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Integrating Digital Migrants: Solutions for Cross-border Identification from E-residency to eIDAS. A Case Study from Estonia

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Abstract. The electronic identification and trust service regulation (eIDAS) was adopted in 2014 to create a digital common market in the European Union (EU). As the world is becoming more and more digital, countries need to develop ways to integrate digital migrants. While the EU does not currently have a digital common market, several EU countries already have working systems for cross-border digital cooperation. The principal focus of this article was to address whether eIDAS can be implemented in these countries, without challenging the local initiatives. The Estonian e-government system (EES) was chosen as an exemplary case. Here we analyzed whether the eIDAS complements or challenges the national e-government initiatives, such as Estonia's e-residency project, and whether it is in the interest of member states to contribute to the fast implementation of the eIDAS as the most effective measure for achieving cross-border use of e-services. To address these questions, a content, context and process (CCP) analysis framework was used. Based on our findings, we concluded that, although the eIDAS creates some additional obligations, the regulation supports national e-government goals and domestic cross-border initiatives. Also, without supranational interference, it is highly unlikely that digital open borders could be created among 28 member states. Thus, it is in the interest of the member states to contribute to a fast implementation of the eIDAS.

Keywords: e-government, case study, cross-border e-services

1 Introduction

The mobility of European Union (EU) citizens and open borders have created an increasing need for a secure and digital common market. To guarantee the four basic freedoms of the EU, digital services will be required. Since 1999, the digital services of EU member states have been derived from a common legal framework¹, however, in reality the digital identities of the citizens of other member states have not been acknowledged. As the world is becoming more and more digital, countries need to

¹ The basis has been Directive 99/93/EC

develop ways to integrate digital migrants². Thus, the electronic identification and trust service regulation (eIDAS) was adopted in July 2014 and a framework to develop the digital common market in the EU was created. [2]

Although the eIDAS could provide digital services across the EU, alternative systems also exist. Various EU countries have different initiatives aimed at decreasing digital fragmentation, so it is important to evaluate how the eIDAS could be implemented in a way that is compatible with local initiatives. Estonia has been a pioneer in cross-border cooperation [3], being a source for cross-border electronic initiatives such as SignWise, the e-residency and bilateral cross-border mutual recognition agreements³. In December 2015, Estonia's e-residency program celebrated its first birthday by 3-fold exceeding its initial annual goal, having enrolled 7,000 members from 119 countries. Estonian Prime Minister Taavi Rõivas called the program "a pioneering move to open up our efficient digital services to anyone in the world" [4]. Here we investigate whether the eIDAS supports or undermines national measures, using the Estonian case as an example. The following research questions will be answered:

- Do the changes introduced by the eIDAS complement or challenge the domestic goals and e-government initiatives of Member States?
- Should Member States contribute to the fast implementation of the eIDAS as the most effective measure for achieving cross-border use of e-services?

To answer these questions, the key aspects of the EES, local cross-border initiatives and the eIDAS are mapped and the compatibility of the eIDAS with an existing e-government systems (ES) is evaluated. In addition to giving insight to the compatibility of the eIDAS with the local initiative, the article also aims to strengthen the theoretical knowledge with a new case study.

2 Theoretical Framework: Context, Content and Process (CCP)

Information systems (IS) are essential part of e-governing and IS theories are often used for evaluating ES and e-services. Trends in public administration are forcing governments to reengineer the administration processes and to set higher requirements on accountability of ICT-based systems [5]. Systems theory, organizational rationalism, social theory of structuration and critical theory are the most commonly employed theories in IS research [6]. Although these theories and frameworks offer a variety of analysis options, because e-government analyses encompass multiple spheres of research, a more complex, multi-faceted approach is needed [7]. CCP analysis creates **linkages between context, content and process** and enables the researcher to ask questions both from the perspective of technology and people engaged [8], ensuring

² For us (in contrast to definitions such as by Prensky [1]) we mean citizens with no legal residence in the country, but wanting to engage digitally with its public services.

³ The concepts of SignWise, e-residency and bilateral cross-border agreements are introduced in 4.2.

that important variables are not overlooked [9]. CCP analysis is used in different research areas, such as education [10], psychology and psychotherapy [11], biology [12] and management [13], but was first introduced in IS research by Symons [14]. The CCP framework offers a high level of structure [8], by breaking processes into a number of elements – **purpose** (*why*), **subject** (*what*), **timeframe** (*when*), **methodologies** (*how*) and **people** (*who*) – thus allowing the researcher to recognize a wide scope of interrelated factors [15]. This also allows the researcher to ask the correct questions and explore a wide range of influences, by inherently including social, political, cultural and economic factors [8].

Here, the CCP framework is used to assess whether it is in the interests of EU member states with existing e-government systems (e.g., the EES) to contribute to the fast implementation of eIDAS. CCP framework allows to evaluate changes through measures such as effectiveness, efficiency and understanding of the context [16], making it possible to assess whether the changes are compatible with the contexts they are implemented in. To assess the compatibility of the EES and eIDAS, the contextual dimensions introduced by Heeks [17] are used. The principal arguments of CCP framework are that changes are most likely to be accepted when the core values of organizations are not impacted [18], there are little or no substantial mismatches between contextual dimensions [17], acceptance among stakeholder is gained, there is thorough communication [9] and the timing is right [19]. The focus of the article is empirical, so the theoretical framework is not elaborated in more detail. The main purpose of the framework is to determine how to structure and analyse the data [20].

3 Methodology

To analyze the compatibility of the eIDAS in an existing e-government system, we applied a deductive approach, moving from a general theory to an explorative single case study [21]. Qualitative research design was used to analyze **linkages between causally relevant factors** and map causal paths in a given situation [22]. Although case studies can involve multiple cases, here we focus on the EES as the center of a single case analysis. Case studies focus on understanding the dynamics within a single setting [23], while also creating a basis for generalization of these results [24]. Although it can be argued that generalizability is limited when using a single case study, using a single case design highlights the contrast between case studies and clear statistical analyses [25]. Here, CCP analysis was used, including key aspects of the observed case, creating clear causal paths and explaining how the conclusions were reached.

It was important to ensure that key causal relationships would not be missed [22] and expert interviews had a substantial impact to prevent that [26]. In addition to the legal documents, reports, impact analyses, written expert opinions, notes from presentations, news and academic articles, six semi-structured expert interviews were carried out with leading experts from the Estonian e-government department. As the network of the EES is small and integrated, these six interviewees represent the main stakeholder viewpoints from the Estonian governmental sector, the private sector and e-government critics. The case of the EES is introduced in the following sections.

4 Case Study: The Estonian E-government System (EES)

As Estonia has a working ES with remarkably high usage, the Estonian case was chosen for analysis [27]. For a small state, Estonia has managed to create a remarkable image of an e-state [3, 28, 29]. In strong cooperation with the private sector [28], the principal idea has been to create a single system that could be used for all e-services, enabling the creation of low cost usable e-services. The X-road solution⁴, electronic ID cards⁵ and data protection acts are seen as the solid building blocks of the system [3]. It is important to note that the innovative services and the image of an e-state do not hold a high value in itself, unless it is visible to citizens and the services needed by citizens are actually delivered. Services such as an e-tax office and e-banking have significantly improved the convenience of Estonian citizens [27], and are used on a daily bases. According to the 2014 UN e-government survey, Estonia is ranked 15th in the list of world e-government leaders and 8th among European countries, being one of the 25 countries ranked as having a very-high-EGDI⁶. Estonia is also among the top 20 countries in online service delivery, being one of the six European countries in that list, and among the top 25 performers in e-participation [33].

4.1 The eIDAS regulation as the content of change

The content dimension allows researchers to see the substance of a planned change [13]. Here, the eIDAS is considered as that content. The current e-Signature Directive [34] has been in use for over 15 years. As the directive has substantial gaps, such as undefined obligations for the national supervision of service providers, and legal and technical cross-border interoperability issues [35], a new framework was needed and, after thorough discussions, new regulations were adopted. The new legislative solution was proposed in 2012 and adopted in 2014 [36]. The European Commission has conducted Large scale pilots (LSP) in the past, such as STORK, E-CODEX, SPOCS and E-SENS, with the aim to test the interoperability and the legality of this new framework [37]. Based on the previously held discussions and conducted pilot projects, new regulations were introduced to develop mutual recognition of electronic identification, cross-border electronic trust services and cross-border electronic

⁴ X-road is the most important environment in the Estonian e-government system, connecting different public and private e-service databases, and making the services interoperable [30]. The end user is identified with an ID card or through online banking. Public and private sector enterprises and institutions can connect their own electronic environment with x-road, and make data exchange more effective [31].

⁵ Electronic ID card is a smart card, which can be used for authentication of the card holder and for giving digital signatures and encrypt documents. Digital IDs are issued to citizens and residents of Estonia [32].

⁶ E-government development index (EGDI) is an index, which aims to view e-government development and reflect relative knowledge of best practices by analysing three dimensions of e-government – provision of online services, telecommunication connectivity and human capacity [33].

documents [38]. Some of the main ideas introduced with the eIDAS include: enhancing trust in electronic transactions by providing a common foundation for secure cross-border electronic actions; providing key enablers across borders (such as electronic IDs, documents, signatures and delivery services); creating public key infrastructure at pan-European level; identifying different assurance levels to characterize the degree of confidence of a party being identified; and establishing a general legal framework for the use of trust services. It is important to emphasize that the regulation is technology-neutral and does not seek to interfere with the electronic ID management systems and related infrastructures, which are established in member states [36].

4.2 EES as the content that is changed. Possibilities for cross-border digital cooperation

Estonia is unquestionably a pioneer of e-services [3, 28, 29]. Based on the EES, four possible models for cross-border cooperation can be described, which are introduced in following sections.

The first option (Figure 1) is forming **bilateral agreements between member states** to cooperate digitally across national borders. An example here would be the cooperation agreement between the tax offices of Finland and Estonia [31], which began in 2013 with the first digitally signed intergovernmental contract [39].

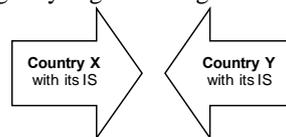


Figure 1: Forming bilateral agreements.

The Estonian e-residency project, which enables non-residents to access the same electronic benefits as the residents of Estonia, can be seen as the second option (Figure 2). Estonian aimed to be the first country to start issuing e-residency, as it was believed that the accessibility of digital services should not be dependent on the person's residency or citizenship. With digital residency, new e-residents (both from the EU and outside) receive a digital ID with a smart card identical to an Estonian electronic ID certificate, which can be used in the digital environment to identify a person and give digital signatures, using the same software as citizens do with their ID-cards [40].

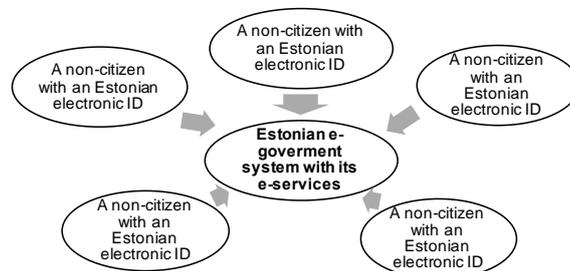


Figure 2: Enabling non-citizens to access the national e-state and use e-services.

The third option is offering **cross-border services through a neutral non-governmental body** (Figure 3). This has been done by a private sector initiative, SignWise, which is a cloud-based digital identification service, enabling people and businesses to digitally sign documents across borders by providing trusted and secure cross-border infrastructure for authentication and validation [41].



Figure 3: Enabling people and companies to digitally sign documents across borders by providing secure infrastructure.

The fourth option is a **supranational framework** (Figure 4) where, based on a principle of subsidiarity, transnational interference is seen as the most effective and efficient solution. The example here is the eIDAS, which aims to create a system of mutual recognition of Member States' national identification systems, by creating a comprehensive legal framework for both the electronic identification and authentication services [42].

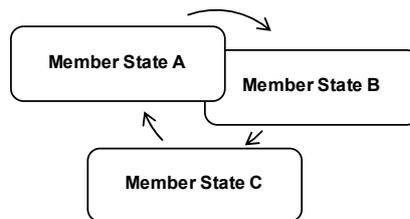


Figure 4: Supranational framework where member states recognize each other's digital IDs.

4.3 The context surrounding the change processes

E-government applications are often seen as isolated technical artefacts, but it is important to understand that their contents are always used in certain contexts [17]. In the following sections, the reasons behind the adoption of new regulation and the involved stakeholders are analyzed through the questions why and who.

Stakeholders. In the case of Estonia, a small circle of people deal directly with IS in the EES. The EES is built on a bottom-up system, with each minister being responsible for the ICT system and e-services of their field. Ministers consult public and private sector stakeholders, and based on the collected information, proposals are then presented at the national central level. [3] As the eIDAS requirements are set by the EU, the bottom-up system cannot be applied and the responsible network here is formed by the Ministry of Interior, the Estonian Information System Authority, the Ministry of Economic Affairs and Communications and the Certification Centre [3, 29]. Also, close cooperation with the private sector needs to be emphasized: electronic identity was developed clearly on the initiative of banks and telecommunication companies [28, 43],

certification services are provided solely by the private-owned SC, and most ICT services are bought in from the private sector [28].

As the networks are rather small, personal opinions and characteristics of individuals have been very important. Ideologies are often carried on from one individual to another, forming a symbiosis between personal opinions and organizational views [3]. (16) From early on, there were pioneers who wanted to develop cross-border e-cooperation, which meant that when the discussions about the eIDAS started, the question was not whether to do it, but how [3, 29]. Charismatic leadership can be helpful for supporting a clear vision and mission, but critics [44, 45] bring out that this can also lead to people following ideas blindly, as they do not actually understand the technical part of these solutions. Thus, the more extensive involvement of ICT people and critics could be beneficial [45].

Reasons for the new regulation and for accepting or repulsing the change. When adopting and implementing changes, it should be made clear why these changes are needed in the given contexts and why are they accepted or repulsed [46]. IS serves a purpose to simplify the work, enabling organizations to work better [14]. In the public services, IS are used to provide for citizens faster, more conveniently and to reduce costs [47]. In the Estonian case, efficiency has been the core driver of adopting IS [3]. Estonia has had paperless decision-making in the government cabinet since 2000, and most of the public sector services are available digitally [30]. Using digital signatures domestically has helped save 2% of GDP and governmental stakeholders believe that this number could be higher once digital IDs are acknowledged throughout the EU [3]. Although Estonia does already have a cross-border digital initiative, this does not necessarily mean that the eIDAS would be seen as a competing concept. It is clear that the Estonian initiatives could not create open borders within the 28 Member States and a two-speed Europe would not be the most desirable option. eIDAS sets the minimal requirements for cooperation but does not limit greater cooperation between strategically important counterparts [3]. Also, aligning after European principles could significantly strengthen the EES, as there are stronger requirements on security, privacy, openness and data protection at the EU level [45]. Thus, the question in Estonia regarding the development of cross-border e-services has not been whether to do it, rather how best to do it [3, 28, 29].

Categorizing contextual dimensions. Contextual divisions (information, technology, processes, objectives and values, staffing and skills, management and structures and other resources) introduced by Heeks [17] are used here to map and compare the EES and requirements introduced with the eIDAS. These divisions enable better comprehension of the scope of changes for the EES.

As mentioned before, the goals of the eIDAS coincide with the objectives and values of Estonian digital policies [3, 28, 29], thus, although some additional obligations are surely created for the EES [29], there are no substantial mismatches in the objectives and values. Regarding the technology and processes dimensions, some changes are needed. As the eIDAS aims to be technology-neutral [36] and Estonia participated in the pilot project STORK, it is believed that existing Estonian technical solutions and processes would not require significant change [3]. However, it should be noted that

the current systems were created and secured for the internal market and, when the number of users multiples, these systems would need to be rebuilt accordingly. Some auditing functions would also be required to strengthen the e-governing process [29]. At the same time, these development would also support the local cross-border initiatives [3], and critics hope that implementing the eIDAS would motivate further strengthening of the technical content [44].

More substantial changes would be needed in the divisions of information, staffing and skills and management systems and structures. The eIDAS sets several new requirements for data exchange, such as exchanging information about supervision activities and best practice [36]. Also, requirements are set on the preservation of information for electronic signatures and seals [36] and EU privacy measures are more strict [3, 45]. As Estonia is a small state, the lack of specific resources is seen as a significant barrier [3, 28, 29]. The main issue here is having too few people, but the technical and legal competencies of the existing people would also need to be developed to fulfil the eIDAS requirements [29, 45]. The lack of resources also influences the division of management systems and structures. While the EES is flexible and receptive towards change [3], the resources are lacking and the mental willingness might be insufficient [29]. Implementing eIDAS certainly creates additional tasks and financial obligations [3], but the key issue here is in the effective use of resources [29]. Also, the EU provides financial support, which should ameliorate resources insufficiencies [28].

4.4 Process of change and factors of timing

For the EES, it was clear that the directive was not working [29] and most stakeholders agreed that in order to develop cross-border cooperation, a new regulation was needed [3]. It is believed that Estonia has had more influence on the European digital policies than it would be assumed based on the size of the country [3, 29]. The same is considered true in the change process for the EES, where Estonia managed to defend its interests well while the content of regulation was worked out. The goal was that the change in Estonian domestic systems would be minimal [29]. If more had to be changed, the resistance against the eIDAS due to large investment needs would likely have been greater [43].

It has been an Estonian ambition to achieve cross-border identification measures and cross-border e-services as fast as possible, but it is clear that comprehensive changes, such as digital open borders, do not happen instantly. It is believed that the timing of the eIDAS has been good [3, 48]. Implementation of the eIDAS and the e-residency project are happening simultaneously, which makes it easier for Estonia to use its resources reasonably [3]. Simultaneous processes also create a better platform for communication, especially since the stakeholders in Estonia overlap greatly [48]. At the same time, it should be remembered that the older the systems become, the more difficult it will be to implement changes [28]. Thus, had the eIDAS been implemented earlier, there would likely have been greater flexibility [29].

Another important aspect of the change process is communication, often determining the end result [8]. As the majority of people do not understand the technical processes

behind electronic services and digital identification means, trust is essential, as are communication and branding [44]. In the case of the EES, branding has been mainly targeted outwards, to create a global e-state image [3]. Although a lack of domestic communication has drawn criticism [45], the wider communication is planned for the period of implementation [3]. The influence of the communication of the change process cannot be evaluated at this point.

5 Discussion

By analyzing the Estonian case, we aimed to answer two research questions: 1) whether the changes introduced by the eIDAS are complementary to or challenge the domestic goals and e-government initiatives of Member States; and 2) whether Member States should contribute to the fast implementation of the eIDAS, as the most effective measure for achieving cross-border use of e-services [49]. The CCP framework was used here to map and analyze the key aspects of the chosen case. In the following sections, the research questions are answered based on the theoretical framework and empirical findings.

5.1 Do the changes introduced by the eIDAS complement or challenges the domestic goals and e-government initiatives of Member States?

The CCP framework allowed us to analyze, based on the EES, whether the eIDAS complements or challenges the existing e-government solutions. It is important to note that the content of change influences the attitudes towards the change, meaning that when the core of the system is not affected, there is less resistance [18]. Also, mismatches between contextual features can cause extensive instability [49], so that comparing contextual dimensions is often key to evaluations of compatibility. If the contexts do not match, contents should be changed [17]. However, in this case, the content under observation is directly applicable. This means that any mismatches not negotiated in the development phase, will require domestic systems (contents) to be changed later. In the case of the EES, most of the identified mismatches were minor. Although there were more requirements for substantial change in the divisions of information, staffing, skills, management systems and structures, we expect that when the necessity of these changes is accepted [3, 29, 45], major resistance will be unlikely.

The second aspect under investigation was the compatibility of the eIDAS with the domestic e-government initiatives. The Estonian case shows that the eIDAS can be compatible with local initiatives. However, it should be noted that resources can be scarce (especially within a small state context), making it important to prioritize. In the Estonian case, the changes introduced by the eIDAS also supported the domestic needs and goals (e.g., the development of e-residency) [3, 28, 29]. Thus, it can be reasoned that, although the eIDAS was enforced to fulfil wider goals of the EU, by creating an open system, it also supports the development of local initiatives [3, 28, 29]. As the content does not conflict significantly with the EES, local initiatives can be developed simultaneously with the eIDAS.

5.2 Should Member States contribute to the fast implementation of the eIDAS as the most effective measure for achieving cross-border use of e-services?

As Directive 99/93/EC has proved to have substantial gaps, the eIDAS was introduced to develop secure mutual recognition of cross-border electronic identification, electronic trust services and electronic documents [38]. Developing cross-border e-services should be in the interest of Member States. However, it should be evaluated whether Member States should contribute to the fast development of the eIDAS as the most effective solution. In the Estonian public sector, efficiency is a priority and digital solutions are seen as a way to achieve it. On the domestic level, around 2% of GDP has been saved due to the use of digital signatures. It is predicted that, if digital IDs were acknowledged across borders, yet further improvements in efficiency could be made [3]. It is clear that none of the domestic solutions have so far managed to create a common digital market, so the eIDAS can certainly support efficiency by doing so.

In any successful change, maximum output should be achieved with minimum input [14]. It could be argued that, for countries that already have usable cross-border solutions, developing new system might be an unnecessary additional use of resources. At the same time, even Estonian e-governance visionaries agree [3, 28, 48] that a digital single market including 28 Member States would be impossible without the eIDAS, thus justifying the use of additional resources [3].

With a supranational framework, impact can be greater, as the partners of the EU are also influenced [29]. For example, when Directive 1999/93/EC was implemented, many of the neighbouring countries were guided by it while developing their digital signature acts. For example, Estonia passed its Digital Signature Act based on the directive, while still outside of the EU [28]. As businesses are keen to cooperate with the EU, the building of a successful digital common market should create the possibility of expanding internationally. Thus giving the EU an opportunity to create something innovative, giving stakeholders (e.g., the EES) the chance of reaching a significantly bigger market. Theoretically, the eIDAS could create a system where countries can use the best available e-services (e.g., the tax system created by one country, a pension system by another and a health register by a third) making e-governing remarkably more effective and cost-efficient. [29]

6 Conclusion

By analyzing the dimensions of content, context and process, we concluded that, despite some additional obligations imposed by the eIDAS, the regulation supports the national e-government's goals and domestic cross-border initiatives. Also, as the creation of digital open borders among 28 member states would be unlikely without supranational interference, we propose that it is in the interest of the member states to contribute to the fast implementation of the eIDAS. Still, as only the Estonian case was analysed, we cannot say that this would be the case in all member states. In future research, more cases need to be covered to make comprehensive conclusions.

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References

- [1] M. Prensky, "Digital natives, digital immigrants part 1," *On the horizon*, vol. 9, pp. 1-6, 2001.
- [2] European Commission, "Impact Assessment Accompanying the Proposal for a Regulation of the European Parliament and of the Council on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market.," Brussels 2012.
- [3] S. Sikkut, "Interview on 2015-04-13," 2015.
- [4] Estonian Investment Agency, "e-Residency Celebrated Its First Birthday," 2015.
- [5] E. Bernroider, S. Koch, and V. Stix, "A Comprehensive Framework Approach Using Content, Context Process Views to Combine Methods from Operations Research for IT Assessments," *Information Systems Management*, vol. 30, pp. 75-88, 2013.
- [6] C. Avgerou, "Information Systems: What Sort of Science is it?," London 2000.
- [7] C. A. Hardy and S. P. Williams, "Assembling e-Government Research Designs: A Transdisciplinary View and Interactive," *Public Administration Review*, vol. 71, pp. 405-413, 2011.
- [8] R. Stockdale & C. Standing, "An Interpretive Approach to Evaluating Information Systems: A Content, Context, Process framework," *European Journal of Operational Research*, vol. 173, pp. 1090-1102, 2006.
- [9] D. Self, A. Armenakis, & M. Schraeder, "Organisational Change Content, Process, and Context: A Simultaneous Analysis of Employee Reactions," *Journal of Change Management*, 7, 211-229, 2007.
- [10] E. Begler, "Wheels and Straw: Balancing Content, Process, and Context in Global Teacher Education," *Theory into Practice*, vol. 32, pp. 14-20, 1993.
- [11] F. Vaughan, "Transpersonal Psychotherapy: Context, Content and Process," *The Journal of Transpersonal Psychology*, vol. 11, pp. 101-110, 1979.
- [12] S. A. Primm and T. W. Clark, "Making Sense of the Policy Process for Carnivore Conservation," *Conservation Biology*, vol. 10, pp. 1036-1045, 1996.
- [13] J. D. Ketchen, J. Thomas, and J. R. McDaniel, "Process, Content and Context: Synergistic Effects on Organisational Performance," *Journal of Management*, vol. 22, pp. 231-257, 1996.
- [14] V. J. Symons, "A review of information systems evaluation: content, context and process," *European Journal of Information Systems*, vol. 1, pp. 205-212, 1991.
- [15] X. Song and N. Letch, "Research on IT/IS Evaluation: A 25 Year Review," *The Electronic Journal Information Systems Evaluation*, vol. 15, pp. 276-287, 2012.
- [16] D. Miller, C. Droge, and J.-M. Toulouse, "Strategic Process and Content as Mediators Between Organisational Context and Structure," *The Academy of Management Journal*, vol. 31, p. 5, 1988.
- [17] R. Heeks, "E-Government as a Carrier of Context," vol. 25, pp. 51-74, 2005.
- [18] G. Devos, M. Buelens, and D. Bouckenoooghe, "Contribution of Content, Context, and Process to Understanding Openness to Organisational Change: Two Experimental Simulation Studies," vol. 147, pp. 607-630, 2007.
- [19] E. Ongaro, "Explaining Contextual Influences on the Dynamics of Public Management Reforms: Reflections on Some Ways Forward," in *Retirement Workshop for Professor Christopher Pollitt, 29-30 March 2012*, ed Catholic University of Leuven (K.U. Leuven), 2012.

- [20] R. K. Yin, *Applications of Case Study Research*, 2 ed. Thousand Oaks: Sage Publications, 2003.
- [21] R. K. Yin, *Case Study Research. Design and Methods*, 3 ed. Thousand Oaks, London, New Delhi: Sage Publications, 2003.
- [22] J. Mahoney and G. Goertz, "A Tale of Two Cultures: Contrasting Quantitative and Qualitative Research," *Political Analysis*, vol. 14, pp. 227–249, 2006.
- [23] K. M. Eisenhardt, "Building Theories from Case Study Research," *Academy of Management Review*, vol. 14, pp. 532-550, 1989.
- [24] B. Flyvbjerg, "Five Misunderstandings About Case-Study Research," *Qualitative Inquiry*, vol. 12, pp. 219-245, 2006.
- [25] F. Mariotto, P. Zanni, and G. De Moraes, "What Is the Use of a Single-Case Study in Management Research?," *RAE: Revista De Administração De Empresas*, vol. 54, pp. 358-369, 2004.
- [26] H. J. Rubin and R. I. S., "Chapter 9: Topical Interviewing," in *Qualitative Interviewing: The Art of Hearing Data*, ed. Thousand Oaks: Sage Publications, 1999, pp. 196–225.
- [27] K. Reinsalu, "Is Estonian Local e-Government Responsive to Citizens' Needs? The Case Study of Tartu," *Information Polity: The International Journal of Government & Democracy in the Information Age*, vol. 11, pp. 255-272, 2006.
- [28] M. Pedak, "Interview on 2015-04-29," 2015.
- [29] K. Pihl, "Interview on 2015-04-24," 2015.
- [30] E-Estonia, "E-Cabinet."
- [31] Republic of Estonia Information Systems Authority, "Finland to create a data exchange layer," 2013.
- [32] C. Center, "What is Digi-ID, How Can I Get it and What Can I Do With it," 2015.
- [33] United Nations, "E-Government Survey 2014. E-Government for the Future We Want," 2014.
- [34] EP, "Directive 1999/93/EC on a Community framework for electronic signatures," 1999.
- [35] European Commission, "European Interoperability Framework for European Public Services," 2012.
- [36] European Parliament, "Regulation No 910/2014," 2014.
- [37] G. Galler, "Proposal for a Regulation on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market (eIDAS). Progress of the Legislative Process," 2013.
- [38] A. Servida, "IAS Study 2 - Stakeholders Workshop," 2015.
- [39] Estonian Government Communication Unit, "Estonian PM and Finnish PM Signed the World's First Digitally Signed International Agreement. Press release," 2013.
- [40] Parliament of Estonia, "Mitterresidentide digitaalse isikutunnistuse väljaandmine: e-residentsuse loomine. Kontseptsioon. Isikutõendavate dokumentide seaduse ja riigilõivuseaduse muutmise seaduse eelnõu seletuskirja lisa 1," 2014.
- [41] SignWise. *About SignWise*. Available: <https://www.signwise.me/EE/et/p/about/about>
- [42] Stibbe, "The New Regulation on Electronic Identification and Trust Services – eIDAS," 2014.
- [43] M. Kirsipuu, "Interview on 2015-04-20," 2015.
- [44] D. Vaarik, "Eesti kui Rajaleidja," 2014.
- [45] M. Pöder, "Interview on 2015-04-15," 2015.
- [46] M. Mahmood and J. Becker, "Effect of Organisational Maturity on End-Users' Satisfaction with Information Systems," *Journal Of Management Information Systems*, vol. 2, pp. 37-64, 1985.
- [47] M. Miyata, "Measuring Impacts of e-Government Support in Least Developed Countries: Case Study of the Vehicle Registration Service in Bhutan," *IT For Development*, 17, pp. 133-152, 2011.
- [48] K. Korjus, "Interview on 2015-04-24," ed, 2015.
- [49] C. Pollitt, "Public Management Reform: Reliable Knowledge and International Experience," 3, 121-136, 2003.