of data-driven approach. The empirical data suggests such limitations as timely

update of data between multiple organizations; limited user feedback; manual data processing; motivation; lack of effective penalty; weak personal data protection and data privacy; affinity with other services.

With regards to the enablers, the following ones overlapped: service expansion; changemakers, influencers and volunteers; positive perception of innovations and promising user trends; technology acceptance; addressing user needs by offering value-added service; open data initiatives. The enablers exclusively mentioned in theories are the financial advantage; collaborations via public sector; political support. The empirical data suggests autonomous market expansion; human-centered approach; quick problem identification with data-driven decision making; agile approach; increasing number of Internet users.

Having identified the gaps in the exclusive factors, we ascribe the differences foremost to the inherent features of the chatbot solution in the studied case and its specifications. The chatbot technology is still new and its application in public sector is limited. Another aspect which is specifically attributable to our case is legal. The current regulations do not define any effective penalties when it comes to personal data protection and privacy. We have also noticed that theories point out the lack of agility, design thinking, and data-driven approaches, however, in practice, those approaches are taken into consideration. Moreover, some theoretical suggestions as organizational silos, costs, cultural values, and financial advantage are, at least, in the LvivCityHelper bot case, not always of particular importance.

To fill in the gaps outlined, we firstly suggest ensuring a timely update of data across multiple organizations. Creating a central database could address the existing problem. As an alternative or a temporary measure prior to introducing a central database, a notification system on the updates in datasets could be implemented. Therefore, it is recommended to consider of how data flow will operate already at the stage of designing a service. Uniform maintenance of data should also be considered at the design phase.

We then point to the problem of limited user feedback when an answer to a question of why the user has quit the chatbot is being sought. This means that although chatbot is perceived as a two-way communication tool, such two-way interaction is only limited to active interaction. User will always have a right to quit without providing feedback on “why”. From the perspective of stakeholders, it is important to understand why it happened. Therefore, a service cannot be improved accordingly. As a recommendation, chatbot providers should seek alternative ways to receive feedback from users, like surveys or user interviews.

The next issue to address is manual data processing. This means even though theory highly recommends data-driven approach and praises advancement in chatbot technology, chatbot developers still lack effective tools to collect and analyze feedback of users. We are recommending to stay updated on the advancements in the given segment of technology accustoming them to the existing solutions.

Moving forward, attention should be paid to the matter of a careless decision to introduce chatbot. This happens because chatbots are perceived as somewhat of a buzzword. The decision to adopt is rarely based on market research, but rather on the idea of popularity and trend. The interviewees have even indicated that sometimes the

service owner simply disappears and no longer supports the project, as there is lack of responsibility in public sector with regards to results of public service performance. This needs to be avoided to maintain citizens' trust. Therefore, we suggest that information about service owner should be more transparent in order to improve accountability of project.

The fifth finding is difficulty of understanding of concepts interlinked with chatbot. Advance in technology means that regular citizens cannot precisely evaluate the need for and the benefits of chatbot, like data-driven decision making, due to complexity of technology. This makes it difficult for citizens to estimate the value of technology. People might be reluctant to use it, as they would simply not understand it. We suggest that government may consider investing in improving digital skills of citizens and prioritize combating the digital divide. In addition, chatbots should also contain guidelines on their functionality.

The sixth finding is autonomous expansion of the market. If launching a chatbot is backed up with a market research of demands and needs, there is a lesser need for advertisement to gain new users. It is supposed that cost of marketing to increase awareness of users, particularly right after the launch, may be reduced as the number of users will naturally grow.

The last finding is affinity with other services. The introduction of chatbot will help automate and accumulate responses for repeated questions and simultaneously improve the efficiency of other services applying the learned patterns. This may also contribute to cost reduction.

We can conclude that exploring a practical case a LvivCityHelper chatbot solution has contributed several new insights on the possible ways to improve the design and implement such solutions in the public sector. Lessons learned from this particular case study can be of use to the stakeholders of other ongoing and/or future projects. The examined gaps in literature in practice also point to areas worth looking into from the research perspective. It is also important to note the holistic perspective of these limitations and enablers where their sum has a greater impact whereas the effect of each factor in isolation may be lower.

7 Conclusion

As we aimed this research to answer the questions of how to design a chatbot for public service, we have conducted a case study of LvivCityHelper bot. The analysis of existing work and empirical data has helped us illustrating and filling the gaps between practice and theory in terms of limitations and enablers of the development of chatbots based on stakeholders' concerns.

The identified gaps are dependent on the contextual and country-specific factors as well as the inherent features of the implemented chatbots. It is also important to point out again the definitive role of legal framework that facilitates the functioning of these innovative solutions, especially, as we learned, in case of Ukraine.

Having studied the LvivCityHelper bot and its stakeholders' opinions, it was discovered that there is rather a small difference between most aspects of the theory.

Though some previous work points out finances, cultural values as limitation factors, it turned out to be of lesser importance in practice. Stakeholders rather acknowledge the requirement of effective legislation for unified and smooth process for development and provision of chatbot service; complete user feedback; market research; consideration of digital divide effect, etc.

Having condensed the experts' responses, we have extracted seven findings, i.e. features of chatbot in terms of limitations and enablers, which are recommended for further consideration of stakeholders when designing a chatbot in public service.

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Appendix 9 – Associated paper 6

Publication VI

Lemke, F., Taveter, K., Erlenheim, R., Pappel, I., Draheim, D., Janssen, M. (2019). Stage Models for Moving from e-Government to Smart Government, [Will be presented at EGOSE 2019: Electronic Governance and Open Society: Challenges in Eurasia, St. Petersburg, Russia, November 13-15, 2019]

Stage Models for Moving from e-Government to Smart Government

Florian Lemke[1], Kuldar Taveter[2], Regina Erlenheim[3], Ingrid Pappel[4], Dirk Draheim[5], and Marijn Janssen[6]

[1]Capgemini, Business & Technology Solutions – Public Sector, Berlin, Germany
florian.lemke@capgemini.com
[2, 3]Socio-Technical Systems Laboratory, Tallinn University of Technology, Estonia
kuldar.taveter@taltech.ee, regina.erlenheim@taltech.ee
[4, 5]Information Systems Group, Tallinn University of Technology, Estonia
ingrid.pappel@taltech.ee, dirk.draheim@taltech.ee
Technology, Policy and Management Faculty,
Delft University of Technology, The Netherlands
M.F.W.H.A.Janssen@tudelft.nl

Abstract. The emergence of super-applications is a complete game changer in how future governments will deliver e-services and interact with their citizens. With respect to this, the scope of currently established e-government stage models is exhausted. Therefore, this article proposes a "provident stage" as an extension of the Layne and Lee stage model, that adequately addresses the rapid technological development and evolvement of mobile- and smart-government solutions. We argue that super-applications can drive the transformation of e-government towards a yet unforeseen quality level: smart government. This article discusses that transition process, the influence of mobile government solutions in this as well as emerging citizens' expectations for modern government service delivery.

Keywords: stage models, e-government (eGov), smart government (sGov), digital government, super-applications, provident services, WeChat

1 Introduction

The daily use of social networking applications on mobile devices has a major impact on how modern societies are connected. For governments, a new era of public service delivery has begun. Governments adopt super-applications to their current repertoire of channels for service delivery. Meeting the citizens' needs is part of the modern idea of citizen-centric service delivery. By combining modern technologies with government services, a greater acceptance and data-driven, *provident services* will be able to entirely change the role of governments in modern societies. Exploring this new phenomenon will help to gain a better understanding of the transition from e-government (eGov) to smart-government (sGov) due to the use of super-applications.

Due to the involvement of Big Data and data analytics, proactive government decision-making will reach a new stage of eGov maturity.

Due to rapid technological development and change, existing e-government stage models reached their possibilities to illustrate currently emerging maturity levels of e-government. To address this, we suggest extending common stage models by a *provident stage*, based on the widely acknowledged stage model of Layne and Lee [17, 18]. Our suggested extension is based on evidence from a literature review and, furthermore, evidence from a case study of the super-application WeChat, based on data from Tencent Holdings Ltd. and eight personal open interviews – each 1,5 hours – that we have conducted in the PRC (People's Republic of China). The interviewees have been WeChat users, specialists in the R&D sector, software developers in Beijing, and official WeChat project managers in the WeChat headquarters in Guangzhou.

The technological development put forth the topic of mobile government (mGov). Our research addresses the importance, efficiency and effectiveness of non-state developed applications for the acceptance of e-government services. It aims to verify that super-applications strongly push the transition towards sGov and that they can enthuse citizens with using government e-services. In Section 2, we discuss related work regarding the transition from eGov towards sGov. In Section 3, we present the case of the Chinese super-application WeChat that exemplifies this rapid development of mobile government solutions. In Section 4, we discuss the existing stage model by Layne and Lee and introduce and discuss the suggested *provident stage*. We finish the paper with a conclusion in Section 5.

2 Related Work

The existence of synonyms of the term "smart" shows that even a definition that has gained a high level of acceptance in its field of research struggles with alternatives such as, percipient, astute, shrewd and quick. Due to this, they have created a definition of sGov centred on the changes and challenges for public administration and society. "As smart-government, or the organizations and networks within the political jurisdiction (e.g. a city, a town, a nation), will use emerging and nanotechnologies and various innovative strategies to gain a sound understanding of their communities and constitutes (being percipient), they would use that ability to accurately assess situations or people (being astute), show sharp powers of judgement (being shrewd), and then make decisions and respond quickly or effectively (being quick)." [1, 2, 3, 4]

The development of smart city initiatives has shown that especially the borders between the terms of smart city and sGov are overlapping. "Therefore, the authors call a city smart when it takes action towards innovation in management, technology, and policy, all of which entail risks and opportunities." [5] The discussion of attempts to define the sphere of each of the terms has developed two different understandings, which on the one hand state that the term of smart city is only a subset of sGov, and on the other hand scholars see sGov within the smart city nexus.

In smart and sustainable cloud-based ICT meta-architecture, the benefits of sGovs and their actions described by government platforms especially can be evaluated. They show the advantages of sGovs for public administration and citizens as well as stakeholders in the process of open government service delivery. The benefits include lower software development, support, and maintenance costs; provision of higher application portability and interoperability; enhancing smart services; and a shortened time-to-market strategy for services. The involvement of Big Data Management, the Internet of Things (IoT), sensor networks, smart devices, embedded systems, 5G and cloud computing technologies in public administration will allow sGovs to create entirely new ways of governing cities, states or nations. "By introducing new type of knowledge processes such as information collection and processing, real-time forecasting and alerting, collectives and crowd-sourced intelligence, cooperative distributed problem-solving and learning from it" [6, 7], sGovs will reach a new level of interconnection between all kinds of stakeholders for public service deliveries.

Jörn von Lucke [3] has developed a design showing an integrational approach to sGov in public administration. The core of this model shows that cyber-physical systems (CPS) will involve intelligent networking objects such as sensors, actuators, and M2M communication to enhance the development of future public administration. CPSs are heterogeneously networked entities that link and combine real physical objects with digital information and communication systems. These are IT systems as part of devices, structures, or processes that directly detect physical data via sensors and act on physical processes through actuators, but above all that evaluate and store the acquired data. In addition, they can actively or reactively interact with the physical and digital world. For this purpose, they are connected via digital communication devices (M2M) and in global networks. This offers the possibility to use the data and services that are available worldwide. [3]

To provide investment security, compatibility, and future viability for governments and stakeholders, the sGov approach must be integrated. The major question in the development of sGov service delivery is to identify what intelligently connected objects the public sector needs and in which CPSs these must be embedded.

As shown in figure 1, one must ensure that the objects not only function in a closed ecosystem but that they are also integrated into the Internet of Content (Web 1.0: World Wide Web and Management Networks, Electronic Government), the Internet of Communication (Web 2.0: Social Media, Open Government) and the Internet of Context (Web 3.0: Semantic Web – Big and Open Data, Open Government Data). The design of the Internet of Things (Web 4.0: Smart Ecosystems, Internet of Things, sGov) with its sensor and actuator networks and its services are, from the state's point of view, essential. As one of the last stages, one can define the network communication on a real-time level as the Web 5.0 – the so-called Internet of Thoughts or the Tactile Internet, which supports real-time government.

In his analysis of sGovs, von Lucke [3] has outlined strengths, weaknesses, chances and risks regarding future public administration. Weaknesses of sGov, as he pointed out, are the specific efforts and time for the development of software solutions that requires financial expenses, and insufficient scientific background. Also, its lack of political prioritization, as well as the lack of research and development capacities of

new solutions will be considered as weaknesses. Risks that von Lucke's system wanted to eliminate are the lack of creativity and design, the uncertainty of successful implementation, the disruptive nature of changes arising from innovation, the fears resulting from the distorted image of "Glass Citizen", which especially in Germany is an issue of privacy, and lack of permanent funding, acceptance, and participation of citizen in early stages.

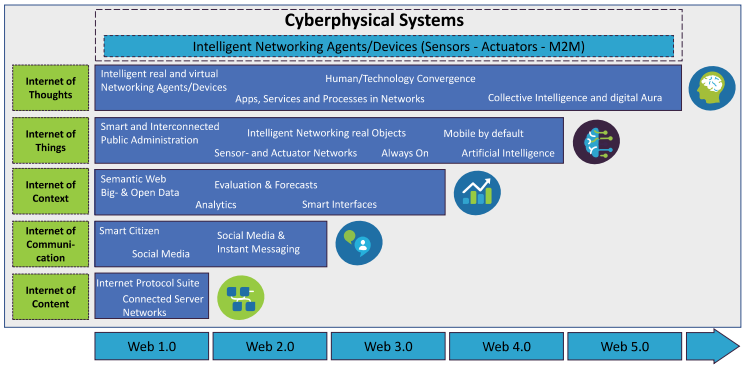

Fig. 1. Integrational Approach of sGov Solutions and their Development.

Chances for sGov are the potential for innovation and the given impulses for society, new intelligent networking of things, services and CPS, increasing efficiency and effectiveness, and in the long run reductions in fees and charges for public administration services. He supports his argumentation with an integrated approach to IT, an intensification of networking and interconnection of agencies, as well as a demand of mission statements by smart authorities, smart management and for smart citizens.

3 The Case of the Super-Application WeChat

The super-application WeChat has been developed in a unique surrounding that is characterized by the Great Firewall, and that can only be found in the PRC. In China, the IT solutions are much more focused on the needs and traditions of the users – the regional-cultural background plays an important role in the development of innovative IT solutions. Surely, the development of emergent technologies will also be performed only within a framework that especially focuses to serve its one-party state that has been ruled by the Chinese Communist Party (CCP) since 1949.

WeChat has been developed towards a social networking application that combines functions such as instant messaging, e-commerce and payment services. In the Western World, government e-services are not supported by applications like WeChat. Applications such as WhatsApp and Facebook will need to be analysed separately due to their more open and democratic and less government-influenced development. Developing countries especially have shown a greater interest and closer

connection to innovation and technological change in the past. The acceptance rates for new technologies are higher than in economically mature and developed countries, e.g. in Central and Western Europe. The increasing use of those applications especially in Asia can be seen in figure 2. [8] This figure compares the most commonly used social messenger applications in the world based on their number of monthly active users (MAU). These applications are mostly used in certain geographic areas. KakaoTalk is used especially in South Korea, Zalo in Vietnam, LINE in Taiwan and Japan, WeChat in the PRC and Facebook Messenger as well as WhatsApp cover the entire globe – except China and politically isolated states.

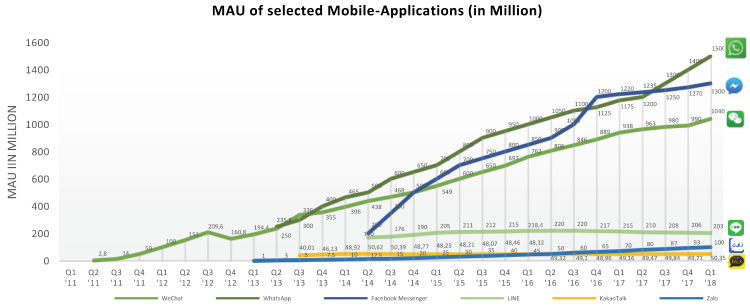

Fig. 2. Monthly active users of mobile application over the past years.

Super-applications enable possibilities to implement services under the idea of Government as a Platform (GaaP). Therefore, they will be able to provide data information for smart cities and innovative administrative government processes.

Sensors can gather various types of data. Smartphones are great examples for this type of data-gathering. The location, temperature, 3D movements, fingerprints, light, atmospheric pressure and even camera sensors with possibilities for face recognition as well as the recognition of handwriting have built into the new types of smartphones. All that gathered information will be used to improve the user-experience and to measure the behaviour of the user. As mentioned in the interviews given by the WeChat managers in Guangzhou, for WeChat this has always been the basic understanding for the development of their application.

In the next step, analytics will be able to predict user preferences and calculate risks of decision-making. Analytics help to define new levels of verification to securely store any kind of information on the user's personal device. "With the mobile Internet extending to IoT in recent years, Chinese Internet enterprises have emerged as the most dynamic actors in the development of IoT, and have been strongly influencing the patterns, models and industrial ecological system of China's IoT development. Major Chinese Internet companies have entered the field of IoT through wearable intelligent terminals, smart home, mobile health care, IoV, security, [virtual reality (VR), artificial intelligence (AI)] and other businesses, and have made rapid development in some of these areas." [9]

One of those examples is the super-application WeChat, which "can communicate with home appliances, toys, routers, wearable devices, sports equipment and other types of smart devices, and help to interconnect intelligent devices and hundreds of millions of Wechat users." [9, 10, 11] With WeChat, not only can people be connected and relationships maintained, but also connections between people and objects or connections between objects can be made. IoT has become reality in China through WeChat. As follows, WeChat will be used to define this new stage of transition of government e-services.

The involvement of data analytics and the implementation of mobile government in the set up, and agile system that can be used on cloud services, also outlines the before mentioned definition of sGov. The developed *provident stage* uses the data that is gathered by governments to better serve citizens' and clients' needs. Hence, this stage plays a major role in the transition process of government. The implementation of emerging technologies and innovation that can be driven by IoT in the public sector, has shown a move towards a more digitalized and more open and interconnected type of government, as outlined in the conducted interviews with interviewees from the R&D sector. This shows that governments will be able to push their transition on the new level, due to the implementation of super-applications to reach the more advanced type of government – sGov.

4 Extending Stage Models from eGov to sGov

The transition of government is a wide term. Due to the involvement of information technologies, governments have been pushed towards the implementation of those technologies. The wide range of possible changes in governments have shown major improvements in organizational structures of government as seen in figure 1. eGov has been a way of better serving the citizens using new technologies and through new channels. It has also changed the entire process of services that governments provide and has changed the entire organizational structures of governments.

Several different stage models for eGov have been developed by scholars in the past. Those stages have some basic features in common. "All of them bring to bear a differentiation in describing the development from the simple information service to a more refined one-stop government." [12] Some scholars especially worth mentioning are Layne and Lee. They offer the general bases of analysing stage models in present work, because it has been the most general but also the most often referenced model over the past years. Several others, such as Hiller and Bélanger [13], Andersen and Henriksen [14], and Klievink and Janssen [15], have been used to shape the right understanding for developing a stage model extension for a new and innovative way of government that is mainly data-driven and proactive.

Various contributions have pointed out problems that need to be overcome to be able to reach the next stage of eGov. Some of them have shown that government officials on lower and higher levels are likely to resist any changes and development in established systems and processes.

Being able to overcome this barrier will drive the transition of government towards a more digitalized and future-oriented government that can have the ability to serve their citizens better than it did ever before. Action areas to become more open and as well predictive are the community engagement and co-production of services, financial investment, automation, collaboration, and governance. To be able to transform government service delivery from eGov to sGov, agencies must collaborate and provide a seamless integrated service delivery across all domains.

4.1 Existing Stage Model by Layne and Lee

Governments do not change for intrinsic reasons but are led by visions of eGov emerging in society. Those visions are shaped by ideas and a new understanding of governance based on a citizens-centred concept instead of a traditional bureaucracy-centred vision. These kinds of visions are driven by a result-centred and market-centred ways that are actively promoting innovation. [16]

There are four objectives that describe the change in governments due to the help of information technologies. From an organizational point of view, it can be said, that governments try to internally enhance the cooperation and collaboration between several government divisions among several levels and various locations. The new way of government will also provide better services to external entities such as businesses (e.g. elimination of redundant data collections and their reduction of transaction costs). Focused on the delivery of services to individuals, governments have set their visions to provide services to their citizens that are working to improve the government-citizen relationship that has been difficult in the past. Lastly, from an individual perspective, governments try to improve their internal processes to boost efficiency and effectiveness of their own administration.

Based on those four objectives, scholars have developed stage models, each having a different approach and, therefore, differing in the number of stages.

Layne and Lee [17] have developed their stage model on the basic understanding of eGovernment as a chaotic and unmanageable development of government-citizen interactions. In this sense, they claim the importance of dividing the development into distinguishable stages. Therefore, they have developed the four stages: (1) catalogue; (2) transaction; (3) vertical integration; and (4) horizontal integration.

The integration of government agencies, as described by Layne and Lee, has been unique. “In Layne and Lee this is divided into vertical; cross-hierarchical integration and horizontal; cross-functional integration. The other models do not separate the cross-functional and cross-hierarchical integration from each other.” [12, 18]

The model is based on technical, organizational and managerial feasibility. The authors define their model as a framework for an evolutionary phenomenon that is called – eGov.

The first stage of the model delivers static or just basic information by using websites. Besides basic information delivery, the functions of this stage are the publication of documents and the possibility of downloading form sheets. Therefore, this information is of a general nature and mostly pays attention to the agency or department itself. The established online procedures of government departments and their

agencies tend to be created in a mainly decentralized way. There will be no interaction between government and citizens and no cooperation among agencies. The move into this stage is initiated by external pressures arising from client (e.g. citizens' and businesses') expectations.

The second stage of the Layne and Lee model extends the previously established possibilities of the catalogue stage. In general, it allows citizens to fill in online forms for governments. This shows that a transaction between government and citizens has been established. For Layne and Lee, this stage represents an internal focus shift that moves agency systems onto the existing websites. Examples of this stage are the renewal of the residence parking permits (e.g. in the Federal Republic of Germany), the renewal of licences, the possibility of paying fines, and checking evidence online (e.g. in the United States of America and the Federal Republic of Germany). A full integration of agency systems has been archived in the next stage of the model. This full integration allows the citizens not only to view information but in addition helps them to post their own information and responses directly into the agency systems. Direct and personal interaction with government officials will be reduced and a greater location-independence can be seen. [12, 16, 18]

In the third stage of the model, a vertical integration has been introduced. This stage differs from the other stage models proposed in the literature. The vertical integration most likely focuses on the transformation of the delivered services rather than on the automation of already existing business processes. It describes the process of integration into a vertical cross-governmental way. In comparison to the first two stages, this stage focuses on the development and the integration of agency systems with the help of web interfaces. In addition, the Layne and Lee model focuses on organizational changes. This is highly important to promote the change in government structures using information and communication technologies. In this third stage, the possibility of connecting government agencies on different levels occurs and offers practical functions such as the "integration of local level business license application [that] is being linked to state and government level to obtain an employer identification number [(e.g. in the United States of America)]." [12] A linkage of local- and state-systems on higher-levels brings this stage to its maturity.

The last and fourth stage of this model describes the horizontal integration and focuses on the integration of systems on the same level of government. Several agencies offer one system for their service delivery to their clients. Even though several agencies deliver different services and functions, the information regarding the client that they have in common can be communicated and shared. A functional example is the possibility for the clients to pay their business fees and taxes to several government entities. This will be possible due to the interconnection of agency systems that makes it possible to divide the payment and deliver it to the right agency. [12, 16, 18]

For the Layne and Lee stage model, the importance of outlining the change of organizational structures due to the implementation and interconnection of agency systems shows that the transformation of government systems does not only include the delivery of services that they provide. It also underlines the internal aspect of change that needs to be done to reach the expectations of modern government.

4.2 Extension of Current eGov Stage Model

With the implementation of super-applications in the delivery process of government services, the terms “fast and effective” have taken on a new definition and understanding. It is above the so far seen eGov approach that delivers information and services to their citizens over the Internet. Due to the wide distribution of smartphones all over the world, the Internet has become part of people’s lives. The Internet is now accessed directly from the people’s pocket and it has become mobile.

All this has made it possible to access government services over the browser on the clients’ smartphones and entirely new problems occurred that have questioned the accessibility and verification functions for government e-services. “With a rapid proliferation of smartphones, public smartphone applications have emerged as a new technology and innovative way to achieve smarter government. […] [G]overnment agencies have followed the trend of the rapid proliferation of public applications without considering how high-level citizen-centric services could be delivered through the public applications.” [1] Therefore, governments had to face the lack of acceptance of their mobile e-services. The use of data that has been given by the clients, has made governments a powerful stakeholder regarding to Internet technologies in a data-driven world.

Data-driven government that will be able to proactively use and deliver information to their clients would be the next generation of government. Sirendi and Taveter even argue that “designing proactive services of e-governance should be seen as the next stage in service design for e-governance. […] [P]roactive public electronic services should be designed in a way that supports the automation and intelligent processing of already available information to reflect the purpose of meeting the needs of different stakeholders yet maintaining a people-first-policy.” [19, 10,11] This new type of government is able to serve its people’s needs in a better way than they were able to deliver services ever before. At the same time, they will be able to provide decision-making to serve their people even before they know that they need to be served by the government.

Based on this new understanding of government, a new stage for describing this transition of government will follow. In this case, it can be said that due to the rapid growth in demand of government e-services for mobile devices and the occurrence of data-driven government that will be able to proactively serve their citizens and enterprises requires a new stage to define the maturity of governments in the transition process from eGov to sGov.

Therefore, the authors propose an extension of the Layne and Lee stage model, as shown in figure 3. This fifth stage extends the existing stage model and focuses on the delivery of this service and the use of government data. This stage will be named as the *provident stage*. Due to the use of analytics and artificial intelligence (AI), a new way of governing citizens will be implemented. Data-driven governments are currently in this stage and they will, on a more mature level of this stage, actively invest in deep data analytics and AI. Its decision-making is based on Big Data and will be able to proactively serve its citizens in the future. [7] The delivery of e-services in this fifth

stage supports the use of smartphones and developed implemented mobile government applications.

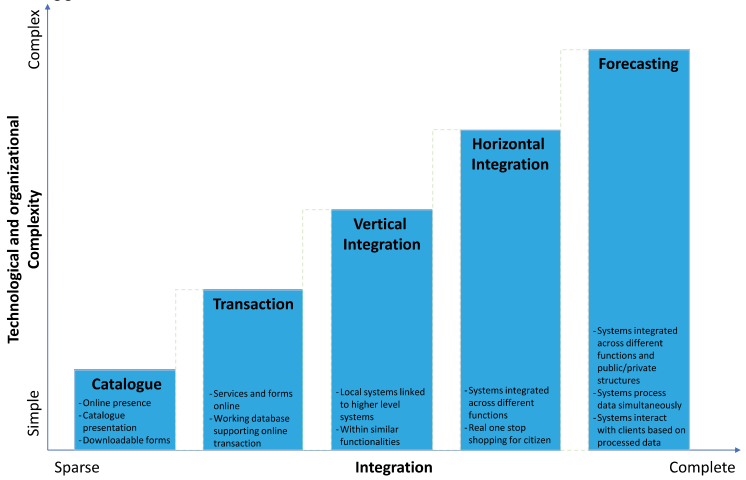

Fig. 3. Extension of the Layne and Lee Stage Model including the *provident stage.*

Considering the use of super-applications in this transition from eGov towards sGov, archiving this stage will be possible by implementing eGov services in daily-used super-applications. In this *provident stage*, organizational structures of government will not be entirely changed anymore. Policy adjustments and new legislative procedures will help to legally connect third-party applications and data-security laws for government databases. Data gathering due to the help of those implemented e-services will offer new possibilities for governments to predict economic changes and movements of society on the long- and short-term scale.

This new way of implementing e-services and analysing the way they input data will surely have an impact on the policy outcomes. By implementing agile delivery procedures that are based on the citizens given data, new ways of customisation for e-services will occur. “In the context of an architecture of consumption, agile delivery is an extremely powerful approach, since it allows the recombination and reuse of standard building blocks, closely customized to user’s requirements.” [20]

This newly and fully citizen-centric approach for government e-services has become a goal for the delivery of those services. This proposed extension of the Layne and Lee stage model shows that even the general stage model will reach its maturity due to the development of ICT and its implementation by government agencies.

5 Conclusion

The novel idea of combining super-applications and the use of eGov service delivery has shown a remarkable change in the way future governments will deliver and interact with their citizens and country-based enterprises. The case study has addressed new ways of interaction between governments and citizens, which have been developed and used by the citizens based on the interviews that were conducted with the eight interviewees in the WeChat context. This adoption of mobile government service delivery has reached a new stage of the currently used and widely spread eGov stage models.

The *provident stage*, which has been developed and introduced here, outlined the move from eGov to sGov due to the use of super-applications and the hardware that will be supported. The case study has shown that super-applications have been a driver for the transition process from eGov towards sGov. This innovative way of software development and the implementation of new sensor technologies and tools into just one application has made it possible to support almost every personal situation of life. In this case, it has adopted people's needs and their circumstances of life to reach any of the needed reasons to be used on the people's mobile devices. Those super-applications have become part of their daily life over the past years and young Chinese especially cannot imagine a life without WeChat anymore - as mentioned by WeChat users and interviewees from the R&D sector in the interviews.

The application has had a major influence on the development of the entire market and the development of Chinese society over the past years. The interviewed software developers and scientists have said that the development over the past years has shown that WeChat is - compared to other applications - one of the early adopters of new possibilities that technology offers. They outlined that the framework for implementing and adjusting services within the application has always been at the forefront. It has changed online and offline business models, it has created entirely new business models and it was able to implement already existing models.

WeChat's existence has increased the users' ability to easily communicate with friends, businesses, and governments. The implementation of public services in WeChat has created the first steps for governments to directly interact with their citizens over their personal mobile devices. For the interviewed users, this has been revolutionary, but it has not changed the way Chinese sense their government.

This implementation process for eGov services specifically explains the first subsidiary research question that asked for the ways to implement government services though GaaP based on super-applications. The platforms that have been developed to offer several services on WeChat have created the possibility for individuals from all over the world to develop microblogs, games, remote controls for any kind of hardware in IoT and many other innovative ideas. By using location services, the service delivery has been shaped especially for the users and just offer services that have been available in their area.

The research has outlined that especially with the use of super-applications, the transition process has led towards a mature level of eGov. While introducing a next stage for the Layne and Lee eGov stage model – that has especially been focused on

Big Data and proactive service delivery due to Non-Stop-Shops – the use of super-applications on next-generation smartphones has been a driver for this process of transition towards sGov.

Summarised, it can be said that due to this research the understanding of mobile service delivery needs to become part of the policy-making process of Western/European governments and supranational organizations in the near future. Innovative ways of service delivery will guide public administration towards a more interconnected, efficient and effective approach on how to govern a country in the 21st century. Making governments smart will increase the trust and positive attitude of citizens towards governments and their service delivery.

Further research could be conducted to draw out specific cases in Western/European countries and to underline this next generation move towards smart government. This will push this framework to a more practical level.

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Curriculum vitae

Personal data

Name: Regina Erlenheim (Sirendi)
Date of birth: 30.07.1988
Place of birth: Tallinn, Estonia
Citizenship: Estonian

Contact data

E-mail: regina.erlenheim@taltech.ee, regina.erlenheim@gmail.com

Education

2014–… Tallinn University of Technology / Swinburne University of Technology (Melbourne, Australia) – PhD
2011–2012 MSC, Science, Technology and International Development, University of Edinburgh, United Kingdom
2007–2010 BA, Political Administration, University of Tallinn
2001–2007 Gustav Adolf Grammar School, Tallinn, Estonia

Language competence

English – Fluent
Estonian – Native
Swedish – Intermediate
Russian – Basic
Finnish – Basic

Professional employment

2014–… Tallinn University of Technology, Lecturer, Project manager
2011–2013 MJI Business Solutions Ltd, Glasgow, United Kingdom, Technology consultancy

Elulookirjeldus

Isikuandmed

Nimi: Regina Erlenheim (Sirendi)
Sünniaeg: 30.07.1988
Sünnikoht: Tallinn, Eesti
Kodakondsus: Eesti

Kontaktandmed

E-post: regina.erlenheim@taltech.ee, regina.erlenheim@gmail.com

Hariduskäik

2014–... Tallinna Tehnikaülikool / Swinburne'i Tehnikaülikool (Melbourne Austraalia) – PhD
2011–2012 MSC, Science, Technology and International Development, Edinburgh'i Ülikool, Suurbritannia
2007–2010 BA, Riigiteadused, Tallinna Ülikool
2001–2007 Gustav Adolfi Gümnaasium

Keelteoskus

Inglise keel – Kõrgtase
Eesti keel – Emakeel
Rootsi keel – Kesktase
Vene keel – Algtase
Soome keel – Algtase

Teenistuskäik

2014–... Tallinna Tehnikaülikool, Lektor, Projektijuht
2011–2013 MJI Business Solutions Ltd, Glasgow, Suurbritannia, Tehnoloogia konsulatatsioon