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KEY FACTORS INFLUENCING THE IMPLEMENTATION OF THE ONCE-ONLY PRINCIPLE: CASE STUDY OF ESTONIA

Master's thesis

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ABSTRACT

The once-only principle (OOP) is an e-government concept that aims to reduce administrative burden and financial costs. For achieving this, public sector organisations should not require data from citizens and businesses more than once but share and reuse the already collected information between other public sector organizations. Although the cross-border implementation of the OOP has recently gained importance in the European Union, there is not much research about the application of the OOP at the national level. The aim of this thesis is to examine the key factors that influenced the implementation of the OOP in Estonia and derive potential lessons that other countries could learn from when implementing the OOP at the national level. A descriptive case study is conducted on the initiation and implementation of the OOP in Estonia covering the period 1991-2004. The case seems to show that the initiation and actual implementation of the OOP were especially influenced by organisational (e.g. financial resources, inter- and intra-organisational collaboration), technological (e.g. ICT infrastructure, chosen technology for data exchange and data reuse) and institutional factors (i.e. supportive and flexible legislative system). In addition, as the case demonstrated several context-specific factors, other countries should rather design context-specific solutions than copy Estonian practices.

Keywords: once-only principle, e-government, factors influencing OOP, data exchange, data reuse

LIST OF ABBREVIATIONS

EU - European Union

ICT - Information and Communication Technology

OOP - Once-only principle

SCOOP4C - Stakeholder Community Once-Only Principle for Citizens

TOOP - The Once-Only Principle Project

INTRODUCTION

The ‘once-only’ principle (hereinafter - OOP) is commonly understood as a principle according to which public administrations collect standard information from citizens and businesses only once, then share the data (Gallo *et al.* 2015; Krimmer *et al.* 2017) and “if permitted, internally re-use this data” (EU eGovernment Action Plan 2016-2020, 3). It is an e-government concept (Gallo *et al.* 2014) that in recent years has started to gain more importance and attention in the European Union. It is expected to reduce the administrative burden and financial costs and has become an important principle addressed by policy and by various pan-European projects (EU eGovernment Action Plan 2016-2020; Cave *et al.* 2017; Wimmer, Marinov 2017). In order to contribute to a successfully functioning and more efficient Digital Single Market (EU eGovernment Action Plan 2016-2020), the European Commission has put a special focus on the cross-border application of the OOP and thus, launched two projects in 2016 and 2017 (Wimmer, Marinov 2017; European Commission 2017a). The SCOOP4C Project explored the possibilities of the cross-border sharing and reuse of the citizens’ data (Wimmer, Marinov 2017) and the Once-Only Principle Project (TOOP) works on building an infrastructure for sharing the data from businesses (European Commission 2017a).

Although the concept of the once-only principle is relatively new, especially in the cross-border context, several countries in the EU have already implemented different initiatives, projects or programmes related to this principle at national, regional or local levels (Blau *et al.* 2015, 8; Krimmer *et al.* 2017, 11-13). However, the interpretation of the principle varies in different EU Member states: whereas some countries have focused on storing the data (i.e. in one database), other countries have aimed at collecting the data only once (Krimmer *et al.* 2017, 10; Blau *et al.* 2015, 12, 32). In addition, only a few of these countries have clear OOP strategies and successfully functioning systems in place (Blau *et al.* 2015, 9). Therefore, in order to contribute

to a successful implementation of OOP across borders, it would be essential to study those countries that can be considered good examples regarding their own OOP related practices. This would allow to understand different factors influencing the implementation of these initiatives on the national level and thus to comprehend the various cases better. Furthermore, studying success stories would not only help to understand what kind of approaches and practices work but also the reasons why they work. Thus, courtesy of this information, it is possible to design solutions for both cross-border and national use of OOP. Moreover, as the OOP concept is new and not widely used yet, there is a lack of academic studies on different cases that would have an in depth focus on the implementation of OOP in particular countries and would try to understand the factors that have influenced the implementation process. Therefore, the aim of the thesis is improve our understanding of this topic.

The thesis will focus and explore the case of Estonia. There are two core reasons for this. Firstly, according to the findings of a few existing studies on OOP studies, Estonia has implemented the greatest number of seamlessly working OOP use cases at the national level (Vallner *et al.* 2017, 14-16; Blau *et al.* 2015; Krimmer *et al.* 2017; Gallo *et al.* 2015, 4, 29). For example, it is possible to find OOP in policy domains such as health, education, taxation, social protection and several others (Wimmer 2018, 11-12; Vallner *et al.* 2017). Furthermore, there is also a legal basis that enables OOP. Secondly, Estonia is well-developed in the digital field and ranked relatively high for its various e-government and digital aspects (Kattel, Mergel 2018, 1; European Commission 2018; United Nations 2018). Therefore, Estonia can be taken as a good example to study. However, in addition to success factors, it would be also essential to understand the main challenges that might have hindered the OOP implementation process in Estonia.

The main research questions of the thesis that will be studied are the following:

- What are the key factors that led to the emergence of the OOP in Estonia?
- What are the lessons other countries could draw from the case of Estonia, if any?

In order to answer these questions, the empirical part of the thesis will give a detailed overview of the history and main developments regarding the implementation of OOP in Estonia. It then

tries to understand and highlight the central factors that have influenced the actual implementation of OOP.

The thesis is divided into five parts. The current chapter gives an overview of the problem, need for the research, research questions, and the structure of the thesis. The second chapter focuses on the theoretical framework, specifically on the main factors that have influenced the implementation of e-government initiatives and projects. The third chapter gives an overview of the research methodology. The next part provides the empirical findings of the thesis and its connections with the theoretical framework. The last part is dedicated to the discussion and main conclusions of the study. Finally, the summary of the thesis will be presented.

1. LITERATURE REVIEW

This chapter will first explain the concept, definition, benefits and different interpretations of the once-only principle. It will then discuss the factors influencing the implementation of the OOP. Due to the lack of literature on the OOP, related disciplines such as public sector innovation, information and communication technology, and e-government will be examined to identify the main factors influencing the implementation of e-government initiatives and projects. Finally, a theoretical framework will be developed.

1.1 The once-only principle: definitions and dimensions

The "once-only" principle is an e-government concept that "allows individuals and businesses to supply certain standard information to the public administrations only once" (Gallo *et al.* 2014; Cave *et al.* 2017; Blau *et al.* 2015; Krimmer *et al.* 2017). In order to make this happen, public administrations should collect, manage, authenticate, share and re-use the data internally by also taking into account various restrictions, for example regulations (Cave *et al*. 2017; Krimmer *et al.* 2017, 5-6, 10). Therefore, the aim of the principle is to avoid situations where individuals or businesses report the same data and information to government institutions and agencies multiple times. Courtesy of this, the implementation of the OOP helps to minimise and eliminate the administrative burden on all parties, i.e. citizens, companies and public administrations. As the exchange of already provided and collected information is less expensive and more efficient than collecting and storing the data over and over again, the OOP is expected to thus, significantly save time and costs. Furthermore, the collection of data only once can prevent accidental mistakes and errors while processing the information. More benefits of the OOP include also improved and user-friendlier public services, better customer

satisfaction, cost-effective, transparent, and efficient government and promotion of innovation and economic growth. (Cave *et al.* 2017; Krimmer *et al.* 2017; Gallo *et al.* 2014)

The OOP is associated with the digitalization of public sector and closely connected to concepts such as digital by default, point of single contact, the fair information processing principles and so forth (Cave *et al.* 2017, 1; EU eGovernment Action Plan 2016-2020, 6). Without the transition of paper documents to electronic data nor the existence of a functioning e-government, the OOP can neither be initiated nor implemented. One of the key elements for putting the principle into practice are the base registries, i.e. "authentic sources of basic information or data for public administrations" that help public administrations to find, determine and exchange the necessary information and data (Osimo 2018, 4; European Commission 2016, 4-5). Base registries that contain information on different categories (e.g. businesses, persons, real property) are crucial for the functioning of the public services (European Commission 2016, 5) and thus, also for the OOP (Gallo *et al.* 2014, 5, 28, 32-33).

However, there are several dimensions that need to be taken into account when trying to initiate and implement the principle. Although technology and various technical aspects play an essential role in the implementation of the OOP, it is crucial to also focus on several other sides. According to Gallo *et al.* 2014, Cave *et al.* 2017 and Kalvet *et al.* 2017, there are various organisational, legal, semantic, political, demand-side, and security aspects that should be taken into consideration when starting to implement the OOP. Therefore the implementation of the principle is an interdisciplinary and multidisciplinary concept that cannot be seen in the isolation. (Gallo *et al.* 2017, 5) The broader context should be thus knowingly taken into account.

According to findings of the OOP related practices and programmes in individual countries of EU (Cave *et al.* 2017; Wimmer 2018; Vallner *et al.* 2017; Blau *et al.* 2015), the interpretation of the principle in different countries is not unambiguous. While some countries have rather put an emphasis on the approach of how to store information and data then other member states have focused on the collection of the data (Krimmer *et al.* 2017, 10; Cave *et al.* 2017, 7). According to the first version, it is required to "store the information once only" (Cave *et al.*

2017, 7) and "not to duplicate the information requests and storages for these" (Krimmer *et al.* 2017, 11). The second version, in contrast, requires to submit data only once. However, it does not forbid to use several records for identical information. (Cave *et al.* 2017, 7; Krimmer *et al.* 2017, 11). In addition to various interpretations of the OOP, it is also possible to notice differences in the level of institutionalisation. While some countries have found it essential to create concrete strategies and a supportive legislative framework for implementing the OOP, other countries have not prioritized such aspects. (Blau *et al.* 2015, 8-9, 13, Vallner *et al.* 2017, 121-130).

As the thesis will study the case of Estonia, the first version, i.e. an approach related to data collection by public authorities and data sharing across public organisations (Krimmer *et al.* 2017, 11) will be further analysed and focused on.

In order to get a more comprehensive understanding of the OOP, it is essential to understand more thoroughly different factors influencing the emergence and implementation of the OOP. Therefore taking into consideration the nature of the OOP, related disciplines such public sector innovation, information and communication technology and e-government will be briefly described and analysed.

The most prevalent concepts of innovation are often associated with private sector (Demircioglu, Audretsch 2017, 1681; Arfeen, Khan 2009, 439; Bugge, Bloch 2016). However, throughout last decade, a significant attention has started to be paid also to the public sector innovation (Bugge, Bloch 2016; European Commission 2014). Different challenges such as complex societal problems (Hartley *et al.* 2013, 821; Millard 2013), growing citizens' and businesses' expectations (Arfeen, Khan 2009, 440) and fiscal constraints (Vries *et al.* 2018, 269; Borins 2002, 467) have pressured public sector to be more innovative (Osborne, Brown 2011). Although not all innovations are successful and effective (Gambarotto, Camozzo 2010, 177), there is a rising understanding that public sector innovation can contribute to improved and more efficient services, enhanced solutions, increased productivity (Hartley *et al.* 2013, 821), and respond better to the public expectations and needs (Mulgan, Albury 2003).

An important part of public sector innovation can be associated with the uptake of Information and Communication Technology (hereinafter - ICT) (Misuraca, Viscusi 2015, 305; Bekkers, Homburg 2005). As ICT has become one of the main factors that encourages changes in the public sector (Arfeen, Khan 2009; Svidronova, Mikus 2015) and therefore modernizes the public sector, governments have started to focus on and invest heavily in ICT-driven innovation in order to provide more transparency, accountability, and efficiency (Csoto *et al.* 2014).

One of the recent trends regarding public sector innovation are different e-government initiatives and practices (Arheen, Khan 2009, 440). E-Government refers to an automation and eventual change from paper-based processes to electronic procedures that brings new ways to various areas such as business transactions, access to services, and organising information (Okot-Uma 2002; Basu 2004). Furthermore, one of the most essential purposes of the e-government is to improve administrative performance, deliver public services in a more efficient way, and promote democracy and transparency (Gil-Garcia, Pardo 2005, 187-188; Tung, Rieck 2005).

Thus, as can be concluded, the OOP with one of its aims to increase the efficiency of public administrations and improve digital public services for citizens and businesses (EU eGovernment Action Plan 2016-2020), is directly associated with all aforementioned disciplines and dimensions. Therefore in order to understand the factors influencing the implementation of the OOP, it would be firstly important to identify and analyse the critical factors generally affecting the implementation of various e-government initiatives and projects. According to the studied literature, it is possible to classify the factors into four broad categories - these are 1) technological factors, 2) organisational factors, 3) institutional and political factors, and 4) demand side factors. Following chapter highlights the factors of each category that might either encourage or hinder the implementation of different e-government initiatives and projects.

1.2 Factors influencing the implementation of e-government initiatives and projects

1.2.1 Technological factors

1.2.1.1 ICT infrastructure

One part of technological factors encompass ICT infrastructure (Hussein *et al.* 2007; Navarro 2016) or technology components such as hardware, software, different ICT-related services, equipment (Egoeze *et al.* 2014), material systems, telecommunications (Fountain 2006, 6), networks, server, internet and data (Ebrahim, Irani 2005) that people with special skills and knowledge use to create "shared and standard services" (Nyrhinen 2008, 5). According to Fountain's (2006) technology enactment framework, such technology components refer to objective technology that is not associated with the real usage by people. As ICT infrastructure has an impact on data transformation and data storage, it is necessary to have a functional infrastructure established before delivering e-services (Al-Rahbi *et al.* 2012). Gichoya (2005) has found that poor ICT infrastructure is one of the main factors that might result in the failure of an e-government project. Thus ICT infrastructure can be considered key factor that has an essential impact on the success of e-government projects and initiatives (Hussein *et al.* 2007; Whyte, Bytheway 1996; Ifinedo, Singh 2011; Ebrahim, Irani 2005; Navarro 2016; Altameem *et al.* 2006; Al-Wazir, Zheng 2014).

1.2.1.2 System and service integration

Fountain (2006) has identified enacted technology that differently from material systems indicate the approaches of the actual usage and implementation of the information system. The development of the features (e.g. services, applications, systems) of enacted technology is usually affected by various institutional and political actors (Fountain 2006 referred in Arduini *et al.* 2013). The idea of the enacted technology can be linked to the idea of an e-government integration that "refers to the embedding and constraining context in which technical interoperation occurs" (Scholl, Klischewski 2007, 897). Scholl and Klischewski (2007) have pointed out that integration is associated with both technical (e.g. interoperation of e-

Government information systems) and non-technical (e.g. cooperation between government units) meanings. Therefore it can be assumed that a successful and effective collaboration between public institutions and private sector is necessary (Sorn-in *et al.* 2015). Layne's and Lee's (2001) theory about integration has put an emphasize on both vertical (i.e. local vs higher level systems) and horizontal system (i.e. integration across functions) integration that would contribute to a successful e-government. Thus based on numerous scholars, integration between e-government systems and services play an essential role in the implementation of e-government initiatives and projects.

1.2.1.3 Interoperability

Charalabidis *et al.* (2009) have stated that interoperability is one of the key factors that can help public sector and e-government reach its full potential. Interoperability can be divided into four main dimensions: technical, semantic, organizational, and legal (Margariti 2018; European Commission 2017b). Moen (2000) explains technical interoperability as a concept that refers to the information exchange and interpretation between different ICT facilities such as computers and networks. In short, it is related to e-government information systems, collaboration among their components, and compatibility in the technical equipment (Goldkuhl 2008, 2-4). Semantic interoperability is associated with the meaning of exchanged data that should be understandable and well interpreted by other applications (Gasco 2012, 4; Guijarro 2009). For achieving semantic operability, it is possible to use for example, classification system, metadata, and thesaurus (Gasco 2012, 4). Organizational interoperability refers to the non-technical aspects (Cave *et al.* 2017) such as capability of collaboration between systems and organizations (Scholl, Klischewski 2007), resource limitations, and path-dependency factors (Cave *et al.* 2017, 172). Legal interoperability is related to the congruence between legislation (Goldkuhl 2008, 4; European Commission 2017b, 27) that has an impact on information systems. As interoperability can be one of the central challenges for e-government initiatives, it is important for e-government agencies to thoroughly deal with this topic (Guijarro 2009).

1.2.1.4 ICT standards

Scholars (Alshehri, Drew 2010; Alshehri, Drew 2011) have emphasized the importance of shared ICT standards and strategies that directly influence the performance of e-Government related actions (Alfarraj 2013; Ashaye, Irani 2014, Khanh 2014). Altameem *et al.* (2006) stated that different systems in government organizations can lead to numerous barriers and difficulties of e-government implementation. ICT standards provide a common understanding of procedures, interfaces, and formats, and give clear guidelines for acquisition, management, and practical application (Nyrhinen 2008). Therefore, standards of hardware, software, and systems are required in order to achieve a consistent system that would work in a compatible way and operate on the same basis (Weerakkody *et al.* 2011).

1.2.1.5 Security and privacy

The concept of security can be simply defined as a protection of data and information systems (Alshehri, Drew 2010). It has been argued that in order to secure the collected information (Layne, Lee 2001), online transactions (Ebrahim, Irani 2005, 594), e-government services (Al-Rahbi 2012), and various e-government operations and systems, it is crucial to invest in and establish suitable and proper security mechanisms such as digital signature, encryption, and firewall (Ebrahim, Irani 2005, 601). Courtesy of different security tools, it would be possible to protect data and systems against numerous threats and attacks (Shareef 2016). Furthermore, as e-government services are closely related to private data, government should put a special focus on these factors. Otherwise, lack of attention and action regarding secured collection of data and privacy protection (Alshehri, Drew 2010) can lead to trust issues that in turn might result in failures of e-government projects (Weerakkody *et al.* 2011; Al-Rahbi 2012).

1.2.2 Organisational factors

1.2.2.1 Organisational structure

Organisational structure refers to a “method or framework by which organizational activities are divided, organized, and coordinated (Ahmady *et al.* 2016, 455-456, 2; Daft, Margic 2009,

249). Alisa and Senija (2010) associate organisational structure with interrelated and integrated aspects that are necessary for creating a system. Tran and Tian (2013) have stated that a favorable and suitable organizational structure leads to more achievable goals and better leadership that consequently would contribute to the successful implementation of e-Government initiatives (Makau *et al.* 2015). One of the key dimensions of the concept are power distribution (i.e. centralization versus decentralization), specialisation, formalization (i.e. standardization), and span of management (Daft, Margic 2009; Alisa, Senija 2010) that all aim at easing various processes in the organization (Nurdin *et al.* 2012; Wimmer 2002). However, scholars have found that the more traditional organizations tend to be less innovative (Vigoda-Gadot *et al.* 2005; Moussa *et al.* 2018) than for example, organizations related to digital technology (i.e. "use of digital processes to carry out work" (Daft, Margic 2009; 278)) that are rather characterized by higher flexibility, decentralization, collaboration, teamwork, and horizontal communication (Daft, Margic 2009, 278-279). Although there is no concrete formula for an ideal organizational structure, it has been found that the correct re-engineering of organisational structure is one of the key elements in achieving success at the implementation of e-government projects (Nurdin *et al.* 2014).

1.2.2.2 Organisational culture

Organizational culture indicates "shared beliefs, understandings, values, norms and perceptions that members of organization have" (Daft, Margic 2009, 63; Tsai 2011). Thus, the concept refers to the identity and the personality of an organization and approaches on how different activities are carried out (O'Donell, Boyle 2008; Schein 1988). Ren and Zhang (2015) have associated organisational culture with organizational climate by assuming that the more positive and innovative organizational climate would lead to more innovative behaviour. Several other scholars have found that the organizational culture affects the organizational performance (Kanungo, Jain 2011, O'Donell, Boyle 2008; Weerakkody, Choudry 2005). Almutairi (2014) and O'Donell and Boyle (2008) have specified that the nature of culture has a significant impact on the behaviour of individuals that therefore, can either facilitate or hinder different changes and reforms. Thus, if a change is in opposition to values and norms of the organization, the probability of resistance is relatively high (Alshehri, Drew 2011). According to Zeffane (1996), however, the knowledge and awareness of the organizational culture can simplify the process

of a change. Albirini (2006) and Irani *et al.* (2005) contented that the lack of emphasis on aspects and dimensions of organizational culture can put the successful implementation of e-government initiatives at risk. Therefore, it would be essential for governments to be well prepared for changes and pay a strong attention to the organizational culture.

1.2.2.3 Qualification and training of employees

The availability of qualified personnel is a crucial factor in order to develop ICT-related services (Kumar, Best 2007; Alassim *et al.* 2017, Alshehri, Drew 2010; Al-Wazir, Zheng 2014; Evangelidis *et al.* 2002). Several scholars have found that governments usually lack sufficient ICT skills, knowledge, and experiences (Alassim *et al.* 2017; Mawela *et al.* 2017; Elkadi 2013; Ndou 2004). Furthermore, highly qualified people generally prefer private sector due to competitive salary, better compensation package, and higher flexibility (Bhuiyan 2011). However, according to Pudjianto and Hangjung (2009) and Kazmi (2011), ICT expertise is one of the key factors that support the implementation of e-government projects and therefore, it would be vital to pay a significant attention to this aspect. In order to better prepare for and adapt to various changes and technological developments, it is necessary to provide employees with trainings, workshops, and education that would help them to develop skills and acquire necessary knowledge (Weerakkody *et al.* 2011). Therefore, it can be said that a successful implementation of e-government projects assumes not only ICT skills but also expertise and competence related to technology, management, commerce, and politics (Gil-Garcia, Pardo 2005; Ndou 2004).

1.2.2.4 Management support and leadership

Several scholars have discussed that top management support can lead to positive environment by strengthening and encouraging e-participation (Akbulut 2003; Alshehri, Drew 2010a; Al-Wazir, Zheng 2014; Baguma, Lubega 2013), decrease the resistance to different changes (Alshehri, Drew 2010b), and result in an adequate funding in order to better implement e-government projects (Detlor *et al.* 2010). Alassim *et al.* (2017) found that management support is directly connected to several other factors such as visioning and planning. Therefore, it is important for high-level leaders to have clear, realistic, and integrated vision and plans in order

to successfully implement e-government initiatives (Alassim *et al.* 2017; Huda, Yunas 2016). Ndou (2004) has emphasized that the leadership is needed in all stages of the implementation - before, during, and after (Ndou 2004, 16). Thus, as leaders and high-level employees influence the decision-making processes and organizational performance (Moussa *et al.* 2018), there can be also a significant impact on the implementation of e-government initiatives and projects.

1.2.2.5 Financial resources

Several scholars have emphasized the importance of sufficient financial resources when implementing e-government projects (Thi *et al.* 2014; Al-Wazir, Zheng 2014; Gichoya 2005). An adequate budget is necessary to build ICT infrastructure, hire skilled personnel, provide high-quality training programs, and improve competencies (Nabafu, Maiga 2012). Lam's (2005) research findings have shown the significance of financial framework that would be particularly necessary for long-term and large-scale projects. Field *et al.* (2003) have emphasized the need for shared budgetary arrangements that would both require and encourage collaboration and coordination between different governmental agencies and departments. Such nature of shared arrangements and cooperation can thus, lead more likely to successful implementation of e-government projects (Field *et al.* 2003). However, decisions regarding funding are largely affected by top management of government who has power to make the final decisions (Weerakkody 2011). This, in consequence, can influence the implementation of e-government initiatives in both positive and negative way. Therefore, budget and funding related decisions have an essential impact on ICT related implementations.

1.2.2.6 Collaboration and coordination

According to Ndou (2004), collaboration and coordination among governmental organizations and departments play an essential role in "providing integrated online services at a single contact point" (Ndou 2004, 10). Furthermore, the successful implementation of ICT related solutions also requires collaboration and partnerships between several other parties such as private sector, research institutions, non-profit organizations, and universities (Ndou 2004; Alshehri and Drew 2010b). Collaboration, however, expects shared understandings and common aims and goals as otherwise, it might result in e-government failure (Lam 2005). Lack of collaboration and lack

of vertical and horizontal coordination (OECD 2015) between various stakeholders, particularly government organizations and public agencies, can impede coherence and therefore affect the success of implementation of e-government projects (Abu-Shanab 2015; Nurdin *et al.* 2014). Furthermore, coordination and collaboration helps to minimize silos and thus also avoid duplications, contradictions, and communication problems (Peters 2018). Hence, coordination and collaboration can lead to achievable objectives, harmonious work, increased knowledge and thus, a better e-government implementation (Nurdin *et al.* 2014).

1.2.3 Institutional and political factors

1.2.3.1 Regulations and rules

The implementation of e-government initiatives and projects requires different rules, laws, regulations and policies (Alshehri, Drew 2010a; Sarrayrih, Sriram 2015; Naidoo 2012; Bjorn, Fathul 2008) that are necessary for undertaking online activities (Ndou 2004). Supportive legal and regulatory frameworks and conducive political environment have a significant impact on the success of the implementation of e-government projects (Abbasi 2005 referred to Obegi 2016, 7). Belachew (2010) has stated that e-government strategies and national ICT policies lead to "seamless interactions between e-Government initiatives" (Belachew 2010, 51). Gupta and Singh (2014) have viewed regulatory framework and policies as an essential basis for the environment that encourages knowledge sharing and knowledge management on government online portals. In addition, formulation of e-government related laws contribute to stronger security and privacy that are essential regarding "transactions between organizations and individuals" (Ndou 2004). Thus, it can be assumed that different regulations, rules, laws, and policies play a significant role in the implementation of e-government projects.

1.2.3.2 Political will and support

Several scholars have found that lack of political will, support and strong political leadership might result in failures of e-government projects (Ndou 2004; Furufolt, Wahid 2008; Schuppan 2009; Mkude, Wimmer 2016). Political leaders have the power to decide whether an e-government initiative is necessary and receives sufficient funding or not. (Evangelidis *et al.*

2002) Therefore, the success of e-government projects depends largely on political leaders' interests, priorities, and political desires (Nabafu, Maiga 2012; Al-Busaidy 2011). Furthermore, political leaders who understand the benefits from encouragement and promotion of e-government projects tend to support similar initiatives (Alshehri, Drew 2010; Al-Busaidy 2011). Bjorn and Fatful (2008) have found that strong political leadership, political support and a concrete vision can contribute to more efficient and successful management and problem-solving processes.

1.2.4 Demand side factors

According to e-government related literature, demand side factors refer to users' (i.e. citizens' and businesses') adoption and usage of e-government and e-services (Al-Khateeb *et al.* 2015; Reddick 2005). Differently from the supply side factors, demand side factors are associated with the "perceived usefulness, perceived ease of use, interest, and trust" (Kunstelj, Vintar 2004; Hujran *et al.* 2013). However, despite of governments' ambitions directing efforts and resources into the implementation and development of different e-government initiatives and projects, the materialization of demand might not always be self-evident and certain (Reddick 2005, 54). Lack of awareness and education among e-government "customers" (Al-Khateeb *et al.* 2015, 106) can significantly hinder the adoption of e-government (Rahman *et al.* 2014) and therefore most likely lead to a failure. Furthermore, accessibility of public services (Cave *et al.* 2017), user-friendly interfaces, highly advanced authentication processes, and well-developed security mechanisms play also a crucial role in shaping the demand for e-government solutions (Ahmad *et al.* 2012). Thus it can be assumed that demand side factors similarly to supply side factors, have an important impact on the implementation of e-government initiatives and projects.

1.2.5 Key factors influencing the implementation of the OOP

Literature review demonstrated four broad category of factors that should be taken into account when trying to understand the factors influencing the implementation of e-government projects in the public sector. As the OOP is associated with disciplines such public sector innovation, ICT, and e-government, it can be assumed that the successful implementation of the OOP

depends on the synergies between all mentioned factors. However, when analysing the specificities of the OOP, some factors can be highlighted (Table 1).

First, as the OOP is related to the data exchange between different public organizations, the "inter- and intra-organizational cooperation, coordination and collaboration" can be considered crucial factors (Kalvet *et al.* 2018, 3). In order to avoid communication problems and silos, reduce public officials' resistance to change and sharing data, and increase awareness of the benefits of the implementation of the OOP, the management support and leadership can significantly support achieving these aims. Moreover, trainings of employees could contribute to better preparedness for changes in the workflows (Kalvet *et al*. 2018, 3; Cave *et al.* 2017; Gallo *et al.* 2015).

Second, the OOP is associated with several technical concepts such as information systems, registers, databases, data exchange, interoperability, and so forth. As the OOP is an e-government concept, the availability of an advanced ICT infrastructure is one of the key requirements for implementing the principle. Furthermore, in order to exchange, reuse, and update the data, it would be important to select and use technological architecture and technological systems that would support the implementation of the OOP (Cave *et al.* 2017, 163). The next factor that should not receive less attention is interoperability. Since the OOP is based on the data exchange between different organisations and their information systems, the information systems should seamlessly communicate with each other, and exchange and consistently use the data (Shiferaw *et al.* 2018). Similarly to technical interoperability, semantic, organisational and legal interoperability are also essential to highlight. All of these factors refer to the compatibility, seamless data exchange between public authorities and clear interpretation of exchanged data by other systems. Moreover, it would be essential to prioritize also ICT standards, especially open standards as these support and increase the interoperability. (Vallner *et al.* 2017) The implementation of the OOP is also associated with personal information. Therefore the lack of data protection mechanisms and incoherently defined security requirements might lead to a project failure. Hence the existence of legal acts and regulations stipulating the specific rules for a secure data exchange can contribute to avoiding such issues. (Cave *et al.* 2017, 161; Kalvet *et al.* 2018, 3) Furthermore, provision and usage of e-services

require also secured electronic identification and authentication systems that according to Cave *et al.* 2017 is an essential enabler of the OOP implementation (Cave *et al.* 2017, 166).

Third, as the OOP is associated with the provision of digital services, demand side factors such as citizens' and businesses' perceived usefulness and trust regarding e-government services can also have a substantial impact on the OOP implementation. These factors may decide whether the demand for the OOP will be modest or not. (Cave *et al.* 2017, 175; Gallo *et al.* 2015; Kalvet *et al.* 2018) Fourth, the initiation and application of the OOP need an efficient amount of public funding. Therefore the political support can play an influential role in achieving this. (Cave *et al.* 2017; Gallo *et al.* 2015; Kalvet *et al.* 2018)

When summarising the theoretical findings on the factors influencing the implementation of the OOP, the following became apparent. First, it is necessary to look at the OOP in the context of several public sector organisations and second, the implementation of the OOP requires the availability of key technological factors. Therefore it can be assumed that both organisational and technological factors play a core role also regarding the implementation of the OOP in Estonia. The research gap in the academic literature became also clear. First, a few available studies on the OOP mainly focus on the cross-border implementation. Thus there is lack of in-depth analyses and case studies on the OOP and the factors influencing the implementation of the OOP at the national level. Second, studies on the implementation of the e-government projects analysed the influencing factors in a more general way. However, differentiation between preconditions leading to the implementation of the OOP and the factors influencing the actual implementation of the OOP could develop and enrich the understanding of this topic. Therefore the following case study tries to contribute to filling the research gaps by giving a comprehensive historical overview of the implementation of the OOP in Estonia.

Table 1. Factors influencing the implementation of e-government initiatives and projects

KEY FACTORS INFLUENCING THE IMPLEMENTATION OF OOP				
TECHNOLOGICAL	**ORGANIZATIONAL**	**INSTITUTIONAL**	**DEMAND SIDE**	**POLITICAL**
ICT infrastructure; Interoperability; ICT standards; Security, privacy	Collaboration and coordination between organizations; Management support and leadership; Trainings of employees; Organizational culture	Legal acts, rules, regulations	Perceived usefulness and trust	Political support and will

Source: Author, based on literature review.

2. CASE STUDY: THE ONCE-ONLY PRINCIPLE IN ESTONIA

2.1 Research Methodology

As this thesis aims to study the implementation of the once-only principle in Estonia, the qualitative research approach was chosen. As qualitative research design helps to understand and describe the perspectives and meanings of a social or a cultural phenomenon (Astalin 2013; Maxwell 2013), this design is suitable to comprehend the main preconditions that led to the implementation of OOP as well as factors that influenced the actual implementation of the OOP infrastructure.

Due to a qualitative nature of the thesis, the case study research methodology was chosen. The main aim of the **case study** is "to thoroughly explore a real-life phenomenon (Thomas 2011, 512-513) that gives an opportunity to understand complex matters" (Zainal 2007; Yin 2009, 18). Yin (2009) highlights that the case study helps to comprehend a phenomenon in a real-life context. The relevance of the case study depends on the research questions (i.e. how and why). However, the case study research can be also suitable when the research questions "require an extensive and thorough description of a phenomenon" (Yin 2009, 4). According to Yin (2009), there can be three types of case studies, i.e. exploratory, descriptive, and explanatory. In addition, a case study can include either a single case or many cases. (Yin 2009, 5) When collecting evidence, it is possible to for example, conduct interviews, analyse documents or do observations (Alpi, Evans 2019).

The aim of this thesis is to understand the key factors that influenced the implementation of the OOP in Estonia. Therefore the thesis meets the criteria to understand and explore a phenomenon

in a real-life context. As the thesis tries to give an in-depth overview of the influencing factors, a descriptive type of a case study was selected. Although the main research question of this paper is "what", the nature of the question is not only descriptive but it also tries to understand the relationships between the phenomena (e.g. how do particular factors affect the introduction of the OOP). The thesis includes a single case and the main sources of data are interviews and documents.

There are two main reasons for choosing Estonia for the case study. Firstly, Estonia has implemented the greatest number of seamlessly working OOP use cases at the national level (Vallner *et al.* 2017, 14-16; Blau *et al.* 2015; Krimmer *et al.* 2017; Gallo *et al.* 2015, 4, 29). Secondly, Estonia is well-developed in the digital field and ranked relatively high for its various e-government and digital aspects (Kattel, Mergel 2018, 1; European Commission 2018; United Nations 2018). Therefore, Estonia can be taken as a good example for identifying both the success factors and also potential barriers. The case study helps to understand how different barriers were overcome and therefore could provide useful lessons for other countries.

2.1.1 Data Collection

For establishing validity and credibility of the research findings, it is important to find and use the information from multiple sources of evidence (Yin 2009, 18). Therefore the data collection included semi-structured interviews and document analysis. Semi-structured interviews were conducted with Estonian e-government specialists and experts, policymakers, top civil servants, ICT developers, and academics. A total of seven interviews were conducted in February-April 2019. Although the interview questions were prepared before (Appendix 1), there was also room for free discussions. Six interviews were carried out in the form of face-to-face meetings, one interview was conducted by e-mail. For recording interviews, both audio recording and written notes were used. As two of the interviewees asked to anonymise their identity, it was decided to anonymise all interviewees' identities for ensuring the confidentiality. Interview questions and list of interviewees can be found from Appendix 1. The responses of interviewees were transcribed and analysed. The analysis of interviews included reading and re-reading the interviews and finding information for example, on historical facts and stakeholders'

understanding of the important factors that influenced the implementation of the OOP in Estonia.

In addition to interviews, also a document analysis was carried out. The main purpose of the document analysis is to "systematically review or evaluate documents" (Bowen 2009, 27). In this thesis, different types of relevant documents such as studies on the OOP, policy documents, audits, research papers, media articles, and different government, legal and other documents were utilized. The document analysis aimed to complement the information found from the interviews. The document analysis included information for instance, on historical facts and the developments of the implementation of the OOP. Ultimately, document analysis is a useful way for providing information on the background and context and confirming findings from the interviews (Bowen 2009, 29-30).

2.1.2 Limitations

One limitation of the case study research is associated with the issue of generalization (Yin 2009, 15). According to Yin (2009), a single case study can be suitable for generalizing theories but not for generalizing "populations or universes" (Yin 2009, 15). It has been also found that conclusions based on a single case might fail to present the reality. Therefore in order to reach better generalisability, it is crucial to pay a special attention to an accuracy and cautiousness. (Wikfeldt 1993, 8-9) Other limitations are associated with the issue of methodological rigour and reliability. These limitations refer to a lack of systematic procedures, author's subjectivity and biased understandings. In order to reduce such risks, it is essential to use multiple methods for finding evidence, properly follow the methodology, and make conclusions in a neutral manner. (Yin 2014, 14-15; Willis 2014)

2.2 Case of Estonia

The first references to OOP in Estonia started to emerge already in the end of 1990s. Today, Estonia is the only member state in the EU that can be characterized by seamlessly working OOP cases in different domains. (Vallner *et al.* 2017; Blau 2015) However, the success has not

come without difficulties. In addition, even today, there are still some domains where OOP does not function yet and thus should be developed and improved further. Nevertheless, in comparison with other EU member states, Estonia can be still considered one of the OOP leaders. The following sub-chapters of the case study will give a detailed overview of the development of the implementation of the OOP between 1990s until the first years of 2000s. For a better understanding and structuring, different preconditions and influencing factors that led to the implementation of the OOP (1991-2000) and factors that influenced the actual implementation of the OOP infrastructure (2000-2004) have been marked in bold. The analysis of the case study ends with 2004 as by that time the beginning phase of the implementation of the OOP infrastructure ended and the further developments of the OOP began. A summarising table of the key factors (Table 2) will be presented in the end of this chapter.

2.2.1 First steps towards the implementation of OOP (1991-1997)

The first steps and preparations towards the initiation of the OOP in Estonia started already in the beginning of 1990s. Having regained independence from the Soviet Union in 1991, Estonia immediately started to focus on the development of ICT and information society (Kalvet 2001, 12; Kalvet 2007, 10; Interview I, II, III, IV, V, VI, VII). Only three years after the re-establishment of independence, Estonia created the first information strategy paper (Kalvet 2007, 10-11; Siil, Ott 2003) identifying ICT as a crucial precondition "for achieving a global economic competitiveness and integration to the European Union" (Eesti Informaatikanõukogu 1994, 3-4). Among several other topics, the strategy also indicated the issues associated with an **inadequate level** of development **of the system of registries**. By 1994, there were **22 national registers** in Estonia. (Eesti Informaatikanõukogu 1994, 11; Riiklike registrite seaduse eelnõu seletuskiri 1995) These registers were maintained in the State Computing Centre and coordinated by the Department of State Information Systems under the Government Office (Eesti Informaatikanõukogu 1994, 11). One of the main problems regarding the system of registries was related to the complexity of data collection, establishment of registries, and understanding of how databases were organized (Eesti Informaatikanõukogu 1994, 11). Another important problem was associated with **data duplication** in the registries and databases. As Estonia was a young country, there were not enough financial resources to afford the duplications. (Interview I, III) For example, until 2000, approximately 1% from the state budget

was planned for the costs of ICT development (Harjo, Kasendi 2001, 10; Krull 2003, 60) that comparing to other countries was relatively modest (Kitsing 2011, 6). Thus, in order to reduce duplications and administrative burden, save money, improve the quality of data, and mitigate the confusion regarding the system of registries, it was crucial to reduce, organise and ensure a more efficient functioning of registries (Interview I, III, IV, VI).

For achieving those aims, the government started to review the existing legislative framework. It was found that The National Registers Act of the Estonian Soviet Socialist Republic that entered into force in 1990 to regulate the state registers (Eesti NSV riiklike registrite seadus 1990) was outdated. For instance, the act was still based on the legislation of Estonian Soviet Socialist Republic. Moreover, it could not take into account ICT developments and clearly stipulate the specific requirements for establishing and keeping the registers. (Eesti Informaatikanõukogu 1994, 15; Riiklike registrite seaduse eelnõu seletuskiri 1995) Therefore in 1995 the government initiated the National Registers legislative proposal that repealed the National Registers Act and formed the basis for the new **Databases Act** (Riiklike registrite seaduse eelnõu seletuskiri 1995). The new act entered into force in 1997 (AKS 1997).

Differently from the predecessor, Databases Act was based on the Estonian government structure, formulated more specifically different definitions of databases, and stipulated concrete requirements and rules regarding the maintenance and usage of both databases and data output (Riiklike registrite seaduse eelnõu seletuskiri 1995; AKS 1997). Therefore one of the essential aims of the act was to optimize the existing system of registries and increase the availability of data. It can be said that the Databases Act was the first formal document that provided a legal basis and reference to the OOP in Estonia as according to its §20 (4), “public authorities were prohibited to keep similar or repetitive databases” (AKS 1997, Interview I, VII). Although the Database Act did not directly stipulate the requirement of asking data from citizens and businesses only once, the act was still a significant achievement in the implementation of the OOP as it enabled to move closer to the facilitation of data exchanges among public organisations.

2.2.2.1 Overview of the data exchange in the end of 1990s

In order for public authorities to complete various legislative obligations and verify the existing data they had, the Databases Act expected public institutions to share the data between each other and at the same time, to follow the rules of the **Personal Data Protection Act** (1996). At that time, the main possibilities for data exchange were either wholly or partly by automatic electronic means or by non-electronic means (AKS 1997; IKS 1996; Interview I, II).

Electronic data exchange usually occurred bilaterally between two public organisations (Harjo, Kasendi, 18-20; Arula *et al.* 2006, 19, 70). Although paragraph 12 of the Databases Act (AKS 1997) highlighted the data reuse, in reality it was rather an exception than the rule (Harjo, Kasendi 2001). According to Harjo and Kasendi (2001), by the end of 2000, only two (i.e. information systems of national treasury and tax authority) from the thirteen examined information systems were successful at data reuse. One of the main reasons for little interest in data reuse was associated with the **insufficient** and uneven quality **level of information systems**, **data security** and **data protection mechanisms**. Several other factors such as incompetence, low level of collaboration among public institutions, lack of both technical solutions and data-protection standards, and poor data compatibility also limited data reuse (Harjo, Kasendi 2001, 16-18, 33) Moreover, at that time, there was neither a national development plan for the base registries (Harjo, Kasendi, 33) nor a general strategy for e-government implementation (Kitsing 2011, 16) that would have put the concrete guidelines and plans for the future in place. As it can be concluded from the National Audits from 2001 and 2002, "most databases and information systems created between 1993 and 1999 rather focused on their own areas of responsibility than the collaboration with other public authorities" (Harjo, Kasendi 2001; Riigikontroll 2002b, 4). Therefore, silos were a common phenomenon in the public sector.

Another reason for the poor data reuse was related to existing legislation**.** Firstly, the definition and basis for the data reuse was not thoroughly and clearly explained in the Databases Act (AKS 1997; Riigikontroll 2002b, 16). Secondly, as the Personal Data Protection Act entered into force one year before the Databases Act came into force, i.e. 1996, there was no reference to the data reuse in the Personal Data Protection Act (IKS 1996) that in a way, created slight conflicts

regarding the reuse of data (Interview I, II, III, IV, VII). On the other hand, a legal basis for reusing the personal data was stipulated in the §12 (2) of Databases Act that permitted to reuse personal data under the supervisory authority of data protection, i.e. Estonian Data Protection Inspectorate. However, it can be assumed that various **privacy concerns** regarding the personal data (e.g. legal basis, information security standards, certain organisational and technical levels) made the reuse of personal data difficult and confusing. (AKS 1997; IKS 1996; Interview II, III) In addition, authorisation from the Estonian Data Protection Inspectorate and different other related processes were relatively time-consuming and bureaucratic (Interview I) that also impeded the process of moving towards data reuse. Thirdly, the Databases Act left room for interpretation. According to the law, data reuse was permitted among the databases registered in the national register of databases. However, the situation regarding other information systems of public organisations remained unclear and vague. (AKS 1997; RRS 2000; Riigikontroll 2002b) Nevertheless, although the confusion and uncertainty regarding the laws played an important role in hindering the smooth adoption of data reuse, in reality different interpretations were not considered major barriers to data reuse. Rather, some public authorities saw the interpretations as an excuse for not making an effort to further develop their information systems. However, for clarifying the legal framework, different stakeholders encouraged policy makers to **adjust the laws** in a way **that would support the data reuse** better. (Interviewee II)

A more common means of data exchange in the 1990s were simpler bilateral electronic data exchanges or data transfers through data networks. Similarly to data reuse, these means required also information systems and security mechanisms with a sufficient level of quality. (AKS 1997) For instance, some information systems that successfully exchanged data were the information systems of customs authority, social security, and land register. On the other hand, there were also cases regarding several information systems where such data exchanges did not operate adequately. For such cases, authorised personnel provided public organisations with an access to the particular databases. (Harjo, Kasendi 2001, 18-20; Interview I)

However, sometimes data sharing could not happen by electronic means. In these cases data was shared by non-automatic means via a digital or printed medium such as floppy disks, post, or telephone (RRS 2000; Riigikontroll 2002b; Interview I, II). Finally, as no formal document

forbade asking the same data several times, public institutions often requested necessary data directly from the citizens or businesses (Interviewee II). Therefore although the awareness of various rules regarding databases and data exchange was created, its practical implementation was still in the early stage of development (Oone 1999 referred to Raidmaa 2016, 15; Riigikontroll 2002a; Riigikontroll 2002b; Interview II, IV).

2.2.3 Initiation of stronger basis for OOP-based infrastructure, X-tee (1997-2000)

After the Databases Act (AKS 1997) entered into force, many databases' owners started to put a greater emphasis on the approaches on how to start exchanging the data (Interview IV). In addition, constantly developing data processing tasks required some public databases to introduce the data exchange between several other databases (Kalja 2004, 7). These reasons led to the situation where the main coordinators of ICT - i.e. the Department of State Information Systems and Estonian Informatics Centre (Riigikontroll 2005) - started to receive several applications from different public authorities to establish bilateral data links between separate databases. However, as the actual number of applications significantly exceeded the initial estimates, it was necessary to find other solutions. (Interview I, IV) It was understood that the architecture based on **bilateral agreements** was **expensive**, **inefficient**, and **time-consuming** (Odrats 2005, 17, 24; Interview I, IV, VI). Although the amount of allocated financial resources from the state budget was sufficient to achieve a relatively consistent development of **ICT infrastructure** in Estonia, there were several countries that spent at least two or three times more on ICT (Harjo, Kasendi 2001, 20, Riigikontroll 2002b, 21; Riigikontroll 2005, 10-11). Therefore, as **Estonia was not economically prosperous country**, it was crucial to find more cost-efficient and systemic solutions (Interviewee I, III, IV) instead of concluding expensive and inefficient bilateral agreements.

In addition to limited financial resources, there were also other factors that led to the understanding of the necessity of better solutions for data exchange. In the end of 1990s, many ICT infrastructure components had **different levels of security** (Odrats 2005, 32) that usually were not sufficiently secure for the electronic data exchange. Furthermore, during 1990s some

incidents that were associated with the **misuse of data** (i.e. Imre Perl's super-database[1] or lost floppy discs) occurred. Therefore, it was understood that in order to avoid such issues and ensure greater security and privacy, a highly secured system of data exchange was crucial to implement (Interview I; Veldre 2015). Moreover, due to a lack of cooperation between public institutions and very limited acceptance and implementation of data reuse, there was still a lot of unnecessary **data duplication** in different databases (Odrats 2005, 32; Interview I, II, III, IV, VII) that made the existing system more expensive and complicated. For example, the existence of two databases with same or similar data made it difficult to identify and determine the database with more authentic and suitable data for performing public duties (Interview III).

Thus in order to save costs, increase the quality and reliability of data and ensure the secure, comprehensive, efficient and systematic approach for exchanging data, there was a plan to develop a single set of **standardised solutions** that would modernize the public registries and databases (Kalja 2004; Ansper 2001; Kindel, Kivi 2010; Interview I, III, VI). In 1998, under the coordination of the Department of State Information Systems, the first preparations for initiating the data exchange layer X-tee began (Veldre 2015; Interview I, IV). In 2000, the pilot project of X-tee was established (Veldre 2015; Riigi Infosüsteemi Amet 2017; Interview I, VI). As the prototype built **trust** among government stakeholders and increased an understanding of the importance and usefulness of the initiative, Government Office, Ministry of Transport and Communications, and Ministry of Internal Affairs decided to **finance** the program. At the beginning of 2001, **several seminars and meetings** on further development ideas with various stakeholders took place. The main aim of these meetings was to develop a precise concept of the project before carrying out the public procurement procedures. Soon, the draft programme of the implementation of X-tee specifying the problem, aim of the project, and structure was submitted to the government. (Riigi Infosüsteemi Amet 2017; Interview I; VI) The public procurement processes were held in April and in May 2001 (Riigi Infosüsteemi Amet 2017) with several participants such as IBM, Microlink, and AS Assert (Kalja 2004, 12). After the winning tenderer AS Assert was announced, in December 2001 the actual implementation of X-

[1] Reference to the article: https://www.postimees.ee/2492559/imre-perli-laks-ise-politseisse-tudines-end-varjamast-politsei-delikaatne-olukord-pala-onnetuse-uurimine-tuleb-peatada-veoautojuht-ei-suuda-anda-seletusi-varastatud-suur-kogus-parkla-magnetkaarte

tee started (Riigi Infosüsteemi Amet 2017; Interview IV). With this, an infrastructure providing a stronger basis for the OOP was created.

2.2.4 Implementation and developments of X-tee (2000-2004)

The initial purpose of the X-tee was to modernize the system of national databases (Krull 2003, 62) by establishing and developing **instruments** and **mechanisms** for **secure internet-based data exchange** between public institutions and national databases (Ansper 2001, 6; Kalja 2004; Arula *et al.* 2006; Combe *et al*. 2006, 15) regardless the platforms and architecture of the information systems (Riigi Infosüsteemi Amet 2017). One of the visions of X-tee was also to focus on citizens and enterprises by giving them the opportunity to receive and provide information on the basis of legislation (Riigi Infosüsteemide Amet 2017). In addition, there was an idea on the political level to develop citizen-centred service-based thinking further (Odrats 2005). However, as the focus in 2001 was more on simple data inquiries from a single database and server solutions than on the service-based architecture that required complex data inquiry mechanisms (Odrats 2005, 37), this approach did not function yet. The main reasons for this were both the lack of supportive technology and clear understanding of the service-based architecture - such approaches were still at the very early stage and thus not widespread (Interview I, VI). Hence the development of well-functioning e-services for citizens and enterprises was in a relatively rudimentary stage (Odrats 2005; Interview I, II, III). Therefore information systems were rather designed with the convenience of public officials in mind (Arula *et al.* 2006, 11).

In 2002, the situation started to change with the development of the first governmental portal. The portal that was meant for citizens, helped to ease the communication between citizens and public institutions, private sector, and non-governmental sector by allowing them to use different e-services. Moreover, citizens had an opportunity to see and review their own personal data from the databases that had joined the X-tee. (Tänavsuu 2003; Äripäev 2003; Riigi Infosüsteemi Amet 2018) Nevertheless, the number of public e-services at that time was relatively low including only 20 e-services (Kalja *et al.* 2015, 625).

The idea of the implementation of X-tee received support among different stakeholders and the start of the actual implementation progressed relatively well. Firstly, a relatively **high political support** played an essential role in the initiation and implementation of the project. The central reasons for the support were related to a common ICT-enthusiasm and a practical need for the solution for saving costs and time, and reducing bureaucracy (Interview I, II, IV, VII; Kitsing 2011, 5-6). Nonetheless, it was still possible to notice some **resistance** among medium-level officials mainly due to a **habit of using old and familiar methods** for data exchange (Interview II, V, VI). However, courtesy of the **encouragement** of the project **by high-level officials and politicians**, some of the fears were dispelled (Interview II). For example, in order to speed up the implementation process of X-tee, in 2001, three ministers, Minister for Transport and Communications, Minister for Internal Affairs, and Minister of Justice, concluded a protocol for cooperation (Riigikontroll 2002a, 98; Interview I, II). Furthermore, **parallel discussions on** the initiation of **electronic identity** (eID) and digital signature played a crucial role in consensus-building and the development of a common understanding regarding the importance of similar projects (Interview I, IV).

In addition to the political support, there was also **support from the private sector**. For example, several commercial banks recognized the potential benefits from the implementation of X-tee, understood the importance of cooperation with public sector and therefore were interested in contributing to the project (Kalja 2004, 11; Interview I, II, IV). Internet banking, introduced in 1996, had become highly accepted and trusted by Estonian internet users (Kitsing 2011, 9). Therefore as banks were found reliable, Estonian Information Centre and the main commercial banks (e.g. Hansapank, Ühispank, Sampo Pank, Krediidipank) concluded contracts to provide the authentication and authorisation services for the users of citizens' portal (Kitsing 2011, 9; Riigi Infosüsteemi Amet 2002; Interview II, IV).

Different private companies on the other hand, were responsible for providing technical solutions. For instance, while AS Cybernetica supported with architecture and security solutions, other private sector companies helped carry out the testing of registries. (Riigi Infosüsteemi Amet 2017; Interview II, IV, VI, VII). Even IBM, one of the largest information technology companies in the world, had a strong interest in winning the public procurement

process in 2001 to provide their own software services for the X-tee. However, although IBM's proposal was well formulated, the proposed cost was extremely high. As Estonia did not have enough financial resources, the government preferred cooperation with smaller Estonian enterprises that had a **common goal** to contribute to the implementation of X-tee. (Interview II, III; Ströbele *et al.* 2017, 8) Moreover, the initiators of X-tee did not depend on the international corporations' ideas but had more flexibility to design their own solutions for the OOP infrastructure (Interview II, III).

At the beginning of the implementation process, however, **misunderstandings with** some **academics** occurred. While academics were rather interested in creating a theoretical ICT-related scheme before implementing X-tee, the Department of State Information Systems found that due to complex government systems and structure, the only reasonable way to implement the infrastructure was using the **trial and error method** that is a principle of an agile implementation. However, after several discussions, a common understanding regarding the usefulness of the **agile implementation** was still established and the cooperation among government, companies and academics was created. (Interview II)

Similarly to a support and a good collaboration, a **flexible and young legal system** with a minimal level of bureaucracy played also an important role in the implementation of X-tee (Kattel, Mergel 2018, 7; Interviewee II, III, IV, V). This allowed to prioritize and focus on the design of the ICT architecture and the actual implementation of X-tee than strictly follow rules and other legislative documents (Kitsing 2011, 8-9; Interview I, IV). Therefore it was not difficult for the initiators of X-tee to first experiment and build up a functioning system and afterwards to adapt the system to the legislation. Although there were several civil servants from the Ministry of Justice who did not find the approach legally correct (Interview I, II), in general, the Ministry supported the implementation of X-tee (Interview V). Compared to other countries, Estonian government managed relatively easily and quickly to implement acts and legislative changes that supported the development of e-government (Combe *et al.* 2006, 13). It can be assumed that high political support, common goals, a practical need for the OOP infrastructure, and an evolving legislative system contributed to the use of the flexible and experimental approach for the implementation of X-tee (Interview I).

Another important factor that facilitated the initiation and implementation of X-tee was the **personal identity code** (PIC) that allowed to identify a concrete person and different records of the person (Herm *et al.* 2006, 14). The personal identity code, introduced in 1992 during the monetary reform, led to a creation of family lists that included data about names, date of birth, and gender (The World Bank 2015, 10; Martens 2010, 214). Later, a unified and a unique personal identity code became a core element for the data exchange between public organisations (Interviewee IV, V) and also eID (Ströbele *et al.* 2017).

The launch of **ID-card** in 2002 was another factor that significantly supported the implementation and further developments of X-tee (Interview I, IV). The aim of the ID-card was not only to focus on the physical identification (Stöbele *et al.* 2017, 10) but to also provide secure and sophisticated functions of authentication, digital signatures, and electronic identification (eID) (The World Bank 2015, 25; Martens 2010, 216). As one of the purposes of the developments of X-tee was to strongly focus on the improvement of security, the eID seemed to be a more proper identification solution for the online transactions than the identification systems provided by commercial banks (Kitsing 2011, 10; Interview I).

However, despite of several drivers, the beginning of the implementation of X-tee was considered challenging (Interview I, II, III, IV, VI, V, VII). First, between 2000 and 2001 the **public funding** for ICT related costs **decreased** (Interview I; Riigikontroll 2005, 10). While in the 1990s the costs related to ICT development were centrally financed by the state budget, since 2000 the budget for ICT expenditure was included in the threshold of the budget for the ministries. Due to the new arrangement, State Department of Information Systems found it more difficult to directly target the financial resources towards different ICT development costs. (Riigikontroll 2005, 10; Interview I). In addition, in 2000 **the coordination of government ICT was moved** from the Government Office to the Ministry of Transport and Communications that in 2002 was merged with the Ministry of Economic Affairs (Riigikontroll 2005, 11). However, this arrangement led to a situation where other ministries started to associate the ICT development with only one concrete ministry. The reason for this was the lack of responsibility

for the development of their own ICT systems. This in turn decreased ministries' motivation for cooperation regarding ICT matters. (Interview III)

Second, although the infrastructure of ID-card was a significant driver regarding the implementation of the OOP infrastructure, the initial integration did not go as planned. The ID-card was meant for identifying and authenticating the users of the citizens' portal (Riigikontroll 2005, 15-16). However, as the portal had only a few e-services at that time, citizens were **not** very **motivated to use the eID**. Furthermore, the low interest in ID-cards was also caused by a lack of awareness of the opportunity. Instead, citizens rather preferred to continue using familiar authentication methods such as PIN calculators and password cards offered by banks. (Stöbele *et al.* 2017, 11-12)

Other hindering factors were related to the organisational aspects. First, there was some **uncertainty** among public organisations regarding **the legality of the electronic data exchange via X-tee**. As the first regulation on the application of the data exchange layer X-tee entered into force only in 2004 (Infosüsteemide andmevahetuskihi rakendamine 2003), the first three years of the implementation were rather characterized by experiments and testing. Such approaches made civil servants reluctant to share their organisation's data. Second, some public organisations were afraid of the wrong or misleading **decisions** that other public authorities could make with the shared data (Interview III). Furthermore, public organisations **did not** completely **understand the necessity of X-tee** and thus were not motivated to connect their registers to the data exchange layer (Interview III). In addition, many public officials were used to the existing solutions for data exchange and therefore were relatively **resistant to change their habits** (Interview II, V, VII). Finally, as in 2003 citizens got an opportunity to review their data in different registries and databases, a lot of incorrect information was identified. Due to a fear of users' criticism of the accuracy and reliability of the data, some public organisations became hesitant to share the data, which hindered the smooth implementation of X-tee (Interview I). Due to the aforementioned reasons, the number of databases that were actually connected with X-tee during the first year was approximately ten times lower than initially planned (Interview IV).

Until the end of 2003, the data exchange and data reuse via X-tee was relatively poor. Although the data exchange layer was seen as a new technological solution, its real value was not clearly understood. One of the key reasons why X-tee continued to exist and did not fail was because of intensive **promotion and marketing** during the first years of the implementation process. (Interview I, III, IV) In addition, the initiators and implementers of X-tee were eager to continuously improve the technology and solutions (e.g. improvements of security systems, creation of more popular e-services) (Interview I). Since 2004, X-tee started to rapidly develop. One of the reasons for this was the **creation of the regulation on the data exchange layer X-tee** that identified the legal basis for the implementation and development of X-tee (Infosüsteemide andmevahetuskihi rakendamine 2003).

The detailed historical overview of the implementation of the OOP between 1990 and 2004 in Estonia demonstrated that in addition to several success factors, there were also hindering factors that slowed down the application and developments of X-tee. However, Estonia was still successful with overcoming the barriers. After the regulation on the data exchange layer X-tee entered into force in 2004, the implementation of the OOP continuously intensified. Today, the OOP is a common principle for providing public services in Estonia.

DISCUSSION

The case study demonstrated numerous factors that influenced the initiation and implementation of the once-only principle (see Table 2 for a summary of the factors). The detailed historical overview of the case enabled to differentiate the preconditions that led to the development of the OOP infrastructure as well as factors that influenced the actual implementation of X-tee. The following discussion tries firstly, to highlight the most important preconditions and factors (Table 2) and secondly, to bring out possible lessons from Estonia that other countries could learn from when implementing the OOP at the national level.

Table 2. Key preconditions and factors that influenced the initiation and implementation of the OOP in Estonia

PRECONDITIONS AND INFLUENCING FACTORS THAT LED TO THE IMPLEMENTATION OF OOP (1991-2000)	**FACTORS THAT INFLUENCED THE ACTUAL IMPLEMENTATION AND DEVELOPMENTS OF THE OOP (2000-2004)**
TECHNOLOGICAL FACTORS	
● Development of the ICT infrastructure ● Existence and overview of the main registries and databases ● Inefficient system of registries (e.g. data duplication) ● Weak security systems for data protection ● Poor quality of data ● Complex and time-consuming processes regarding data sharing and data reuse	● Chosen technology for the implementation of X-tee ● Data interoperability ● Strong focus on the development of security systems and mechanisms ● Launch of ID-card ● Agile implementation, trial and error method

ORGANISATIONAL FACTORS	
• Limited financial resources for establishing bilateral connections with registries and databases – looking for cost-efficiency • Management support and leadership • Stable allocation of financial resources for ICT developments • ICT-enthusiasm • Skilled employees • Stable coordinating organisation • Lack of strong centralized management, inflexible rules and horizontal communication	• Good collaboration with private and public sector • Management support and leadership • Uncertainty and lack of awareness among public sector organizations regarding the X-tee • Path-dependency, resistance to change • Decrease in public funding on ICT-related costs • Changes regarding ICT coordination • Advanced and skilled employees
INSTITUTIONAL AND POLITICAL FACTORS	
• Political will and support • ICT-enthusiasm • Creation of Database Act – legal document supporting the OOP • Flexible and evolving legal system	• Strong political support and trust towards the solution • Databases Act (1997) • Personal Data Protection Act (1996) • Flexible and evolving legal system • Creation of the regulation on the implementation of the data exchange layer X-tee (2004)
DEMAND SIDE FACTORS	
• Practical need for the OOP infrastructure	• Practical need – public officials, citizens, private sector • Trust on the political level regarding the X-tee • Lack of awareness and uncertainty among public officials regarding the use of X-tee
OTHER FACTORS	
• Creation of personal identity code (1992)	• Existence and use of personal identity code for data exchange • Promotion and marketing of X-tee - raising awareness

Source: Author.

Similarly to theoretical findings on technological factors, the case study proved the importance of the availability of an advanced ICT infrastructure. Large investments in the development of ICT infrastructure between 1993 and 1999 gave an opportunity to establish and modernize the key elements, i.e. information systems, registries and databases, for data exchange and data reuse. According to the interviewees, one of the most crucial technological factors in the later period were the chosen technological systems and solutions for the X-tee infrastructure that were also highlighted in OOP studies. The implementation of X-tee in 2001 permitted disparate information systems to communicate with each other "regardless of the architecture or technology" (Vallner *et al.* 2017, 110). Therefore X-tee enabled data interoperability that is one of the key factors influencing the successful implementation of the OOP. It is important to also highlight the use of open standards that contributed to achieving a consistent system and helped to increase the interoperability. Furthermore, the case study also confirmed the theoretical findings in regards to the importance of security and privacy. As the OOP projects are directly related to the processing of sensitive data, the implementation of the OOP in Estonia demonstrated already in the beginning a strong focus on the development of high security requirements, authorisation and logging system (Riigi Infosüsteemi Amet 2017). The launch of ID-card (and eID) supported the implementation of X-tee by providing a secure identification service and increasing technical interoperability (Vallner *et al.* 2017) Differently from the literature, the case study highlighted a new but important factor that contributed to a successful implementation of X-tee, i.e. agile implementation and trial-and-error method. This approach increased flexibility by allowing to develop small parts of the project at the time and thus helped to anticipate possible bottlenecks. With such an approach, Estonia was ahead of time - the dominant logic in the information systems development by then was the linear sequential design process.

One of the most important organisational preconditions that led to the implementation of the OOP infrastructure was the lack of financial resources. As the establishment of numerous bilateral connections between registries and databases was too expensive for a small country with the limited resources, the need for more cost-efficient solutions was clearly understood. The implementation of X-tee successfully increased the cost-efficiency by significantly

reducing costs and administrative burden (Kalvet *et al.* 2013). The case study therefore demonstrated that the lack of money did not lead to the failure of the OOP but rather encouraged policy-makers to find creative and economically beneficial solutions. Second, similarly to several studies (e.g. Kalvet *et al.* 2018) that highlighted the importance of a good inter- and intra-organisational collaboration, this factor played also a key role in the successful initiation and implementation of the OOP in Estonia. A stable coordinating organisation (i.e. Department of State Information Systems) with a small group of motivated and qualified personnel having common ideas and goals can be one good example to illustrate this. On the other hand, a cooperation with other stakeholders (e.g. Data Protection Inspectorate, Estonian Informatics Centre, private sector companies, academics) contributed to building a shared understanding and solving the legal and technical issues. According to interviewees, lack of a strong centralized management, inflexible rules, and horizontal communication were also considered essential factors that led to the implementation and further developments of the OOP infrastructure. In addition, the top management support was not a less significant factor. For example, top managers from public sector institutions helped to gradually overcome different barriers, e.g. public officials' resistance to change, path-dependency, and uncertainty related to the new system, that slowed down the implementation of X-tee. Therefore it can be concluded that most of the findings of the case study on the organisational factors confirm the findings from literature review. However, one factor that was not concretely mentioned by scholars was a strong will and motivation to initiate and implement ICT-projects. In Estonia, this factor played a crucial role. As 1990s were characterised by ICT-enthusiasm, different stakeholders from the public and private sector wanted to strongly contribute to the development of Estonia and implement future-oriented projects regardless the smallness of the country and its limited resources.

In respect of institutional factors, the importance of the Databases Act cannot be underestimated. The act provided a legal basis for the OOP implementation and made it necessary both to exchange the data between public organizations and reuse the data. According to interviewee IV: "State system is based on so-called "lazy principle". Without coercion, public organisations would have viewed the data in their databases as their own and would have had no motivation to voluntarily share the data with other parties". Therefore as was also highlighted in the literature review, the regulatory framework contributed to a more wide and successful

implementation of the OOP. The case study also demonstrated that even a few differences between legal acts (e.g. Databases Act vs Personal Data Protection Act) led to the confusion and various interpretations that in turn, hindered the smooth data exchange and data reuse. In the later period, the creation of the regulation on the data exchange layer X-tee brought more clarity regarding the rules for implementing and using X-tee, referred to other legal acts and therefore increased the legal interoperability that according to the literature is one of the key factors for a successful implementation of the OOP. One factor that was not highlighted by the scholars but was extremely important in Estonia was a flexible and still evolving legal system. In the 1990s, it enabled to build an open space for discussions and negotiations between stakeholders that eventually led to the initiation of pilots on the OOP infrastructure. In the later period, the flexibility of the legal system enabled to primarily focus on the actual implementation process of X-tee. This made possible to create and align relevant legal rules only after having the functional technical solutions ready and. Therefore the possibility to prioritize the actual implementation of the OOP infrastructure is without a doubt a unique factor that led to the successful implementation.

Similarly to the literature review, the political and demand side factors did not receive as much attention as the technological, organisational, and institutional factors in the case of Estonia. However, some of these factors were still considered important. First, the importance of the political support and will played an essential role in the initiation and implementation of the OOP in Estonia. Mainly due to the ICT-enthusiasm, many politicians strongly supported the initiation of X-tee (e.g. concluding agreements between ministries). This gave also a clear signal to the public officials to accept the new way of thinking and switch to different systems in order to exchange and reuse the data. Second, while the literature review on the demand side factors rather focused on the citizens' and businesses' perspective, the case study of Estonia mostly demonstrated the perspective of the public officials. Although the policy-makers understood the strong need for the OOP infrastructure, it took a few years when X-tee started to gain trust among the public organisations and public officials. Due to lack of awareness of the solution, the actual benefits of X-tee were not understood. As was also shown in the literature, these factors indeed hindered the smooth implementation of the OOP.

Finally, differently from existing literature on the OOP and e-government, the case study of Estonia demonstrated the importance of a unique personal identity code (PIC) as an enabler of the OOP. As in Estonia, there is a PIC for every single citizen, the solution has significantly eased the identification processes and therefore avoided confusion and security issues.

The findings of the case study confirmed the assumptions made on the literature review. As the implementation of the OOP is related to the data reuse and electronic data exchange between public organisations, the initiation and implementation of the OOP in Estonia was to a large extent influenced by different technological and organisational factors. However, it became also clear that institutional factors are not less significant. The case study also demonstrated several context-specific factors (i.e. agile implementation, strong will and motivation to initiate and implement ICT projects, flexible legal system, limited financial resources). Therefore if a country is interested in implementing the OOP, it would be crucial to have an in-depth understanding of the context of the country (e.g. political, administrative, and legal systems). As countries are different, the practices that work in one country do not have to necessarily work in another country. Thus other countries should rather design their own context-specific solutions than copy Estonian practices. Nevertheless, it is possible to still provide with some general recommendations that other countries could take into account when implementing the OOP. For example, it would be crucial to firstly, get an in-depth overview of the existing ICT infrastructure and system of registries and information systems, if any. This knowledge would enable to make more informed decisions and plans regarding the implementation of the OOP infrastructure. Second, as it was shown, the availability of the personal identity code would significantly ease the implementation of the OOP by eliminating the confusion in regards to the identification processes. Third, a special attention should be paid to the development of security systems in order to avoid different security and privacy issues. Fourth, it is crucial to focus on the intra- and inter-organisational collaboration to build a common understanding and vision on the central aspects of the OOP (e.g. regarding ICT architecture and security systems). In order to achieve a better collaboration, it would be essential to organise different seminars and meetings that would provide an open space for discussions, negotiations and finding compromises and common understandings.

CONCLUSION

A few years ago, the European Union started to pay a strong attention to the cross-border implementation of the OOP that has now been addressed by policy and by various pan-European projects. However, there is not much research on the implementation of the OOP at the national level. This thesis aimed to fill this gap by examining the key factors influencing the implementation of the OOP in a member state that has been considered a success story. To that end, a case study of Estonia was carried out.

Due to lack of literature on the OOP, related disciplines such as public sector innovation, e-government, and ICT were taken into account to understand the factors influencing the e-government initiatives and projects such as the OOP. The findings demonstrated four broad categories of factors, i.e. technological, organisational, institutional and political, and demand side factors. By taking into account the specificities and the nature of the OOP, both technological and organisational factors seemed to influence the implementation of the OOP the most.

The case study of Estonia confirmed the findings from the literature. Some of the most important factors that influenced the initiation and implementation of the OOP were the availability of an advanced ICT infrastructure, chosen technology for the OOP infrastructure, technical interoperability, security, lack of financial resources, inter- and intra-organisational collaboration, and top management support and leadership. However, in addition to technological and organisational factors, the case study strongly emphasized also the importance of the institutional factors (i.e. supportive legislative framework). Furthermore, factors such as political support, perceived usefulness of X-tee among policy-makers, lack of awareness of X-tee among public officials, and the existence of the personal identity code were also considered

important to highlight. As the findings demonstrated several context-specific factors, it is possible to consider the case of Estonia unique. The main reasons for the uniqueness can be associated with the context of history, smallness of the country, and the stakeholders' and policy-makers' specific way of thinking in regards to the implementation of the ICT-projects.

The theoretical findings on the factors influencing the application of the e-government projects can be taken as a valuable framework for understanding the success or failure of the implementation of the ICT-projects. Nevertheless, the literature lack to explain the contextual factors affecting the implementation of the e-government projects such as the OOP. Therefore in order to get a more detailed and comprehensive understanding of the implementation of the OOP at the national level, both strands should be taken into account.

Regardless of the issues with a generalisability that a single case study might have, the findings of the case study of Estonia can be useful and beneficial as a learning process for other countries. The case study demonstrated a significant importance of the availability of the core technological components for the OOP, a successful collaboration and coordination between different stakeholders, common understandings on different aspects of the implementation of the OOP.

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APPENDICES

Appendix 1. List of interviews and interview questions

List of interviewees

1. Interview I - E-government expert, policy maker - audio record, written notes (18 February 2019)
2. Interview II - Top civil servant of Ministry of Economic Affairs and Communications - audio record, written notes (8 March 2019)
3. Interview III - Former employee of Information System Authority - audio record, written notes (8 March 2019)
4. Interview IV - E-government expert, policy maker - audio record, written notes (26 February 2019)
5. Interview V - Top civil servant of Ministry of Justice, former employee of Estonian Data Protection Inspectorate - audio record, written notes (2 April 2019)
6. Interview VI - IT developer - audio record, written notes (26 February 2019)
7. Interview VII - academic - e-mail correspondence, written notes (5 March 2019)

List of interview questions

1. What were the main reasons for starting with the implementation of the OOP-based infrastructure?
2. How important was the OOP as a principle in the development?
3. When did the first ideas and preparations for the initiation and implementation of the OOP in Estonia begin?
4. Who were the main supporters?
5. What were the key preconditions the led to the implementation of the OOP in Estonia?

6. What were the key factors that influenced the actual implementation and further developments of the OOP in Estonia?
7. What are the central benefits that can be seen from the implementation of the OOP in Estonia? Has the dynamic changed within the period?
8. Is the case of Estonia special in some way?
9. What could other countries learn from the case of Estonia?