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Digital Health Beyond Borders: Interoperability Challenges and Critical Success Factors in the Deployment of Cross-border ePrescription in Finland and Estonia

Master Thesis

at the Chair for Information Systems and Information Management
(Westfälische Wilhelms-Universität, Münster)

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Date of Submission: 2021-08-09

Content

Figures

Tables

Abbreviations

CBS	Cross-border Services
CEF	Connecting Europe Facility
CH	Connected Health
DG SANTE	Health and Food Safety, European Commission
eHDSI	eHealth Digital Service Infrastrcuture
EHIF	Estonian Health Insurance Fund
eHMSEG	eHealth Member States Expert Group
eIDAS	Electronic Identification and Authentication Service
EIF	European Interoperability Framework
epSOS	Smart Open Services for EU Patients
EU	European Union
GDPR	General Data Protection and Regualtion
HIT	Health Information Technology
ITPOSMO	Information, Technology, Processes, Objectives, Staffing, Management, and Other Resources
Kanta	Finland's National Patient Portal
Kela	Social Insurance Institution of Finland
MAXQDA	Qualitative Data Analysis Software
MS	Member States
NCP	National Contact Points for eHealth
SM	Estonian Ministry of Social Affairs
STM	Finnish Ministry of Social Affairs and Health
TEHIK	Health and Welfare Information Systems Center
THL	Finnish Institute of Health and Welfare

Acknowledgement

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1 INTRODUCTION

The need for cross-border cooperation has significantly increased in the recent years due to the evident progress made by the European integration which means creating a huge impact not only in the freedom, flow, and exchange of labor, goods, services, and capital but also in strengthening the provision of public services in a cross-border setting (De Sousa, 2013). In the European Union, there is an increasing interest and effort by the member states in the standardization of processes and systems for the delivery of cross-border public services to governments, citizens, and businesses (Navarette et al., 2010).

Although the digital single market has created a wide array of incentives and opportunities, there are still many stumbling blocks to workers, patients, or citizens across the border in provision of health services (De Sousa, 2013). The political, economic, social, and cultural environments of border regions have become a barrier to governmental collaboration and interactions (Navarette et al., 2010).

The European Commission (2019) reported that "there are over 2 million recorded instances every year where a citizen living in one Member State has sought healthcare in another" (p.1). However, most citizens in the EU cannot yet access nor securely share their health data across borders and the uptake of digital solutions for health remains slow and varies across the member states and regions (European Commission, 2019). In addition, it has been reported that many of the formats and standards in eHealth record systems are incompatible. As a result, this lack of interoperability in eHealth services and applications leads to fragmentation and a lower quality of cross-border healthcare (European Commission, 2019).

Due to people becoming more mobile, the need for e-services to be available outside the country's borders is growing. As a result of the active cooperation in e-governance, Estonia and Finland are the first countries to launch a service enabling the purchase of medicinal products in another country via a digital prescription (Kond & Lillevali, 2019).

Patients in Finland and Estonia can use digital prescriptions issued by their physicians when visiting a pharmacy. Both countries have signed an agreement that enables this cross-border exchange of ePrescriptions (Kohl, 2019). The ePrescriptions exchanged between Estonia and Finland are visible electronically to participating pharmacists in the receiving country via the new eHealth Digital Service Infrastructure (eHDSI). Due to this novelty, patients will no longer have to provide a written prescription. This is in line with the policy on Digital Health and Care, which aims to empower patients by giving access to their health data and ensuring continuity of care (European Commission, 2019).

1.1 Research Gaps

In order to ensure the safe implementation of cross-border ePrescription specifically patient safety and data protection, under the eHealth Network directive, the Member states should "undertake assessment activities, such as measuring the quantitative and qualitative possible benefits and risks (including economic benefits, risks and cost-effectiveness) of ePrescription services" (eHealth Network, 2016, p. 9). It has been pointed out that Member States should "assess progress on legal, organisational, technical and semantic interoperability for their successful implementation" (eHealth Network, 2016, p. 9). There is a "very little research has been done regarding the process and results of implementing the e-prescription" and "future nationwide e-health services should have a more rigorous evaluation process carried out during the design and implementation stages" (Parv et al., 2014, p.1). It has been reported that "it is a fact that despite favorable attitudes toward both cross border e-prescriptions and patient summaries, multiple perceived barriers impede its incorporation and integration in clinical practice" and Member States have "varying degrees of health care policy, privacy enforcement and laws concerning data protection, telecommunication services and digital signature with regards to ePrescriptions and patient summaries" (Katehakis et al., 2016, p. 480).

1.2 Research Questions

In order to study the research gaps in the interoperability of cross-border digital healthcare services, this research seeks to answer the following:

(1) How do the governments of Finland and Estonia overcome the constraints and challenges in the interoperability of cross-border ePrescription?

(2) What are the critical success factors and drivers in the deployment of cross-border ePrescription?

The overall goal of this paper is to identify, describe, analyze, and map out the challenges, constraints, drivers, and critical success factors in the interoperability and deployment of cross-border ePrescription service in Finland and Estonia. This study is being pursued in order to provide practical information to other digital governments that are yet to adopt this breakthrough.

This research is exploratory in nature and the research strategy being used is a case study. The data collection, furthermore, was done in multi-method by which semi-structured interviews were conducted and secondary sources were gathered to reinforce the primary findings. A total of eight (8) key experts were interviewed from the identified key agencies in Finland and Estonia. Interview data was analyzed using MAXQDA software.

2 LITERATURE REVIEW

This chapter provides a comprehensive discussion on European integration, cross-border services, integration and interoperability in eHealth, EU's digital health programs, eHealth Network and eHealth digital service infrastructure, cross-border digital prescription in Finland and Estonia, and key agencies of both countries primarily involved in the cross-border exchange of health data. The last section presents a review of critical success factors, driver, and barriers in eHealth adoption and implementation.

2.1 European Integration and Cross-border Cooperation

The EU integration, establishment of the digital single market, and abolition of border controls have led to increasing opportunities and regional cooperation programmes funded by the EU (De Sousa, 2013). As De Sousa (2013) further elaborated, the need for cross-border cooperation has significantly increased due to the evident progress as a result of European integration which means creating a huge impact not only in the freedom, flow, and exchange of labor, goods, services, and capital but also in strengthening the provision of public services in a cross-border context. Cross-border movements of all types have become the focus of creating a pan-European programs and projects.

By definition, *cross-border cooperation* is "any type of concerted action between public and/or private institutions of the border regions of two or more states, driven by geographical, economic, cultural/identity, political/ leadership factors, with the objective of reinforcing the good neighborhood relations, solving common problems or managing jointly the resources between communities through any cooperation mechanisms available" (De Sousa, 2013, p. 673).

Keating (1998) explained that cross-border initiatives have a functional basis because the cooperation efforts and solutions address common problems and opportunities that have a strong political component for expanding to a wider stage and escaping national restrictions but this depends on a variety of factors such as political dynamics as well as the attitude of national and local governments (as cited in De Sousa, 2013). When the exchange and flow of labor, skills, and resources become increasing important, the more agencies and countries interact with each other and the more they need organizational capacity, human resources, technological development, and policy integration in order to facilitate their interactions.

Although European integration has provided a wide array of benefits and opportunities for cross-border cooperation, there still exists many visible and non-visible barriers that impede the implementation of a new tier of shared governance (De Sousa, 2013).

2.2 Challenges in the Design and Integration of eHealth

Van Germert-Pijnen et al. (2011) reported that many eHealth solutions are not successful in attaining sustainable innovations in healthcare because the current development of eHealth technology fails to consider the interdependencies between technology, human characteristics, and the socio-economic environment. This results to a low impact in healthcare practices which can be attributed to a mismatch between the expected benefits and actual outcomes that a lack of evidence about the impact of eHealth is apparent (van Germert-Pijnen et al., 2011). Standing and Crisps (2015) revealed that the barriers to the adoption of eHealth continue to exist because many health authorities consider these as difficult to address. Identified barriers in the integration of cross-border digital services include incompatible infrastructures, heterogenous communication networks, complex applications, and diverse database designs and data models (Navarette et al., 2010).

Introducing eHealth solutions into the healthcare system requires careful attention in the communication, participation, and collaboration among end users, patients, healthcare professionals and others. Integrating processes, systems, and resources across organizational boundaries relies heavily on the creation and maintenance of collaborative networks (Navarette et al., 2010). In order to overcome the challenges around the design and implementation of eHealth, a holistic approach is needed by taking into account the complexity of healthcare and the varied needs and interests of stakeholders (van Germert-Pijnen et al., 2011).

Most citizens in the EU cannot yet access nor securely share their health data across borders and the uptake of digital solutions for health remains slow and varies across the member states and regions (European Commission, 2019). In addition, it has been reported that many of the formats and standards in eHealth record systems are incompatible. As a result, this lack of interoperability in eHealth services and applications leads to fragmentation and a lower quality of cross-border healthcare (European Commission, 2019).

2.3 Cross-border Healthcare in the EU

The exchange of electronic health record in EU within and across borders has a number of benefits: “an improvement in the quality of care for citizens, reduction in the cost of health care to households, and it supports the modernisation of health systems in the Union that are under pressure from demographic changes, rising expectations and costs of treatment” (European Commission, 2019, p. 1). It is expected that health care needs will increase in the future because of rising prevalence of chronic conditions, population ageing, and increasing demand for long-term care (European Commission, 2019).

The Commission (2019) has established a set of principles that would guide the electronic exchange of health records which means that eHealth solutions should be: (1) citizen centric by design, (2) comprehensiveness and machine-readability, (3) data protection and confidentiality, (4) consent or other lawful basis, (5) auditability, (6) security, (7) identification and authentication, (8) continuity of service.

In addition, the secure access and sharing of health records across borders in the EU are important for citizens who are working or living as retired people in another country (European Commission, 2019). The European Commission (2019) highlighted the need to make eHealth systems "more interoperable in order to give citizens greater control over their health data" (p. 2). The provisions and principles being set under the General Date Protection Regulation (GDPR) and the use of electronic identification and authentication service (eIDAS) complement the cross-border exchange of health data in maintaining the highest standards for a safe and secure access and trust in the use of eHealth systems.

In order to support the development of eHealth systems, facilitate cooperation, and making health services and applications interoperable, the Member States established the eHealth Network with the support of the Commission. The Member States participating in the eHealth Network have worked together with the Commission to build the eHealth Digital Services Infrastructure (eHDSI) which is supported by the Connecting Europe Facility (CEF) Programme. Through the eHDSI, the exchange of health datasets across borders such as ePrescriptions, Patient Summaries, laboratory results, medical imaging and reports, and hospital discharge reports is now possible and being implemented across the member states and regions (European Commission, 2019). The purpose of setting up this infrastructure and facility for electronic exchange of health records is to enhance the continuity of care among EU citizens. The Commission also released various set of principles and a set of common technical specifications for cross-border exchange of data specific for each of the health information domain (European Commission, 2019).

The Commission's eHealth Network has developed a common framework for managing the interoperability specific in the eHealth domain and this is referred as the refined eHealth European Interoperability Framework (European Commission, 2019). The baseline for a European electronic health record exchange format also referred as the *health information domains for cross-border exchange* consist of:

- Patient summary
- ePrescription/ eDispensation
- Laboratory results
- Medical imaging and reports
- Hospital discharge reports

The goal of this exchange is to “deliver the right data, at the right time – for citizens and healthcare providers and allow for the secure access, sharing and exchange of electronic health records” (European Commission, 2019, p. 4).

Under the 2011 cross-border healthcare directive, Member States should implement the “rules for facilitating access to safe and high-quality cross-border healthcare” and to “ensure that mechanisms for the protection of patients and for seeking remedies in the event of harm are in place for healthcare provided on their territory” (Official Journal of the European Union, 2011, p. 48).

2.4 Cross-border ePrescription and eDispensation

The purpose of cross-border ePrescription and eDispensation is to “support the processes of prescription and dispensation through the electronic exchange of supporting data for citizens who are travelling inside Europe, where a patient from Country A (the patient’s country of affiliation) is seen in another Member State Country B (the country of treatment)” (eHealth Network, 2016, p. 5). In both medical and economic perspectives, the use of this cross-border service has various benefits in heightening the quality of care, improving patient safety when citizens are travelling abroad and decreasing the effort of gathering or exchanging health information (eHealth Network, 2016).

ePrescription is defined as “a prescriber's ability to electronically send an accurate, error-free and understandable prescription directly to a pharmacy from the point-of-care” (eHealth Network, 2016, p.5). On one hand, **eDispensing** is “the act of electronically retrieving a prescription and reporting on giving the medicine to the patient as indicated in the corresponding ePrescription” (eHealth Network, 2016, p.5).

In cross-border events, the following information is retrieved and collected: the *consent* (information about patient’s consent), *prescription* (information necessary to prescribe the medication), *dispense* (information about the dispensed medicines) (eHealth Network, 2016). The end users of this cross-border service are patients, prescribers, and dispensers. **Medicinal product** is defined as “any substance or combination of substances presented as having properties for treating or preventing disease in human beings or any substance or combination of substances which may be used in or administered to human beings either with a view to restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action, or to making a medical diagnosis” (eHealth Network, 2016, p.5). According to eHealth Network (2016), “there is a need to define the electronic requirements applicable to the seamless identification of the patient, of the prescribing health professional and of the health product” (p.7).

In addition, the National Contact Points (NCP) for eHealth are the focal point of a member state responsible for setting up their national ePrescription services for cross-border use cases and the main national organization "responsible for the proof of authenticity of origin and content of ePrescriptions" (eHealth Network, 2016, p. 8).

Along with ensuring the rights of the patients, the Directive establishes a network of National Contact Points (NCP) and obliges them to provide the necessary and complete information on cross-border healthcare services. The adopted legislation similarly elaborates on the list of the medical prescriptions available for cross-border medication dispensation. Recognizing the previous achievements of cross-border cooperation in the context of eHealth, the Directive encourages further collaboration among the EU member states by creating seamless healthcare services for the EU residents and enhancing the interoperability of the national solutions.

In the context of providing seamless integration of healthcare systems and health services that require the collaboration of various actors, eHealth interoperability is defined as "facilitating and safeguarding the exchange, understanding and acting on patient and other health information and knowledge among linguistically and culturally disparate medical professionals, patients and other actors within and across health systems in a collaborative manner" (Stroetmann & Artmann, 2014, p. 7).

With the purpose of regulating eHealth development and ensuring consistency of member states in the matter of healthcare digitization, the EU established an overarching legislation to create a single legal space for collaboration. The EU Directive outlines the major conditions of cross-border healthcare functioning, setting a guideline under which a patient can access health services and consecutive reimbursement (Official Journal of the European Union, 2011).

The eHealth Network emerged upon adoption of the Directive on the application of patients' rights in cross-border healthcare (Official Journal of the European Union, 2011). The eHealth Network's main objective is "to support the development of sustainable eHealth systems, services and interoperable applications, facilitate cooperation and the exchange of information among Member States, enhance continuity of care and ensure access to safe and high-quality healthcare" (European Commission, 2019, p. 4).

2.5 Review of Success Factors, Drivers, and Barriers in eHealth

In order to understand the critical success factors and challenges in eHealth solutions and health information technology (HIT), the researcher reviewed related research papers on the drivers, enablers, barriers, constraints, and inhibitors in the success of digital health.

Critical success factors are the key elements that have significant influence in attaining the desired goals of an organization and these can be viewed as the areas of activity that should be dealt with constant and careful attention (Nguyen et al. 2014). These factors greatly assist the organizations in focusing on the right priorities to enable success in the implementation of digital health solutions.

(1) De Sousa (2013) highlighted that there a combination of various facilitating factors for effective cross-border cooperation such as economic, political leadership, cultural identity and state formation, and geographical factors and these factors greatly influence the degree of cross-border cooperation and organization. It has been conveyed that countries seek cooperation efforts and joint agreements because there is an overlap of interests, a shared historical memory, a strong interdependence between two regions due to geographical or economic factors, and a political objective for future joint action (De Sousa, 2013). De Sousa (2013) believed that geography is typically the most important driver to cross-border cooperation as it forces neighboring authorities to negotiate, implement, and administer joint projects.

(2) Nguyen, Saranto, Tapanainen, and Ishmatova (2014) identified 16 success factors for health information technology (HIT) implementation. These factors were categorized based on the point of view of the interest groups such as end users, leader, implementers, organization, vendors, and other stakeholders. (1) In the level of end-users, success factors consist of training and technical support, end-user participation and involvement, assigning of a project champion or change agent, incentives, regulations/policies, quality of system, information and service, and infrastructure quality. (2) For the leaders' point of view, drivers include sufficient resources, commitment, and support. (3) For the implementers, project management and planning and the performance of the project team are considered as enablers. (4) In the level of the organization, the key drivers are cooperation and collaboration among administrative, IT and clinical functions, co-development of system and workflow, and openness of the organization to change and innovation. (5) For the vendors level, collaboration with vendors is important. The success factors are being assigned to different interest groups participating in the deployment of eHealth solutions. Figure 1 illustrates these success factors.

Figure 1 Critical success factors in different perspectives/ stakeholders (Source: Nguyen et al., 2014)

(3) Kaye, Kokia, Shalev, Idar, and Chinitz (2010) reported various barriers in health information technology namely lack of clear benefits, lack of sufficient incentives, inadequate support for clinicians, marketplace competition, and privacy legislation. In contrast, critical success factors are innovative leadership, integrated management, and collaboration with the doctors based on concrete needs, benefits, incentives, and support. Their study emphasized the importance of solving problems in eHealth applications by maximizing the potentials of multidisciplinary teams and the process of organizational change needed to focus on the benefits of digital health (Kaye et al., 2010).

In addition, Kaye et al. (2010) identified a typology of barriers such as (1) financial and business barriers (i.e. absence of solid evidence of the economic impact of eHealth, lack of clarity regarding cost-benefit to stakeholders, absence of financial rewards), (2) structural barriers (i.e. lack of standardization for health IT systems, lack of system and data interoperability, regulations relating to health data, privacy and confidentiality as they restrict the sharing of patient data among service providers), (3) cultural barriers (i,e, clinicians perception about health IT as time-consuming, fear that it will depersonalize healthcare, perception as a threat to patient privacy and confidentiality), (4) technical and professional barriers (i.e. lack of professional workforce and expertise in eHealth implementation, lack of strategic organizational process).

On one side, critical enabling factors in eHealth implementation are innovative leadership and collaboration with clinicians (Kaye et al., 2010). Other drivers include the decision to invest in health IT, integrated responsibility (i.e. integrating active organizations responsible for developing and managing the system), clear identification of concrete needs and the goals to be achieved, clear strategy and organizational process (Kaye et al., 2010).

(4) De Felice and Petrillo (2014) proposed an integrated performance measurement system to evaluate the access to healthcare and success factors in eHealth in a balanced scorecard framework. They proposed a set of indicators in order to assess the strategic performance of the eHealth system namely *financial, customer, internal business, and learning and growth perspectives* in a balanced scorecard approach (De Felice & Petrillo, 2014). These indicators are focused on the quantitative measures involving the numbers and percentages of potential gains that have increased or reduced. They highlighted the importance of comparing the costs and effectiveness of eHealth services in order to determine if it is convenient to adopt the e-service.

According to De Felice and Petrillo (2014), the performance measures in the financial perspective are the number of project milestones and budget reviews, cost per project, and increased number of eHealth services. In the customer perspective, performance measures include increased user confidence in the e-services, percentage of stakeholder participation in projects, increased user satisfaction with effectiveness and efficiency of the eHealth system (De Felice & Petrillo, 2014). In the internal business perspective, measures consist of number of inquiries, RD expense/total revenues, reduced average time to resolve problems (De Felice & Petrillo, 2014). Lastly, the learning and growth perspective includes number of IT training programmes attended by staff and employee satisfaction.

(5) Standing and Crisps (2015) identified barriers in the adoption of eHealth such as the wide range of stakeholders with varied interests and objectives, and the risk-aversive environment because of the critical nature of patient care and being overwhelmed due to the complexity in the management and transformation of information communication technology. On the other side, the critical success factors are classified according to the type of system, stakeholder involvement, vision and strategy alignment, communication and reporting, process implementation, consideration of IT infrastructure and other factors (Standing and Crisps, 2015).

(6) Chouvarda et al. (2019) proposed an assessment framework for evaluating the connected health (CH) services which has the following components: CH service, enabler, barrier, service description, outcome, value proposition, and user. This provides an holistic approach for integrated services. In addition to the authors came up with five elements to describe the CH service such as its function, process, primary goal, evidence level, and control (Chouvarda et al., 2019). There are contextual factors that must be considered such as geographical, social, demographics, human factors, educational, regulation, interoperability, contexts where the connected health systems are particularly deployed (Chouvarda et al., 2019). There are 3 main value propositions of a connected health solution such as the *desirability* for all involved users, *feasibility* both technical and organizational, and *viability and sustainability* through a supporting ecosystem involving integration and collaboration of stakeholders (Chouvarda et al., 2019). Barriers and enablers occur at various levels that are specific to individual, organizational, and technical levels.

(7) Granja, Janssen, and Johansen (2018) systematically reviewed the factors influencing the outcome of eHealth interventions in terms of success and failure. The study revealed that the commonly mentioned contributing success of eHealth interventions can be attributed to the quality of care while the factor that leads to failure are the costs (Granja, Janssen, & Johansen, 2018). The authors suggested that there are three pillars of care that are important areas to be assessed namely access, quality, and cost containment. The categories of success and failure are based on various entities in eHealth interventions. In the level of patients, the success factor is patient empowerment and self-management while privacy and security are factors behind the failure of eHealth solutions. In the level of healthcare professionals, the contributing factor to success is the quality of healthcare while workflow is seen as barrier to success. Lastly, in the health system, costs policies influence success while costs can be inhibitors.

(8) Rahimi, Vimarlund, and Timpka (2009) identified factors that are important for the implementation of health information system. These factors can be classified into: (1) strategic actions (management involvement), (2) tactical actions (system integration in healthcare and workflow), (3) operational actions (user involvement, establishing compatibility between software/ hardware, education, and training) (Rahimi, Vimarlund, & Timpka, 2009).

Table 1 provides a matrix of all the research papers reviewed identifying the critical success factors, drivers, challenges, and barriers.

Table 1 Review of Critical Success Factors and Challenges in the Implementation of Digital Health

Research Papers Reviewed	Critical success factors, enablers, and drivers in eHealth implementation and integration	Types of Challenges, Barriers, and Inhibitors in eHealth implementation and integration
Chouvarda et al. (2019) *Focus:* connected health (CH) services	• **Connected health service** (function, process, primary goal, evidence level, and control) • **Value proposition** (desirability for all involved users, feasibility both technical and organizational, viability and sustainability through a supporting ecosystem involving integration and collaboration of stakeholders) • **Enablers at individual level** (consumer education, consumer motivation, provision of incentives) • **Enablers at organizational level** (cost-saving strategy, integration of services, guideline support and contracting strategies) • **Enablers at technical level** (platform independence, data integration, data interchange and privacy awareness)	• **Barriers at individual level** (digital literacy, usability, lack of incentives, technology acceptance, awareness, conflicting interests and costs) • **Barriers at organizational level** (regulations, reimbursement systems, care model sustainability, stakeholder involvement, lack of evidence, contracting strategies and political constraints) • **Barriers at technical level** (lack of standardization and data security concerns)
Standing & Crisps (2015) *Focus:* eHealth adoption	• User/stakeholder involvement • Vision and strategy alignment • Communication and reporting • Process for implementation and integration • Plan for ICT infrastructure • Contextual factors (differences in culture, government policy, management styles, and work practices)	• Wide range of stakeholders with different objectives • Risk-aversive environment because of the critical nature of patient care • Being overwhelmed due to the enormity and complexity of IT transformation
De Sousa (2013) *Focus:* cross-border cooperation	• Economic factors • Political leadership • Cultural identity and state formation • Geographical factors	

Kaye et al. (2010) *Focus:* health IT implementation	• Innovative leadership • Collaboration with clinicians • Decision to invest in health IT • Integrated responsibility (integrating active organizations responsible for developing and managing the system) • Clear identification of concrete needs and goals to be achieved • Clear strategy and organizational process	• **Financial and business barriers** (i.e. absence of solid evidence of the economic impact of eHealth, lack of clarity regarding cost-benefit to stakeholders, absence of financial rewards) • **Structural barriers** (i.e. lack of standardization for health IT systems, lack of system and data interoperability, regulations relating to health data, privacy and confidentiality as they restrict the sharing of patient data among service providers) • **Cultural barriers** (i.e. clinicians perception about health IT as time-consuming, fear that it will depersonalize healthcare, perception as a threat to patient privacy and confidentiality • **Technical and professional barriers** (i.e. lack of professional workforce and expertise in eHealth implementation, lack of strategic organizational process)
Nguyen et al. (2014) *Focus:* health IT implementation	• **End-users** (i.e. participation and involvement, training and support, project champion, incentives and regulation, quality of information, service, and system, quality of infrastructure) • **Leaders** (i.e. lack of standardization for health IT systems, lack of system and data interoperability, regulations relating to health data, privacy and confidentiality as they restrict the sharing of patient data among service providers) • **Implementers** (i.e. performance of the project team, project management and planning) • **Organization** (i.e. co-development of the system and workflow, openness of the organization to change and innovation, cooperation and collaboration among IT, administration, IT, and clinical functions) • **Vendors** (i.e. collaboration)	

De Felice & Petrillo (2014) *Focus:* e-Healthcare system evaluation	• **Financial perspective** (i.e. increased number of eHealth services, cost per project, number of project milestones and budget reviews) • **Customer perspective** (i.e. increased user satisfaction with effectiveness and efficiency of the e-healthcare system, increased user confidence in the e-services, percentage of stakeholder participation in projects) • **Internal business perspective** (i.e. reduced average time to resolve problems, number of inquiries, RD expense/total revenues) • **Learning and growth perspective** (i.e. number of IT training programs attended by staff, employee satisfaction)	
Granja, Janssen, & Johansen (2018) *Focus:* eHealth interventions	• **Patients' level** (patient empowerment and self-management) • **Healthcare professionals' level** (quality of healthcare) • **Health system level** (costs policies)	• **Patients' level** (privacy and security) • **Healthcare professionals' level** (workflow) • **Health system level** (costs)
Rahimi, Vimarlund, & Timpka (2009) *Focus:* health information system implementation	• **Strategic actions** (management involvement) • **Tactical actions** (system integration in healthcare and workflow) • **Operational actions** (user involvement, establishing compatibility between software/ hardware, education, and training)	

3 THEORETICAL AND CONCEPTUAL FRAMEWORKS

In order to understand the challenges and constraints in eHealth interoperability and analyze the critical success factors in the deployment of cross-border ePrescription, the researcher used a combination of theoretical and conceptual frameworks. Additionally, this paper presents a review of frameworks in interoperability in digital health, success and failure in eGovernment projects, cross-border collaboration, and public value creation. At the end, the researcher proposes an integrative model that serves as lens to analyze the cross-border health service which helps answer the research questions.

3.1 Multinational eGovernment Collaboration

Navarrete et al. (2010) proposed an integrative model which has four perspectives in understanding the factors that affect the multinational collaborative networks such as (1) collaboration, (2) value network models, (3) cross-border regions, and (4) data integration and interoperability.

In the first perspective, there are a set of factors that affect the collaborative networks. This includes *the number and variety of participant entities* which entail that there should be clear definition of roles and responsibilities in the membership and participation in the network, *initial disposition toward cooperation* which means establishing trust in the negotiations, *institutional design* by establishing the rules that guide the collaboration, *facilitative leadership* in managing the collaboration process, *strength and richness of incentives* that reinforce people to cooperate, and *power and resources imbalances* in making sure that each partner has equal status and fair share of power. (Navarrete et al., 2010). These factors affect the strength and trust in a collaborative network.

For the second perspective, factors affecting the value of a network greatly depend on the *roles* of the individuals and organizations, *transactions* or activities that add meaning and contribute to the goal, and *deliverables* both tangible and intangible resources that produce positive outcomes and efficiency within the network (Navarrete et al., 2010).

The third perspective deals with the *cross-border factors* such as the market forces and trade flows which includes the flow of people, skills, labor, and investments across borders, the policy activities of multiple levels of governments, the political entities that influence border relations, and the culture of borderland communities like common language, cultural differences, and socio-economic resemblances (Navarrete et al., 2010). The fourth perspective revolves around the challenges and constraints in the integration and interoperability of eGovernment projects and initiatives such as legal, organizational, financial, technological constraints, among others (Navarrete et al., 2010).

The four perspectives of the multinational collaborative networks proposed by Navarrete et al. (2010) will be used as a reference in this research to understand various factors affecting the success of cross-border ePrescription by looking closely at the nature of cross-border collaboration, value networks, and integration between Finland and Estonia. Figure 2 presents a model for the various factors in eGovernment collaboration.

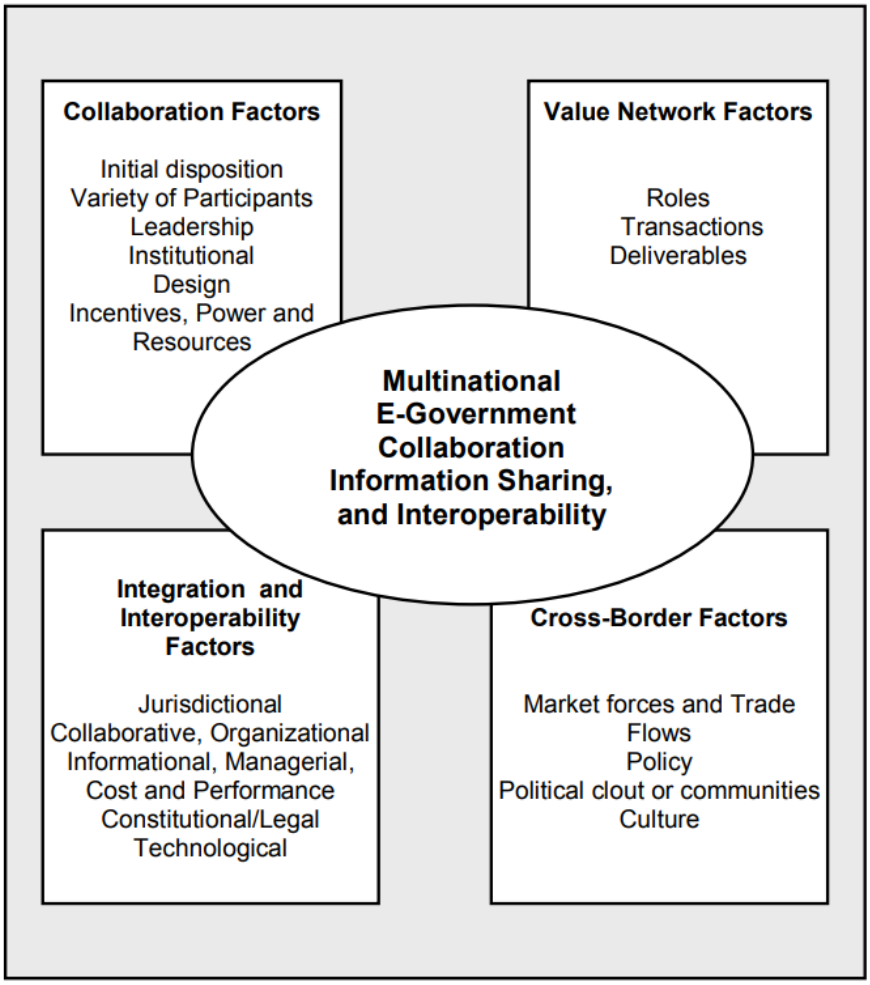


Figure 2 Model for multinational eGovernment collaboration, information sharing, and interoperability (Source: Navarrete et al., 2010, p.7)

Figure 2 can be used to map out the critical success factors that will be identified during the analysis of primary qualitative data and will help categorize the implemented solutions in the cross-border exchange of health data in ePrescription. However, this model provides only a general description of common factors in eGovernment collaboration and not specific to European context specifically in the health domain so this will be used in combination with other more recent existing conceptual models.

3.2 Types of Constraints in Government Integration and Interoperability

In the integration of government resources and processes as well as the interoperability of eGovernment information systems, various challenges and constraints typically exist that can either hinder or inspire actions in the design and deployment of the service (Scholl & Klischewski, 2007). This section looks at the specific types of constraints that happen in the integration of electronic services specific to eGovernment initiatives. Although these constraints can set boundaries in integration, they can be regarded as an opportunity that will open up possibilities for actions (Scholl & Klischewski, 2007).

Scholl and Klischewski (2007) identified nine (9) types of constraints in eGovernment integration and interoperability as a result of their intensive literature review. The table below present these barriers or inhibitors to eGovernment information system's success.

Table 1 Types of constraints in eGovernment integration and interoperability

Types of Constraints	Descriptions
Constitutional/ Legal	This pertains to the challenges at various levels of governments in their exercise of power and authority as well as the division of roles and responsibilities in the process of integration (Scholl & Klischewski, 2007).
Jurisdictional	The participation of various agencies whether government and non-government is voluntary and optional and these institutions operate differently and have their own processes (Scholl & Klischewski, 2007).
Collaborative	Organizations have varying levels of readiness and commitment as well as leadership and working styles that affect their means and ways of cooperation (Scholl & Klischewski, 2007).
Organizational	This type of constraint includes that amount and quality of resources needed for integration and the different business processes and workflows that need to be standardized and harmonized (Scholl & Klischewski, 2007).
Informational	Organizations have different ways of structuring information and different quality standards for organizing and collecting data or information (Scholl & Klischewski, 2007).

Managerial	As the collaboration becomes more complex, more actors with different interests, needs, and expectations are being involved and it might be difficult to manage various stakeholders (Scholl & Klischewski, 2007).
Cost	This refers to the budget required to finance the project as insufficient funding might pose major challenges to sustain the integration of projects in the long-term (Scholl & Klischewski, 2007).
Technological	This deals with the different systems or technology platforms in place with varied networking capabilities as well as different standards and protocols used (Scholl & Klischewski, 2007).
Performance	This refers to the performance of the system wherein the fewer the interoperating partners are involved, the more effective the operations become (Scholl & Klischewski, 2007).

This typology of constraints will be used to identify the kind of challenges or barriers that exist during the planning and deployment of cross-border ePrescription. However, this typology is a very generic description and has not been applied to the European interoperability context as well as in cross-border settings where two countries are involved, and more complex and wider challenges are being dealt with.

3.3 The Refined eHealth EIF (European Interoperability Framework)

The EU's eHealth Network proposed a common refined interoperability framework specific to the health domain to cover various levels that need to be managed during the integration of eHealth systems throughout Europe. The framework serves as a common language that contains terms and methodologies for structuring eHealth projects and describing eHealth solutions with which problems in interoperability and challenges in standardization can be analyzed and documented (eHealth Network, 2015). This framework offers a common starting point for communicating and deciding on the critical aspects, requirements, and standards that must be adhered to ensure consistency and compatibility of eHealth solutions when implemented during the integration of policies, processes, and systems (eHealth Network, 2015). The said framework has six levels that specify the actors involved and activities conducted on each level.

This framework is a non-technical model for showing the relationship between the different levels of interoperability that can be used by all involved stakeholders and team members in any eHealth project (eHealth Network, 2015), as shown below:

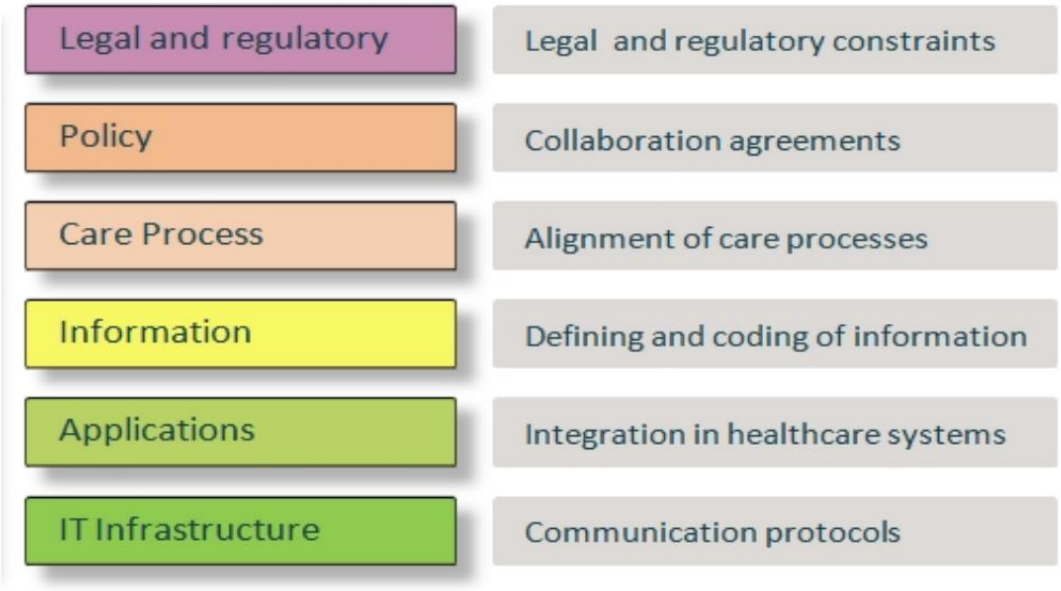


Figure 3 The refined eHealth EIF model (Source: eHealth Network, 2015)

The refined eHealth EIF model is used in this paper to examine the alignment activities at each level between Finland and Estonia in cross-border ePrescription. This conceptual model serves as a starting point for the analysis of challenges and descriptions of solutions during the cross-border collaboration of these countries.

The six interoperability levels are used as a reference to explore problems in cross-border ePrescription in the compatibility of legislation and regulations (*legal and regulatory*), constraints in the collaboration agreements (*policy*), challenges in the alignment of care processes and workflows (*care process*), solutions in the data structures and formats (*information*), integration in ePrescription systems (*applications*), and communication and network protocols (*IT infrastructure*). The researcher will use this framework to structure interview questions specific to each interoperability level wherein various stakeholders (i.e. project managers, health specialists, policy officers, etc.) will be asked of any constraints encountered during each stage and the implemented solutions both countries have jointly undertaken.

The refined eHealth EIF is an extension of the general EIF and the reason for extending it is that for example, there are different stakeholders responsible in the organizational level of the general EIF and this needs to be divided into health policy and care processes to fit into the health domain (eHealth Network, 2015). Table 2 presents the definition of the six levels of the refined eHealth EIF taken from the eHealth Network (2015).

Table 2 Definition of the six levels of the refined eHealth EIF

Levels of the Refined eHealth EIF	Descriptions
Legal/ Regulatory	On this level, a set of legislation and regulatory guidelines are being adhered to ensure compliance and compatibility (eHealth Network, 2015).
Policy	This represents the kind of contracts and agreements made for collaboration, the establishment of trust, and the responsibilities of the two countries or organizations (eHealth Network, 2015).
Care Process	During integration, various processes, care pathways, and shared workflows are being analyzed and aligned in order to deliver an integrated health and care (eHealth Network, 2015).
Information	On this level, organizations come up with common standards to harmonize data models, terminologies, and formatting as well as identifying the requirements in the collection and integration of data models and data elements (eHealth Network, 2015).
Applications	This represents the agreements made in the import and export of medical information and how are they being handled by the country's information systems and what communication standards are in place to ensure that the information is transported (eHealth Network, 2015).
IT Infrastructure	This is the generic use of "communication network protocols and standards, the storage backup, and the database engines" (eHealth Network, 2015).

On one side, another way of understanding the success and describing the failure of eGoverment initiatives is looking closely at the interrelated dimensions of ITPOSMO (information, technology, processes, objectives, staffing, management, and other resources) which is a checklist for identifying the gaps in the design versus the reality of eGovernment solutions (Heeks & Mathisen, 2012). Heeks suggested that the ITPOSMO checklist can be further categorized in three major dimensions such as *technical* (information, technology, and process), *human* (objectives, motivation, and value) and *organizational* (management structures and other resources) (as cited in Alduraywish, Xu, & Salonitis, 2017). The outcomes of evaluating the information system using the checklist can be either total failure, partial failure, and success. For this paper, these dimensions are all-encompassing and rather general and already present in the conceptual models that will be used for the analysis of challenges and success in cross-border collaboration in healthcare.

In order to gain multiple perspectives in understanding the success of eGovernment collaboration in a cross-border setting, the researcher views at cross-border services as a creation of public value. Understanding the positive outcomes and main benefits of cross-border ePrescription is an integral part towards understanding the success of the service and how this created an additional value to the stakeholders. The next section delve into the creation of public value produced in cross-sector collaborations.

3.4 Integrative Cross-border Public Value Framework

In creating public value, three core ideas are needed to be recognized and aligned by the public managers in the design and delivery of services; these interrelated ideas are: legitimacy and support, operational capacity, and public value (Alford, Douglas, Geuijen, & Hart, 2016). Public managers should actively design and develop public value propositions to customers and stakeholders that reflect their concerns, values, and aspirations as basis and foundation for improving government services towards effective public governance (Alford, Douglas, Geuijen, & Hart, 2016).

Public value can be created and captured through the innovation process wherein public managers and policymakers are deeply engaged in the discovery of new, untried, and creative interventions (Crosby, Hart, & Torfing, 2017). Creating value through collaborative innovation requires various functions and types of leaders that must act as sponsors, champions, catalysts, and implementers (Crosby, Hart, & Torfing, 2017).

Public value when it is realized and delivered to certain groups of people (public) produces some benefits (value). Applying to the public sector, this implies delivering services that benefit the citizens. Many countries have made effective efforts to create a more responsive and trustful government by making relevant and reliable services available to the citizens and allow them to participate in government initiatives and decision-making processes (Bonina & Cordella, 2009). Collaboration across organizational and government levels is both essential to address major public challenges and problems and thus cross-sector collaboration is created that involves many different stakeholders and policy-making processes in order to achieve lasting and widespread benefits to the public (Page, Stone, Bryson, & Crosby, 2015).

In creating public value, Mark Moore proposed a strategic triangle that public managers should strive to balance and align (Mintrom & Luetjens, 2015). This framework implies that public managers must engage in a variety of actions to achieve strategic goals through specific programs, services, or projects to increase and sustain public values (Mintrom & Luetjens, 2015). This framework is presented below.

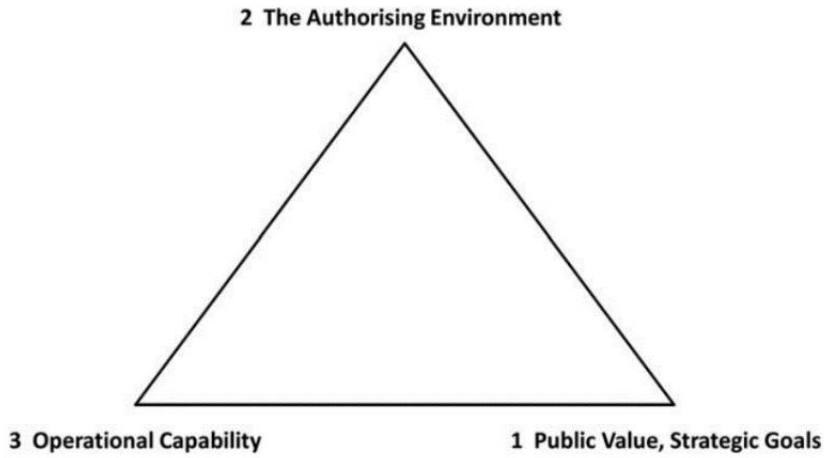


Figure 4 Moore's strategic triangle (Source: Mintrom & Luetjens, 2015).

The core of Moore's (2000) public value framework includes "the strategic triangle" which has basic elements: (1) operational capabilities of the organization itself in the control over the allocation of resources to achieve strategic goals, (2) the authorizing environment which encompasses the political realm, authority figures, and relevant stakeholders like elected politicians, higher levels of government, and community groups that have a wide range of interests, needs, and expectations, (3) the daily task environment of public managers where they have a great position to create and deliver public value and achieve strategic goals (as cited in Mintrom & Luetjens, 2015).

Moore's (2000) triangle is referred as the Public Value Chain where the organizational production takes place mapping out the relevant inputs, activities or projects, partners, outputs, and customer satisfaction (as cited in Grant, Tan, Ryan, & Nesbitt, 2014). Public managers seek to align the three components of the strategic triangle in implementing services and projects, making it more likely that public value is successfully delivered. It is important to note that the strategic triangle's components consist of the specific service (the public value proposition) over its immediate organizational context (the operational resources) to the general political structures (the authorizing environment).

In a related perspective in creating value, Melville, Kraemer, and Gurbaxani (2004) proposed an integrative model of IT business value which is based on the resource-based view of the firm that integrates various strands of research into a single framework. Melville et al. (2004) proposed three domains in understanding the different organizational and IT resources and performance that drive business value. These domains are: (1) focal firm, (2) competitive environment, and (3) macro environment. This can also be expressed in related hierarchies *(Micro, Meso, Macro levels).*

At the Micro level (focal firm), the organization maximizes the use of its *IT resources* or infrastructure, IT and non-IT human resources (people with technical and managerial skills), *complementary organizational resources* such as policies and rules and workplace practices, etc., *business processes* in transforming inputs to outputs, and *performance* of the business process (operational efficiency) and the overall organizational performance (Melville et al., 2004).

At the Meso level (competitive environment), Melville et al. (2004) identified industry characteristics and the trading partner resources as components that support the focal firm. This level consists of competition in the market and relations with buyers and suppliers and is focused on the business environment in generating business value. In the public sector, public value is attained through collaboration among public managers and various stakeholders in the political realm and thus this paper will refer to Meso level as the "collaborative environment" wherein key players and key agencies take part in the cross-border collaboration of two countries in digital healthcare.

At the Macro environment, macro factors such as the country characteristics like the level of development, basic infrastructure, education, research and development, culture etc. also play an important role in the generation of value (Melville et al., 2004). The researcher proposes to include the authorising environment of Moore's framework in this level to suggest that there are political actors at the national and supranational political and regulatory environment that contribute to the integration and interoperability of cross-border services.

Combining Moore's (2000) public value framework and Melville et al.'s (2004) integrative IT business value model, the researcher proposes an integrative framework that will fit into the cross-border context. Figure 5 illustrates the proposed integrative public value framework for cross-border service.

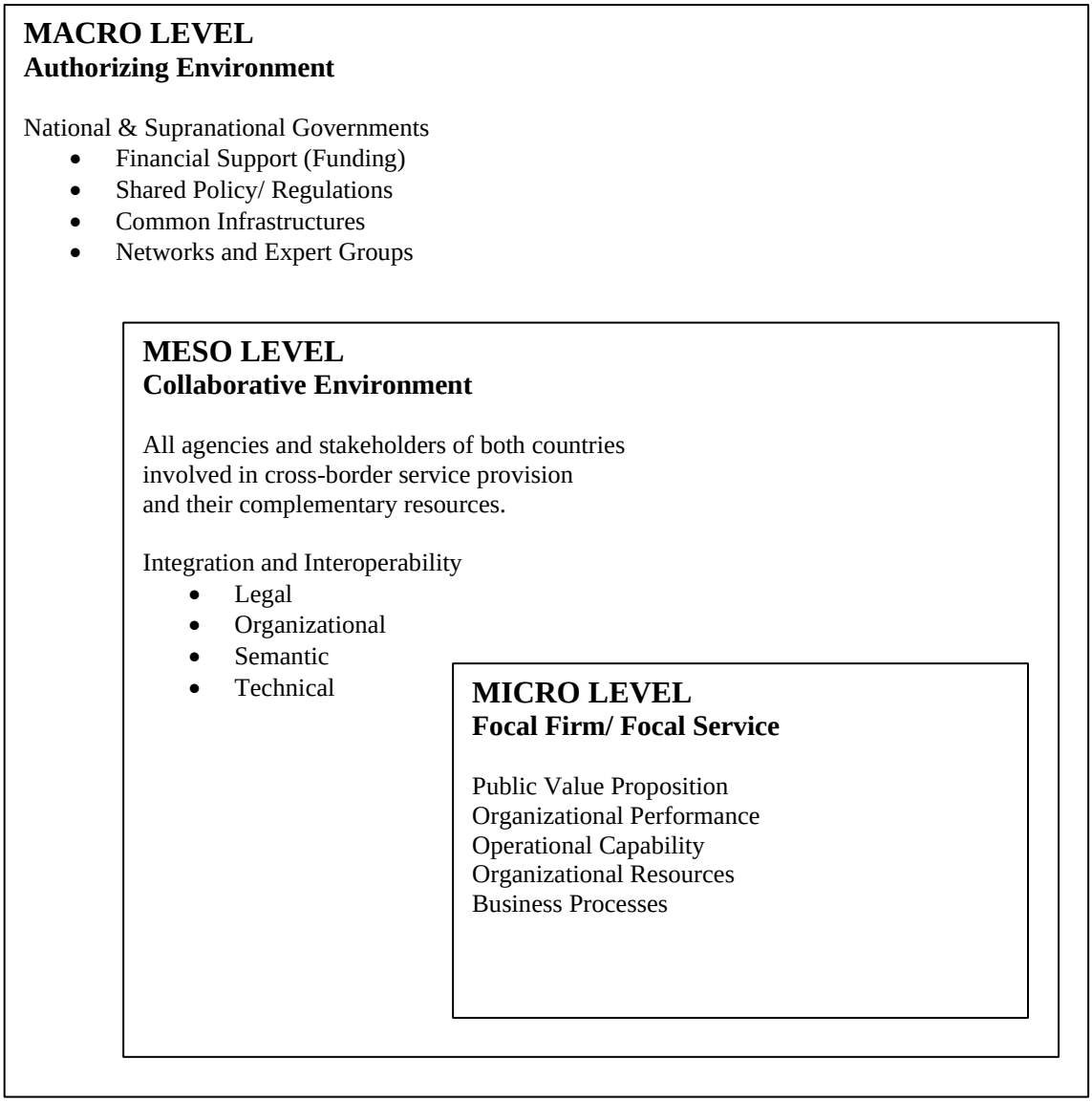


Figure 5 Proposed Integrative Public Value Framework for Cross-border (Adapted from Moore (2000) and Melville (2004))

This study will use the above integrative model in mapping out the challenges as well as the critical success factors that generate benefits and public value in the cross-border exchange of ePrescriptions. This model will help the researcher describe the solutions implemented by Finland and Estonia in the interoperability of their ePrescription service.

4 METHODOLOGY

This chapter discusses the research design, main research strategies, data collection techniques, interview design, and the procedures in the analysis of data.

4.1 Research Design

The primary goal of this paper is to identify the challenges in the interoperability of cross-border ePrescription and determine the critical success factors that the governments of Finland and Estonia implemented as solutions to overcome constraints in the deployment of ePrescription service. Therefore, the purpose of this research is exploratory, and the research strategy being used is a case study.

An exploratory study is an important way of understanding the situation, seeking new insights, asking questions, making inferences, assessing phenomena in a new light, and offering a new perspective (Saunders, Lewis, & Thornhill, 2009). A case study, as defined by Saunders, Lewis, and Thornhill (2009), is "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence" (p.145).

Using the case study as a strategy, the figure below presents a methodology roadmap adapted from Yin (2009) and further modified which will be used to guide the researcher on what logical procedures to undertake in this study.

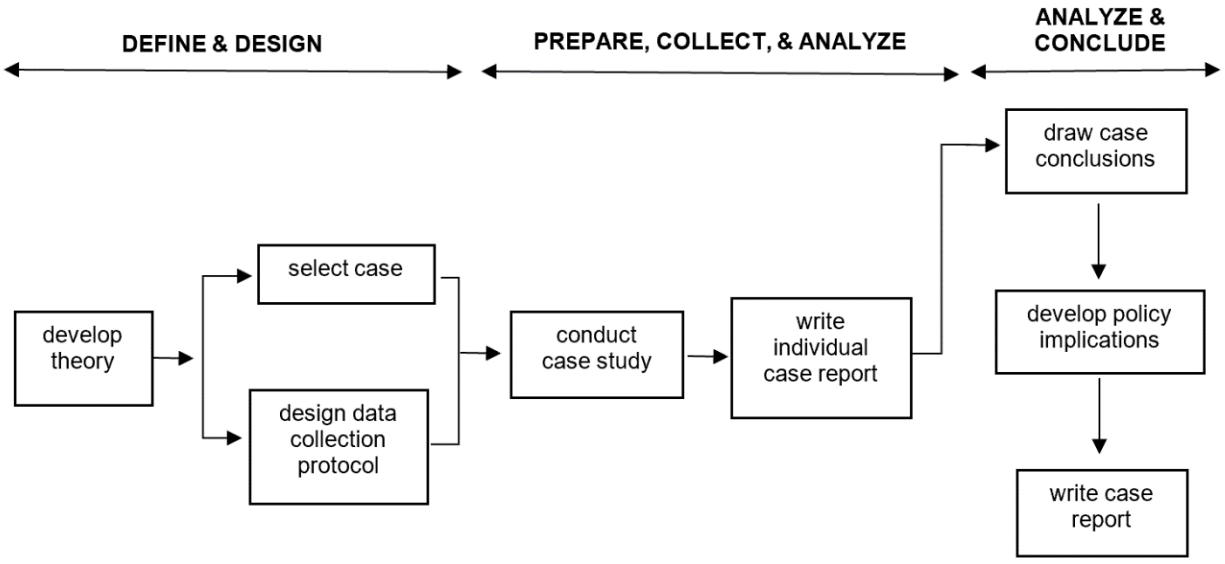


Figure 6 Case study method adapted from Yin (2009)

As can be seen in Figure 6, the following case study process was followed:

(1) ***Defining and Designing.*** In the first phase, three important steps were followed. First, this study made use of theoretical and conceptual frameworks such as the refined eHealth EIF and integrative public value model for cross-border service. As what Yin (2009) suggests the use of existing theory greatly helps to formulate the research question and objectives. The refined eHealth interoperability has six levels namely legal, policy, care process, information, applications, and technical. The use of this framework is to identify if there are constraints or inhibitors to success that occurred at each level. Another conceptual model being used is the combination of IT business value and public value models that contain three (3) important environments such as Micro, Meso, and Macro. The micro level focuses on the focal firm or the country itself, the meso level is where the collaboration and interoperability happen, and the macro level involves the national and supranational governments. Second, the selected case was the Finland-Estonia cross-border e-prescription service. Overall, the purpose of this single case is to analyze and assess the solutions and drivers both countries have implemented in overcoming the interoperability challenges in the deployment of this e-service. Third, the researcher has designed a data collection protocol which includes the design of the interview guide questions and structure of the interviews.

(2) ***Preparing, Collecting, Analyzing.*** The second phase includes (1) conducting the case study which is the actual data gathering and (2) writing the individual case report which is documenting the information and recording of qualitative data. The researcher identified six important government institutions responsible for cross-border ePrescription in Finland and Estonia. Overall, a total of eight (8) key informant interviews were conducted and these are experts and specialists who have been directly involved during the planning and deployment of the service. This research is qualitative in nature wherein the technique for collecting data is through interviews and the procedure for data analysis is through codifying and categorizing that uses non-numerical data. Actual interviews were recorded and transcribed for further analysis.

(3) ***Analyzing and Concluding.*** In the third phase, the researcher analyzed the recorded interview data using the MAXQDA software for data analysis and came up with categories and themes to organize the interview results. Conclusions and implications were then drawn based on the identified constraints and drivers. Finally, a consolidated case report was written in the end to present significant findings and document the entire research project.

4.2 Data Collection

This research is qualitative in nature and involves the collection of qualitative data. Saunders et al. (2009) defines qualitative as "a synonym for any data collection technique such as an interview and data analysis procedure such as categorizing data that generates non-numerical data." Qualitative data was collected which is defined by Saunders et al. (2009) as based on meanings expressed through words where results are collected in non-standardized data requiring classification into categories and the analysis is conducted through the use of conceptualization.

The data collection, furthermore, was done in multi-method by which semi-structured interviews were conducted and secondary sources were gathered to reinforce the primary findings. Saunders et al. (2009) suggested that there are three principal ways of conducting exploratory research namely a search of the literature, interviewing experts in the subject and conducting focus group interviews. For this paper, literature review and expert interviews were carried out from key agencies in Finland and Estonia.

Qualitative data was gathered since the research aim is to discover the challenges and success factors which are largely human experiences. As noted in Jamshed's (2014) article on *Qualitative research method: interviewing and observation,* "qualitative research methodology is considered to be suitable when the researcher or the investigator either investigates new field of study or intends to ascertain and theorize prominent issues". While a quantitative approach could also generate insights, relevant data was not available in open data sources and because of the limitation of distance, time and budget, no large-scale survey was conducted.

Oakley (1998) implied that an interview is considered as one of the most common format of data collection in qualitative research, and qualitative interviews are typically semi-structured, lightly structured or in-depth as this provides a framework to better support the recording of practices and standards (as cited in Jamshed, 2014). Therefore, semi-structured interviews were used for the purposes of this research and semi-structured interviews can best be described as "those in-depth interviews where the respondents have to answer preset open-ended questions and thus are widely employed by different healthcare professionals in their research" (Jamshed, 2014).

Review of existing and relevant literature was used to gather relevant data from secondary sources as well. Reports from international organizations, studies done by consulting companies, academic literature, and large-scale survey results published by research organizations are some examples of the type of documents reviewed for the purpose of data collection for this research.

4.3 Interview Design

Primary data was collected through interviewing eight (8) key experts or specialists who were involved in the cross-border ePrescription project. The interviews were done via video conferencing and recorded with the consent of the respondents. This is considered good practice, though some have noted it controversial, however, “in order to have the interview data captured more effectively, recording of the interviews is considered an appropriate choice” (Jamshed, 2014). The interviews were later transcribed and transcripts of the interviews have been provided as appendices of the paper.

4.3.1 Interview Guide Questions

Saunders et al. (2009) suggested that in semi-structed interviews the researcher have a list of themes and questions to be covered where he may decide to omit some questions due to a specific organizational context that is encountered in relation to the research topic. In addition, the sequence of questions can be varied based on the flow of the meeting or conversation and additional questions may be asked to explore the research question and objectives. The questions developed in the context of the framework were both open-ended and probing – those that were open-ended invited general knowledge and made no presumptions regarding the response, whereas those that were probing were used in order to extract more depth and maintain a line of enquiry (Williams & Cutler, 2020).

Before the actual data gathering, the researcher made an interview guide. In forming the interview guide and interview schedule, the following steps were followed based on the recommendation of (Wellington & Szczerbinski, 2007), they are as follows:

(1) *Brainstorming.* The researcher listed all possible questions and areas of interest.

(2) *Classifying and Categorizing*. After coming up with preliminary questions, the researcher used the theoretical and conceptual frameworks as guide to grouping and classifying these questions based on common themes.

(3) *Interview Guide.* After listing many possible questions, the researcher decided and selected only those important questions that will be actually explored considering the time limit and duration of interview.

(4) *Interview Schedule.* To finalize the questions, the researcher made sure that they are properly worded, sequenced, and ordered to fit into the different types of key informants with diverse backgrounds and expertise.

The interviews were structured using the theoretical and conceptual frameworks as a guide, meaning that "questions are more specific, and asked in a predefined order" (Williams & Cutler, 2020). This approach was selected as the responses of the key experts would need to be compared in order to support data analysis.

Open-ended questions were designed and shared with the respondents before the interview. This is considered a best practice as in order to achieve optimum use of interview time, this sharing of information in advance provides focus for the interview and allows the topic to be reviewed in a more systematic manner (Jamshed, 2014).

Table 3 presents an excerpt of guide questions being used as an instrument to gather responses from key informants during the actual interviews from May to July 2021.

Table 3 Sample interview guide questions

Themes/ Categories	Interview Guide Questions
Organization Role and Contribution	Can you explain the role of your organization in planning and deployment of cross-border digital prescription? If applicable, discuss the methods used, stakeholders involved, and activities conducted.
Common Challenges	Were there any administrative issues and governance challenges in this cross-border collaboration between agencies during planning and deployment?
Legal and Regulatory	Given that each country has their own health policy and healthcare frameworks, were there any issues in compliance and compatibility to EU and national legislation and regulations?
Policy	How did the collaboration agreement happen for cross-border ePrescription and how did you establish the trust?
Care Process	How were the business processes, care pathways, and shared workflows (i.e. prescription, dispensation, reimbursement) integrated and harmonized? Were there misalignments?
Semantic	How did you come up with common standards to harmonize data models, terminologies, and formatting?
Applications	Given that this system has privacy implications, what do you think about the quality of the system and the infrastructure? What are the appropriate technical measures that were implemented to ensure the system is secure?
IT Infrastructure	What communication and network protocols and standards are being adhered? How has that been handled?
Public Value Proposition	Can you discuss the public value or main benefits of this e-service (ePrescription/eDispensation) to the end-users, health practitioners pharmacy), public managers/government?
Future Development	How do you see the future development of the system?

4.3.2 List of Key Informants and Key Agencies

The term key informant is used to describe the "person who may be the key figure in a piece of qualitative research and as individual who possess special knowledge, status or communication skills and who are willing to share the knowledge with the researcher" (Wellington & Szczerbinski, 2007, p.82). The researcher identified six main government institutions responsible for the cross-border healthcare in both countries and these organizations have been deeply engaged during the planning, development, and deployment of cross-border ePrescriptions. Each agency was represented by either 1 or 2 key informants. The researcher directly contacted the organization and was referred to their main specialist involved in the project.

The researchers came up with the following segregation matrix to equally represent the various agencies in their respective country. The reason behind this matrix is to gather insights and information from multiple perspectives in order to evaluate results from various viewpoints in relation to the organization and country.

Table 4 Interview Participants and Key Agencies

Key Agencies in Cross-border ePrescription	**Number of Key Informants Interviewed**
European Commission – DG SANTE	1
Finland	
Ministry of Social Affairs and Health (STM)	1
Finnish Institute of Health and Welfare (THL)	2
Social Insurance Institution of Finland (Kela)	1
Estonia	
Ministry of Social Affairs (SM)	1
Health and Welfare Information Systems Centre (TEHIK)	1
Estonian Health Insurance Fund (EHIF)	1
Total	8

4.4 Data Analysis

According to Saunders et al. (2009) there is no standardized procedure for data analysis but despite this, the collected data can be analyzed into three main types of processes such as *summarizing* where salient information and meanings are condensed, *categorization* or grouping of these meanings and *structuring* or ordering of information using narrative. Yin (2009) suggested that the use of existing theory or framework can help in organizing and directing the data analysis.

Together with the abovementioned processes, the researcher followed the recommended data analysis procedures by Kvale (1996) and Miles and Huberman (1994) such as (1) comprehending the gathered data, (2) integrating the related data taken from various interview transcripts and notes, (3) identifying key emerging patterns or themes for further exploration, (4) developing theories based on the identified themes for patterns or relationships, and (5) drawing and verifying conclusions (as cited in Saunders et al., 2009). As what Saunders et al. (2009) further elaborated, qualitative analysis typically consists of summarizing data, categorizing and structuring them using narrative to determine patterns and relationships, developing and testing propositions and producing well-grounded conclusions.

Using MAXQDA software. In processing and analyzing the interview data, the researcher used MAXQDA software for qualitative data analysis. The use of computer-assisted qualitative data analysis software can help the researcher with regard to managing the project, organizing data, exploring codes and categories, retrieving data, searching and interrogating to build propositions and theorize and recording thoughts systematically (Saunders et al., 2009). When the software is used systematically, "it can aid continuity and increase both transparency and methodological rigor" (Saunders et al., 2009).

The following analytical procedures were followed in using the MAXQDA software based on the recommendations of Saunders et al. (2009), they are as follows:

(1) Structuring the work. The researcher organized the transcripts to provide connections between all data files within the research project and to provide access to all data once it has been introduced.

(2) Exploring the data. The researcher imported the interview transcripts and searched for important keywords, collection of words, and statements to have ideas on possible codes and categories to be used.

(3) Coding and identifying themes. Qualitative data gathered from the interviews were extracted from the transcripts. This data was labeled and organized using the coding method. Saldaña (2009) defines code as "most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data." As Saldaña noted, the coding is being used as analysis and, as what Richards and Morse (2007) pointed out "it leads you from the data to the idea, and from the idea to all the data pertaining to that idea (as cited in Saldaña, 2009).

Based on the open-ended questions used to guide the interviews and the theoretical framework, thematic areas were specified and data was coded and categorized based on the themes identified. While coding, data were separated into smaller samples and codes were generated to summarize the particular sample in an open-ended manner. Each sample consisted of at least a sentence to five sentences. The following steps were followed to code all data:

1. A new sample was examined and given a code.
2. The next sample was examined to see if an already existing code can be applied to the sample or the sample is a sub-category of an existing code. In those cases, existing codes were used for the sample. Or else a new code was generated
3. Step number 2 was repeated until all the samples were covered.

At the end of coding, a codebook or coding list was generated to determine their frequency. The codes generated through this iterative process were then categorized based on the thematic areas that were pre-selected. Insights were generated from this categorized data or interrelationships that could be established within those data.

5 RESULTS

The overall goal of this research is to answer how the governments of Finland and Estonia overcome the interoperability challenges in cross-border ePrescription and discuss the common factors or drivers that contributed to the project's success.

This chapter presents significant results of the series of interviews conducted with key experts in cross-border digital prescription in Finland and Estonia. This chapter is divided into three sections: (1) challenges and constraints in eHealth interoperability; (2) critical success factors and drivers in cross-border ePrescription, (3) value proposition and main benefits of the service, and (4) implemented solutions in eHealth interoperability and ongoing developments in cross-border healthcare.

There was a total of eight (8) key informant interviews conducted with various specialists from the identified key agencies in Finland and Estonia who have been deeply involved during the planning and deployment of cross-border ePrescription. The interviews via online video call with 35-50 minutes in length for each meeting were carried out from May to July 2021 and were recorded, transcribed, and analyzed.

Using the MAXQDA software for qualitative data analysis, the transcripts were thoroughly coded to determine the common themes and patterns. Interview codes were grouped under the identified major categories and are presented in graphical form to understand their associations. Overall, a total of 188 codes were created and categorized under eight (8) interrelated themes (*see Appendix C*).

5.1 Challenges in eHealth Interoperability and Cross-border Collaboration

During the interviews, the participants were asked about the common challenges they encountered during the planning and deployment such as structural obstacles in breaking organizational silos, coordination issues in managing the project complexity, and resource constraints like human or financial resources.

Expert 01 who has worked with this project since its inception in 2011 under the Smart Open Services for EU patients (epSOS) project pilot for cross-border health data exchange explained that there still exists some difficulties and complexities in cross-border services that hinder the exchange of health data in cross-border setting including ePrescriptions but the pioneer countries, Finland and Estonia, have successfully overcome these challenges during project integration and deployment.

Key experts of both countries, in addition, confirmed that there were no major issues in the past that impeded the deployment of the project and collaboration with stakeholders but there have only been common concerns that are yet to be addressed or reconciled as part of the ongoing development in cross-border healthcare.

The following are the common challenges that the project team members encountered during the planning, coordination, and implementation stages. The figure below is created using MAXQDA's coding analysis. Figure 7 summarizes these reported challenges.

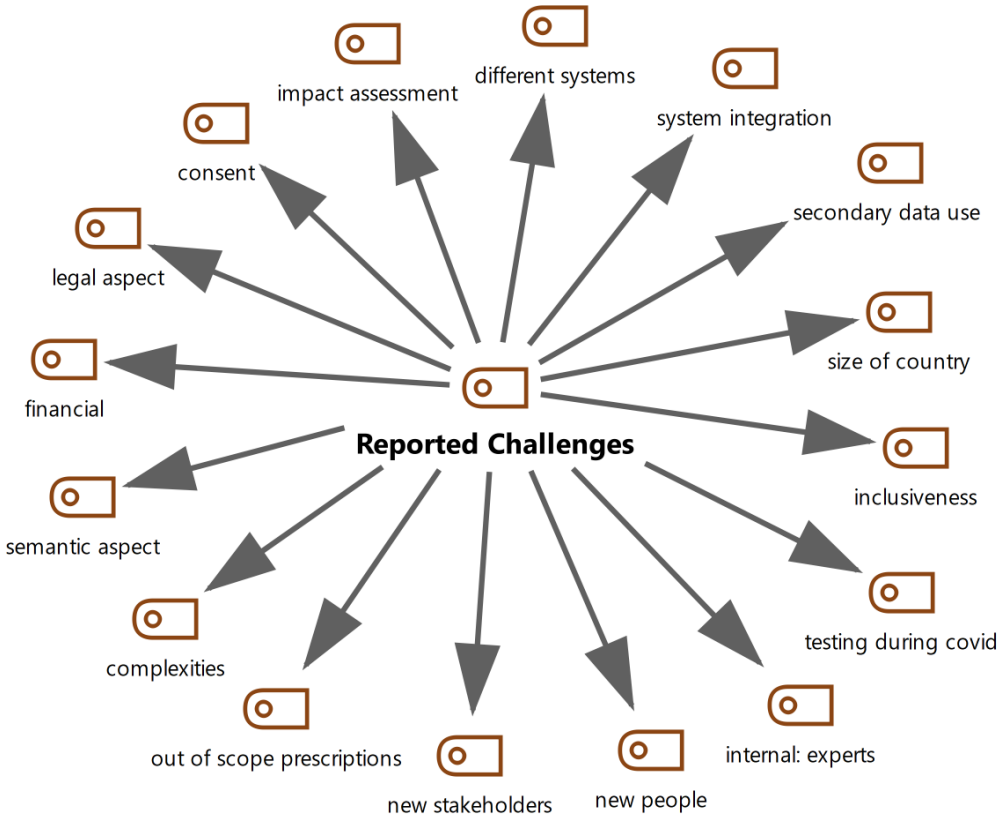


Figure 7 Reported challenges in cross-border ePrescription

The above figure contains various codes that were identified from the interview data. The reported challenges and constraints occurred during the planning, development, deployment, and evaluation of the cross-border collaboration. These constraints are financial, legal aspect, policy of consent, conducting impact assessment, different systems, system integration, secondary use of health data, size of country, inclusiveness, testing during Covid, technical experts, new people and stakeholders, complexities, new and out of scope prescriptions, and semantic aspect. These are discussed in detail in the following subsections.

5.1.1 Different Healthcare Systems and Models

Expert 01 explained that there are differences in the healthcare designs in the countries that have so far implemented the cross-border ePrescriptions such as country-specific healthcare processes. He added that various pharmacy systems from different IT vendors are already in place and pharmaceutical markets with distinct medicinal products are on the rise. This has become a challenge in the integration of systems and interoperability of health datasets not only between Finland and Estonia but among the participating EU member states of the cross-border network.

Expert 02 who is the head of digital development at the Estonian Ministry of Social Affairs (SM) believed that the integration of health systems remains a difficult task for countries that are yet to join in this project because they might be required to align the care processes and amend some existing policies. The decision to scale up across borders is still up to the country (Expert 02, 2021).

Expert 05 who is the chief specialist at the Finnish Institute for Health and Welfare (THL) reported that when they started the integration of their eHealth systems, Estonia had to modify their own system based on the common EU requirements in order to be certified and audited by the central European system.

With regards to country-specific processes and care pathways, Expert 03, who is the project manager of cross-border health services at the Estonia's Health and Welfare Information Systems Center (TEHIK) pointed out that these two countries have their own processes in prescribing and dispensing medicines. She added that in Estonia, a person can access the prescription by presenting an ID card and the pharmacist abroad can retrieve it in the system. Medicines can directly be dispensed on behalf of a person like buying for immediate family members or grandparents. In Finland, however, a person should be listed first in their system as authorized for getting medicines on behalf of someone else before a pharmacist can dispense the prescribed drugs (Expert 03, 2021). The dispensation of medicines on behalf of someone mostly acting for family members is defined by a national policy for giving consent which is seen as important for patient safety and this is totally different among Member States. She highlighted that there are several discussions in this area, especially that countries need to coordinate and follow rules in the wider health data exchange via the EU's centralized digital service infrastructure for cross-border services. In the end, she maintained that *"it is the national law that you still have to follow, and you cannot go over the national legislation basically"* and this was one challenge that they reconciled. As previously stated, it is conveyed that different national policies and legal aspects are considered one major challenge for cross-border data exchange.

5.1.2 National Legislation and Policy of Consent

Expert 07 who is the team leader at the Finnish Institute for Health and Welfare (THL) articulated that "*one huge challenge in many countries is the legal aspect because when you start deploying all these cross-border use cases then you run into the fact that usually the national legislation has not been planned for that.*"

Expert 07 stated that Finland had amended their legislation during the epSOS (Smart Open Services for EU patients) project pilot in 2014 which entailed a lot of coordination between agencies, and it was a complicated process especially when two countries were involved (Expert 07, 2021). She emphasized that:

> *It is really complicated from a legal point of view in terms of defining the responsibility - how long it goes and where it stops, and when the other country's responsibilities are coming in. But this was a huge, huge work that it has been worked on for years and years in the European context. And we also have lawyers from both countries who discussed those things very very thoroughly.* (Expert 07, THL)

Expert 05 confirmed that during the epSOS pilot, Finland changed their permanent legislation and made a special kind of decree that mandated cross-border exchange of health data with other countries, formalized the responsibilities of key agencies, and established the national contact point for ehealth.

On the Estonian side, Expert 03 pointed out that the real challenge was also the legislation because it took a longer time for the Ministry of Social Affairs to finalize it due to multiple revisions that required a lot of communication from several agencies in order to formalize the cross-border agreements and legitimize the processes. She expressed that *"it was the legal aspects that took a lot of time especially from the Ministry side and with the cross-border, we managed to change the legislation at the very last minute, but this is not a good practice and we passed it back and forth to have it finalized."*

Expert 08, the health information management specialist at the Finnish Institute for Health and Welfare (THL), recognized that common challenges in this cross-border collaboration were linked to legal aspects because of varied laws and policies in prescribing and dispensing medicines in both countries. She inferred that during meetings on cross-border health services she attended, legal matters are common concerns being brought up in addition to different health management models which is probably one reason why other MS are taking longer time to scale up (Expert 08, 2021).

When the project was deployed, one evident challenge was consent. The two countries have their own policy of consent for patients in sharing their health data in a cross-border setting. When GDPR came into force in between, both countries had to rethink the policy of consent as patient health data have privacy implications (Expert 07, 2021). In the Estonian policy, a patient's electronic health data is in the beginning open for cross-border data exchange and the consent is basically granted by default although a patient has an option to close or invalidate it (Expert 03, 2021).

On the Finnish side, a patient has to give or indicate his consent beforehand through their My Kanta national patient portal to allow cross-border access and transactions (Expert 01, 2021). This is considered as the main concern for Finnish patients that they have to enable prior consent in order for the pharmacists in Estonia to retrieve their ePrescriptions (Expert 03, 2021). As what Expert 01 described:

> *You have to provide consent in Finland, travel to Estonia with your ID card, and that's it. For Estonians, you don't even need to provide consent in the national service because their legislation is different in that respect, so they can only simply go to the Finnish pharmacies.* (Expert 01, DG SANTE)

This case can also be the same for the cross-border exchange of patient summaries (PS) that contain medical history and personal health records. Expert 03 added that the same policy of consent applies to other health information domains including PS in Estonia's opt-out system where patient health data is by default open for cross-border use. This comes with a concern on varied rules on the policy of consent and even in the understanding of GDPR guidelines and the national legislation that resulted in a mismatch during the system audit stage (Expert 03, 2021). She elaborated that:

> *"When we were implementing the patient summary service, during the audit stage by the solution provider that checked our system and its compatibility to their regulations as well as with the European rules, we encountered a mismatch in their legal specifications. The rules set by the solution provider would require us to have a consent but when we actually check GDPR, we don't have to have a consent in special cases - a special case where opt-out consent has a legitimate basis in our national legislation.* (Expert 03, TEHIK)

5.1.3 Financial and Human Resources

In the interviews, one theme that was identified as a challenge is financial and human resources. Half of the informants reported that the funding from the Connecting Europe Facility (CEF) Telecom was not sufficient to cover the costs and build the entire project wherein both countries allocated their own national budgets to sustain the eservice. As Expert 01 reasoned *"it is like a fight for resources because the people involved in the project are basically the same and there are many, many national projects as well and the financing is, of course, limited."* Expert 05 revealed that they allocated more than 25% of what was on the budget proposal. The funding received from CEF, however, made the project development easier and it was well managed by both countries (Expert 07 & Expert 03, 2021).

On one hand, the development of ePrescription involves technical experts who have rich experience on how systems and processes work. On the Estonian side, one department at TEHIK that is responsible for system testing and integration has only two experts for testing health information systems for cross-border use. Expert 03 revealed that *"if one of them is on vacation and the other one is busy with other projects then we have a lack of resources, but this purely our internal issue, so we can't really rely on anybody else on this topic."* This highlights the importance of having project team members with specialist knowledge in cross-border solutions which is considered as a valuable asset that their absence can have a great impact to both the project and the organization. Expert 07 emphasized that *"you need to have really good project teams in both countries that could actually discuss all kinds of matters in all aspects of interoperability."*

Because cross-border ePrescription has long been implemented, one identified challenge is working with new personnel and new stakeholders to become a part of this collaboration (Expert 07, 2021). Expert 07 stated that although governance models were already in place, new kinds of collaborative ways had to be formed to handle the project and manage stakeholders. As what she noted:

> *This was a lengthy period of time; one challenge is the people who started and finished working the project and went to other projects and then we had to take on new people and not everybody was that experienced. I would say that was our challenge more than in the latter part of the implementation process.* (Expert 07, THL)

5.1.4 Concerns on the Semantic Level

Experts from both countries confirmed that they encountered interoperability issues especially after a series of system testing before deploying the actual service. This also resulted in a delay of implementation (Expert 07, 2021).

One interoperability challenge is on the semantic level. Expert 01 stated that most of the data structures were designed already in the epSOS pilot and there were a lot of revisions, additions, and changes in various specifications that happened in order to harmonize these datasets and data models like pharmacy profiles, drug information, and the like. Such tasks for semantic specifications were done at the European level by the eHealth Network's semantic task force and ePrescription cluster (Expert 01, 2021). He also inferred that *"it's a moving target all the time so we have to make updates every year and there is a new wave of specifications coming; it's not like we're designing all at once but it's a constantly updated set of data structures and value sets."*

5.1.5 New and Out-of-Scope Drug Prescriptions

Each country has different lists of medicines, especially the list of active substances (Expert 05, 2021). Updating and adjustments have also been made because there are newer drugs that exist in the market and this drug information has not been put into the coding system yet (Expert 01, 2021). He added that there are some limitations in what is supported by the service because of the need to include newer drug prescriptions and transport data about active ingredients and so on. He emphasized that:

> *There are still some drugs or some prescriptions which are still out of scope of this service. We need some work to be done in order to include them in the cross-border system. This would need some changes on the Finnish side and after the implementation of the medication list in Finland which is an ongoing project next year… we should get some of these in scope of the service. But still, there will be some descriptions out of the scope. It's not a one-year exercise to fix everything.* (Expert 01, DG SANTE)

5.1.6 Concerns on the Technical Aspect

On the Estonian side, Expert 03 pointed out that when the service was launched the Finnish pharmacies were a bit unsure if the integration would fully work because there are three (3) different pharmacy systems integrated for cross-border use and this also caused a delay in the implementation. She noted that it was difficult to conduct end-user

testing sessions last year due to Covid situation which was an important part to be passed as an audit requirement of the system.

5.1.7 Measuring Impact and Actual Benefits

In the interviews, informants were asked if there have been any evaluation activities and impact assessment conducted to measure cost-effectiveness, uptake and adoption, or related calculations. All informants recognized that it is difficult to measure the project's impact and actual benefits of the cross-border ePrescription. On the Estonian side, there have not been any outcome evaluation done yet and this is one thing that they have to carry out soon (Expert 02 & Expert 03, 2021) while in Finland, there is one ongoing user-focused assessment carried out by the University of Eastern Finland which will investigate the usability and adoption of cross-border ePrescriptions (Expert 08 & Expert 07, 2021).

Expert 08 and Expert 05 mentioned that THL has partnered with this university to determine the actual uptake of patients who are being dispensed with medicines from Estonian pharmacies. The goal of their investigation is to get feedback from end-users, determine pros and cons as well as challenges in the current design of the service. Expert 08 even noted that there might be a linguistic barrier on the understanding of drug information and this is important for medication safety. She further elaborated that *"we are a little bit afraid about the different languages used in medication for example how to use the medicine and other information written in local language... and this research investigation will explore if there exists a gap in customer's perspective."*

Expert 03 stated that the same concern was given to a working group who did an appraisal on different e-services in Estonia that user-focused assessment has not yet been done although they already gathered feedback from pharmacies on how the integrated system is working. She emphasized that *"when it comes to end-users it might be even a bit difficult because you have to reach a certain group of people and since this is also involves delicate data and we don't have it anywhere in public… of course we have those companies that carry out researches among people but we aren't quite sure yet if we can reach enough people when carrying out research via that."*

In addition, Expert 01 stressed that impact assessment remains as assumptions that are subjective although doing calculations is possible but it is a real challenge especially in cross-border use cases. Defining the research indicators and analyzing the impact measurements are commonly difficult topics (Expert 01, 2021).

5.1.8 Other Minor Concerns

The secondary use of data, inclusiveness of the service, and size of the country were identified in the interviews as minor concerns. First, the prescription and dispensation information gathered from the cross-border data exchange can be maximized for secondary use to improve health decision making and bolster research and innovation regarding cross-border health services and this is an ongoing project funded by the Commission (Expert 01, 2021) and as of today, there have not been any other use of these records (Expert 08, 2021) and there are national as well as international challenges on the secondary use because it has data privacy and security implications (Expert 07, 2021). Second, the use of ePrescriptions is evident among older populations which may include senior citizens who may have low digital skills and this is difficult in designing the service that caters the need of everyone (Expert 03, 2021). She pointed out that:

> *When doing any kind of digital solutions, it's in a way you leave out a certain group of people always. For example, when we develop the Covid-19 tracing app there are prerequisites that you have to have a smartphone, a newer version of an iOS or Android and so on...it eliminates a part of people, a group of people right from the beginning. And as a country, you have to make sure that you still have to offer services to all the people so this is really difficult…* (Expert 03, TEHIK)

However, there is still an option to use paper prescriptions for both countries when going to pharmacies abroad (Expert 03 & Expert 08, 2021).

Third, the success of cross-border ePrescription between Estonia and Finland can be probably attributed to geographical factors such as size of the country and increased mobility and exchange of people living, working, and traveling that created a greater need for cross-border healthcare (Expert 08 & Expert 07, 2021). Expert 07 mentioned that *"collaboration happens on a very day-to-day basis and we are two small countries and it makes it much easier to implement."* On one side, Expert 01 posited the view that *"for some countries it takes longer time to build them because maybe it's really bigger for it."*

5.2 Critical Success Factors in Cross-border ePrescription

This study seeks to identify the critical success factors in the deployment of cross-border ePrescription between Finland and Estonia. From the interview data, there are four major themes that emerged to represent these drivers or success factors. These themes are (1) organizational or country resources, (2) cross-border cooperation, (3) European Commission's support, and (4) eService features. Figure 8 presents the codes under these categories:

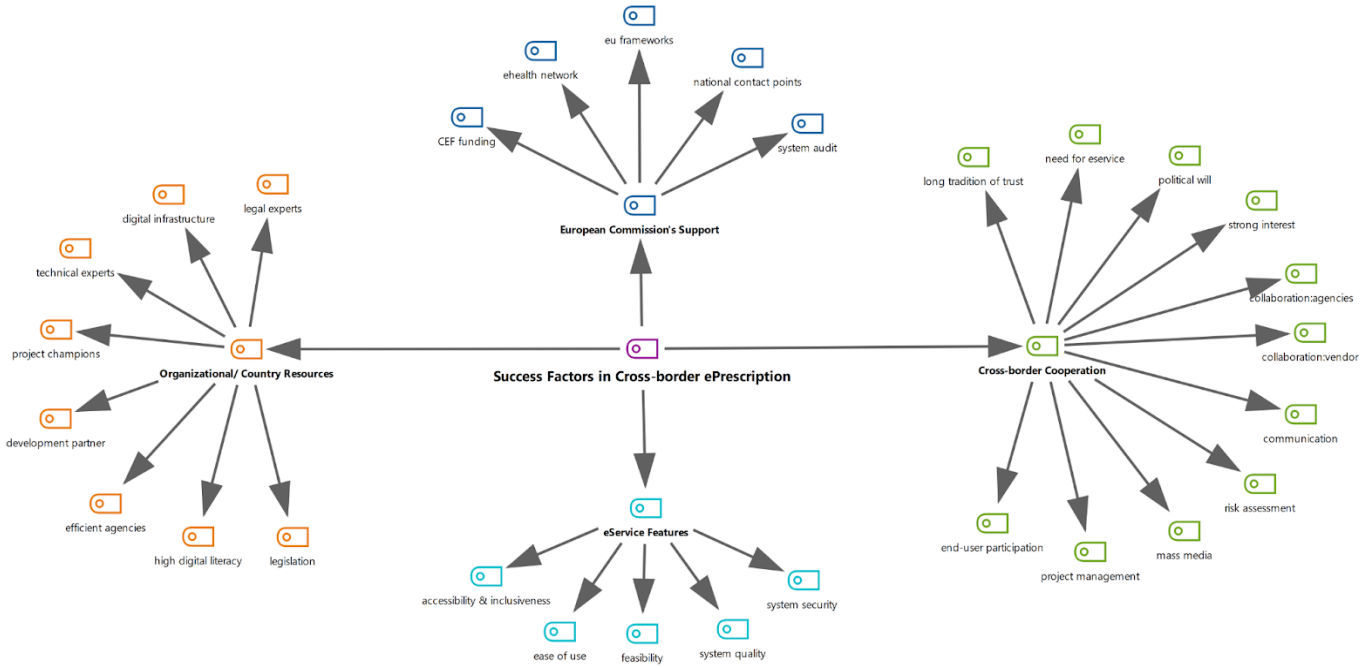


Figure 8 Critical success factors in cross-border ePrescription

In the organizational and country resources category, there are 8 identified drivers while in the theme of cross-border cooperation, 11 factors are grouped together. There are 5 enablers under the European Commission's support while 5 factors are classified under the eService features. Figure 8 presents the groupings of these themes which were created using MAXQDA software.

5.2.1 Organizational and Country Resources

As can be seen in Figure 9, the organizational resources that are identified include digital infrastructure, technical experts, legislation, legal experts, project champions development partner, efficient agencies, and digital literacy.

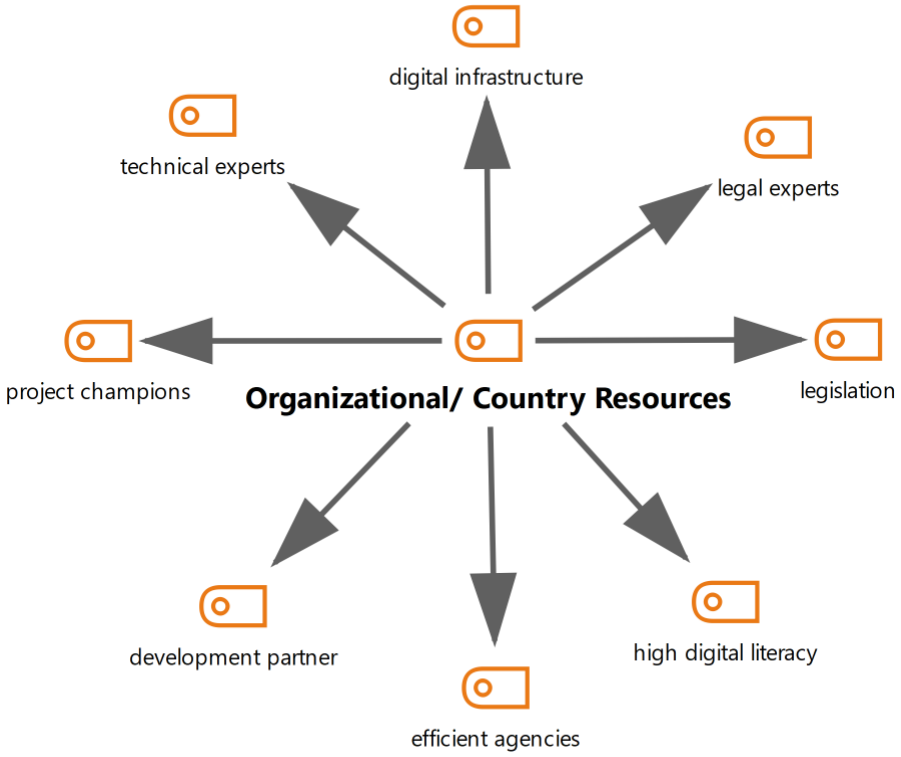


Figure 9 Organizational and country resources as success factors

Digital Infrastructure. One important success factor is the national digital infrastructure of both Finland and Estonia. It has been noted that these countries have well-established digital foundations for systems and processes to operate efficiently (Expert 02 & Expert 07, 2021). As what Expert 07 pointed out:

> *I think there's one very important aspect in both countries actually, that we have this national infrastructure. I mean you need to have a very good national infrastructure before going across the border. So we have our prescriptions, we have our centralized prescription repositories, which made it possible.* (Expert 07, THL)

This can also be attributed to the digital maturity of the country which is a significant driver to enable data exchange beyond national borders. Expert 07 believed that it is difficult to start implementing cross-border services on a European level and with a forecast of every country participating if their digital maturity is not high.

Expert 02 noted that the capacity of a country to integrate its systems and data is necessary and to date, there are only few countries that were able to integrate into the system such as Croatia and Portugal in addition to Estonia and Finland for cross-border ePrescription. She added that one enabler for the project's success in Estonia is the establishment of their own central health information system that has already been in place for a very long time. All the information needed is readily available and they only need to structure and exchange it for cross-border use cases through an integrated platform (Expert 02, 2021). As she elaborated:

> *Our ePrescription system has long been in place for internal and state use and we just needed to widen the scope of service. This is of course our huge advantage and our strength because other countries are at varying levels of their technological capabilities. But this is challenging to see how EU countries can have a harmonized approach to have integrated solutions for interoperability.* (Expert 02, SM)

On the Finnish side, it is convenient to participate in cross-border integration because the national health information system is already built-in and well-operating (Expert 05, 2021). The country is ready to integrate its systems for cross-border use cases and strengthen cooperation in future digitization projects with other countries like Sweden because of its well-established organizational and technical capabilities (Expert 08, 2021).

Technical and Legal Experts. Given the complexity of the project, the implementation of cross-border ePrescription service involves a multidisciplinary team with diverse backgrounds from various agencies. Three key informants believed that the quality of the human resources or experts with specialist knowledge on cross-border services (CBS) like the technical and legal experts is considered as one success factor (Expert 07, Expert 08, & Expert 03, 2021). As what Expert 07 claimed:

> *For both countries, we have really good human resources that our technical experts are of the highest quality in Europe I must say and we also make a huge difference in cross-border services and pan-European development.* (Expert 07, THL)

Expert 08 believed that it is important to have great experts who have the will and commitment to do their duties, especially that this project is complex and requires a lot of coordination with other countries. She claimed that Finland has been in a leading role in this cross-border ePrescription following the success from the past epSOS pilot and that the country has strong experts and others may not have the same level of technical expertise for CBS.

On the other hand, Expert 03 reported that in Estonia there are many people involved in the design and development of digital solutions at TEHIK such as system administrators, system architects, and the like. She maintained that this is necessary in order to ensure seamless integration of systems and processes and that the digital solution is in compliance and accordance with the European rules. In the same department, they also have a reliable development partner in designing digital solutions. As Expert 03 emphasized:

> *It's always good to have a reliable development partner. In this cross-border ePrescription project, we've had the same partner from the beginning and they have really good and deep knowledge about digital prescription and overall ecosystems in Estonia so this really helps because they can see all kinds of obstacles that might have and immediately communicate to us.* (Expert 03, TEHIK)

In order to ensure compliance and compatibility to EU regulations, both countries have their own lawyers to reconcile and harmonize policies for cross-border ePrescription (Expert 03, 2021). Interoperability in the legal and regulatory level requires a huge amount of work and is considered a major challenge that can prolong the delay in implementing any CBS project. Expert 07 clarified that legislation for cross-border data exchange was a huge work that it has been worked on for several years in the European context that demands good lawyers from both countries to discuss legal matters thoroughly because of data privacy and security implications of CBS.

Expert 01agreed that overall the involved agencies of both countries were efficient during the planning and deployment stages of this project that despite all the identified challenges and differences, both Finland and Estonia were able to deliver the final service for cross-border use. He believed that the agencies of both countries as well as various international communities such as the eHealth Network, among others, and EU member states are all the project champions for this CBS. Expert 08 noted that in addition to EU funding and support, the involvement of various specialists in the project for both countries plays a major role for seamless integration of CBS.

Political Commitment and Support. The political support which was visible as well as the political commitment declared at the level of Prime Ministers of both countries have propelled the successful implementation of the project (Expert 01, Expert 07, & Expert 03, 2021). This is considered as the main contributor for the effective coordination among the involved agencies in cross-border ePrescription. As what Expert 01 reported:

> *There was political support at the Prime Minister level. At some point in 2018, there was a memorandum of understanding between Estonian and Finnish prime ministers to build this exchange of not only health data but also some other parts like taxation data and so on.* (Expert 01, DG SANTE).

Expert 07 and Expert 03 highlighted that the political commitment declared at the level of highest authorities has greatly helped in the collaboration of government institutions as well as the management of stakeholders to deliver expected contributions.

Digital Literacy. In addition to digital infrastructure, according to two informants, it has also been conveyed that the digital literacy and skills among the population of both countries is considered high. In Finland, digital literacy is at a very good level even older people have their own smartphones with which they have greater access to eservices (Expert 07, 2021). In Estonia, around 99% of prescriptions are digital so that even senior citizens know they only need to present their ID card when visiting a pharmacy abroad and there is very little known information about a lack of digital access and this is not an issue anymore (Expert 03, 2021). Overall, with an established digital infrastructure and high digital literacy skills of the end-users, these countries can provide digital solutions because the capacity to adopt and maximize the use of e-services is considered high.

5.2.2 Success Factors in Cross-border Cooperation

This section contains various success factors under the theme of cross-border cooperation such as the need for cross-border ePrescription, long tradition of trust, political will, strong public and stakeholder interest, collaboration among agencies and system vendors, communication, risk assessment, mass media, project management, and end-user participation.

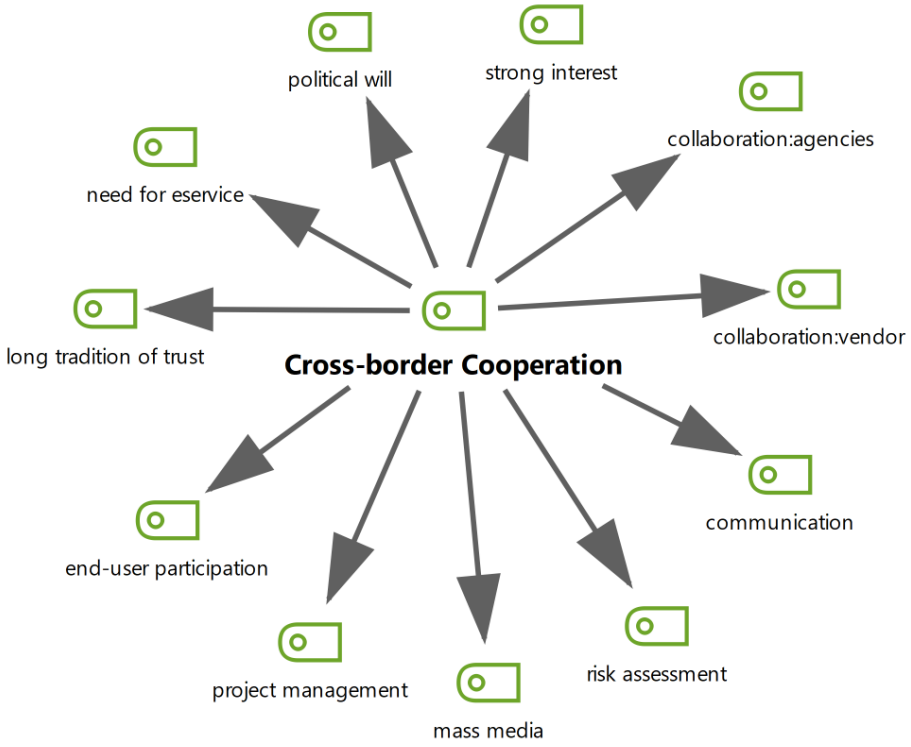


Figure 10 Success factors under cross-border cooperation

Collaboration of Key Agencies. One identified enabler for success is the strong collaboration and coordination efforts among the key agencies of both countries. Expert 07 explained that collaboration happened on a regular basis between stakeholders and system developers and architects had to work quite closely on a daily basis and in some other stages of deployment, the project was well-coordinated and smooth. Expert 05 emphasized that they had good cooperation because both countries are forerunners in ehealth projects and the kind of trust between national contact points is proven and sustained. Expert 01 confirmed that:

> *We had a lot of collaboration with different stakeholders in Finland such as the Ministry of Social Affairs, the National Medicines Agency and so on. It was not an easy exercise. It's not like developing software and putting it into production; it involves quite a lot of coordination. But despite the complexity of the project, I don't think we had any cooperation problems.* (Expert 01, DG SANTE)

Coordination with Pharmacy System Vendors. In the interoperability of cross-border ePrescription, there are various pharmacy systems that are being used from different system vendors to retrieve patient information. The involvement of these vendors plays a crucial part during system testing and deployment to ensure seamless integration during data exchange. Expert 03 pointed out that in Estonia the software they developed was tested together with the pharmacists and feedback was gathered to identify technical and semantic issues. Expert 07 mentioned that the active participation of these system vendors is a major driver. As what she emphasized:

> *We have a sort of agile way working with our pharmacies and the system vendors in both countries. They all came along without any extra payments or anything and they made their share. So that's quite also you need that now in both countries every pharmacy can actually dispense medications from the other country. So that I would say a driver actually.* (Expert 07, THL)

Expert 01 further explained that they had collaboration with two pharmacy system vendors in Finland with three different pharmacy systems wherein they were expanding the usability in order to have an integrated system for doing dispensations nationally and internationally. He added that the systems are interconnected and interoperable where information about the drugs is available and other relevant information can be retrieved and validated.

Bilateral Communication. In the interviews, two informants emphasized the importance of two-way communication between the two countries and it was easier because these are small neighboring countries (Expert 07, 2021). Expert 03 articulated that communication is the major driver: *"one of the things that was really good was actually communication between different parties, at least nationally, they have been faster to respond and so on."*

End-user Participation. Expert 08 stated that end-users were involved during the planning, development, and deployment stages of the project. Expert 01 believed that patients were already involved during the epSOS pilot. There were some questionnaires with which we asked them about their experiences with the service (Expert 01, 2021). He mentioned that people who purchased drugs sometimes would provide feedback in the service desks, *"we analyze feedback and as part of the change, we integrate it to the service in the pharmacy systems."*

Expert 05 emphasized the willingness of the stakeholders, especially the community pharmacies to be involved in identifying issues and proposing solutions. He further explained that there were customer groups involved and they underwent usual preparation for operations such as stakeholder analysis and bringing up the needs of different segments.

Long Tradition and Culture of Trust. One critical success factor is the long-established trust between Finland and Estonia. Expert 08 declared that the governments of these countries have higher trust when it comes to CBS especially with long records of partnership and collaboration. She added that the two countries have been using ePrescriptions so long and the technology has already been in place. Furthermore, Expert 07 further elaborated:

> *We have a long, long tradition of trust in many respects. We have very good capacities actually existing already before this cross-border collaboration so we could just make use of everything that has long been there. We really strive to digitize our services because we have many common services that actually benefit the citizens of both countries.* (Expert 07, THL)

Strong Interest and Need for Cross-border ePrescriptions. It is claimed that there was a lot of public interest in the cross-border ePrescription as well as strong interest from different agencies, for example in Finland, the National Medicine Agency and the National Supervisory Authority for Welfare and Health (Expert 01, 2021). It has often been suggested by all informants that there was a strong need to implement CBS in both countries because their citizens are living, working, or traveling and the use of ePrescriptions to buy medicines at any pharmacy has become part of a regular activity. Expert 03 illustrated that during the Covid lockdown the use of ePrescription was significant for people who were stuck, especially for Estonians who were in Finland at that time. This is the reason why they launched the service in June 2020 in order for Estonian prescriptions to be dispensed in Finnish pharmacies. Expert 01reported that Estonians living in Finland already have their prescribed drugs that they could simply go to a Finnish pharmacy and it was surprising that Estonians actually used the service on a daily basis. Moreover, Expert 07 said that from the Finnish side, ePrescriptions have long been a need for them as they travel to Estonia often and get their medicines at the same time.

Although cross-border ePrescriptions as a service itself may not have a huge impact in the European perspective but Expert 07 maintained that it is vital to have a strong need for the service to work and continue, however limited in terms of its scope, but when it is shared with other patient health data can be a great resource and asset for cross-border healthcare. She stated that this is indeed a very good case as the first step to showing that the common infrastructure behind CBS in Europe actually works.

Legislation for Cross-border Service. It is often pointed out that the legislation or the memorandum of understanding declared at the Prime Minister level to legitimize the cross-border cooperation between Finland and Estonia has been a huge factor in making all the resources and efforts converge to successfully implement this CBS. Expert 08 argued that both countries were enthusiastic in deciding to have this cooperation, underscoring the strong political will and support to push forward the deployment of cross-border ePrescription with which the development of the project was very fast and efficient. In addition, Expert 01 stressed that political commitment was a major success factor because if the country has multiple, even bigger national projects compared to ePrescription which may not be so huge but still an important service, it is very useful to have a clear political support to focus on the continuance of the CBS. As what Expert 07 underscored:

> *If we go up to the political level, I see that it even became less complicated in our countries because there was an outspoken need and desire to elaborate and develop our digital collaboration on a cross-border level in all respects not only in the healthcare sector but in many other administrative sectors as well.* (Expert 07, THL)

In Finland, Expert 05 reported that they had already introduced the legislation on digital prescription and on processing of patient data in 2007 and added that: *"We are path dependent in the way that we have our own legislation that comes from the past and it's really a step by step towards what we have nowadays."*

Project Management and Assessment of Risks. Expert 03 believed that one key driver is how the ePrescription service is being managed and supported. As the project manager for CBS in health and welfare in Estonia, she highlighted that it is important to understand the project and its processes. Like a classic project management approach, they followed a project plan and carried out the expected targets and deliverables. One project management knowledge area is the project risk management. Because the deployment of any CBS entails data privacy and security implications, both countries confirmed that they conducted risk analysis as well as data protection impact assessment as deemed as necessary and mandatory.

As Expert 01 further explained:

> *We are sure that each country was audited, audited before starting the production of the service. In short, risks were analyzed. And we have some project plans for dealing with any compromise in data protection and system security.* (Expert 01, DG SANTE)

Furthermore, one project management component they also implemented is the project communication management not only with stakeholders as well as through mass media to broadcast the use of cross-border ePrescription. Communicating the service to a wider audience is also important in promoting the benefits to the public that it is possible to get their medicines when travelling or working abroad (Expert 07, 2021). Expert 05 highlighted the importance of raising awareness to certain population groups, especially those who often travel. He specified that: *"We have this advice in our website already but not everyone is keen or willing to access information in the website."* On the Estonian side, which was recently launched, Expert 02 stated that the Ministry of Social Affairs made several press releases to inform the public and promote the service and their negotiations with Finland.

5.2.3 Support at the European Commission Level

On top of the national efforts and coordination, one major driver is the support and resources from the European Commission (EC). This theme presents different enablers that contributed to the success of the cross-border ePrescription. As shown in Figure 11, these factors are the Connecting Europe Facility (CEF) funding, compliance to EC's recommendations, guidelines, and frameworks, support from the EC's eHealth Network and coordination of national contact points (NCPs) for cross-border healthcare.

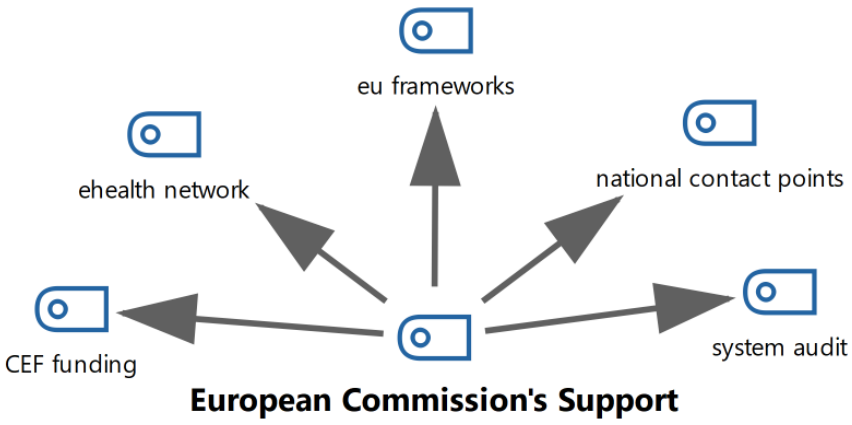


Figure 11 Identified enablers at the European level

CEF Telecom Funding. It has often been pointed out by the informants that the support and funding from the Commission played a huge part in the development and interoperability of systems, processes, and policies. One main driver is the funding received from the Connecting Europe Facility (CEF). When the cross-border ePrescription was launched, both countries acquired some funding through the CEF program. Expert 01 highlighted that *"the fact that financing was received from CEF Telecom was indeed a great help to the success of the project...that we have commitments to the European Commission."*

Expert 07 inferred that *"the action under the Connecting Europe Facility...that both countries had also the funding from there made it easier actually then to get some national funding that was also needed."* Although the said funding did not cover all the costs during development and deployment, Expert 03 maintained that:

> *The project was actually well organized from the beginning since the project is funded by the European Union and the money we got from there, we were really precise with that. We have some few developments that we have to pay for ourselves but other than that, we managed to basically do the whole project with the EU funding. So this was really well managed.* (Expert 03, TEHIK)

Expert 08 believed that both countries do not have major challenges in terms of finance and this is one success factor that in addition to their national funding, financing from the Commission has been significant.

eHealth Network's Guidelines and Frameworks. The EU's eHealth Network has published several guidelines that would support the Member States in the development and deployment of electronic cross-border health services. Expert 01 articulated that the eHealth Network was providing quite high-level guidance as well as technical work which was needed to put in place so that those guidelines on ePrescription are actionable and feasible. Under this network, there is the eHealth Member States Expert Group (eHMSEG) which oversees technical development and project management. There are some communities in addition to these larger groups such as ePrescription cluster, semantic task force, among others to identify and resolve issues regarding cross-border data exchange including ePrescriptions. Overall, these expert groups helped both countries in the specifications on technical, semantic, infrastructure, and in the areas of interoperability (Expert 01, 2021).

If there are significant changes in the interoperability specifications or in the technical or infrastructure aspects of the CBS that a country desires to implement, Expert 03 explained that they can do so through a change proposal which will be deliberated by these expert groups at the European level. She stated that: *"we have a solution provider from the European side that basically takes care of their central software, or the processes, business rules, and so on."*

Expert 03 also pointed out that part of the development process was the system audit by the European central developer that checks all the data and evidence that were produced from the system testing. This is an important step that is needed to be passed before any CBS system can be integrated and deployed. She stated that: *"before even going live with any services, we have to pass the European audit so this is really very thorough; it's not a security audit per se but it mostly concentrates on that.* "Furthermore, she stressed the importance of having a central solution: *"when you have a central solution, it's easier for all the countries to take part in the whole system, you don't have to have your own side ready, you can have your own timeline… and once ready, you can integrate to the central system."*

It is important to recognize that the Commission's recommendations on the interoperability of digital health as well as the eHealth network's guidelines on the cross-border exchange of ePrescriptions have provided a solid foundation in setting up the service and contributed to the project's success by building on what has been already produced at the European level (i.e. guidelines and frameworks). Expert 07 explained that both countries had to refer to the common interoperability requirements and specifications to ensure consistency and feasibility especially on the technical and semantic aspects as well as evaluating their business models for cross-border use cases. She believed that this pan-European architecture is going to work as long as it will be based on the joint efforts and actions taken by various national contact points (NCPs). As Expert 07 claimed:

> *I think that this common infrastructure, especially both technical and semantic, I think these are the strengths. It always comes down to semantic interoperability - if it's not structured information, it is not going to take us anywhere so we always aim for that and this is a good first step.* (Expert 07, THL)

National Contact Points for eHealth. The national contact points (NCPs) are the responsible organizations for connecting their eHealth systems to other countries to enable cross-border exchange of health data. The Social Insurance Institution or Kela is the NCP of Finland while the Health and Welfare Information Systems Center (TEHIK) is the NCP of Estonia. These two organizations are working closely together to design and develop any cross-border services including the ePrescriptions, Patient Summaries, and other health information domains. On the Estonian side, Expert 02 claimed that TEHIK as the national contact point has performed very well in connecting their eHealth system to other countries. Expert 01emphasized that the existence of NCPs in the brokering and smoothing out of country differences in the processes of prescription and dispensation was a key driver in coming up with common models for the interchange of health data. He stated that the European baseline and the basic description which is transferred between member states is more or less the same and this makes CBS organizationally and technically feasible.

Past epSOS Project Pilot. The past epSOS (Smart Open Services for EU patients) pilot funded by the EU had served as an important building block to the success of what is now a working cross-border ePrescription service. The goal of this project was to explore and pilot two services such as patient summary (PS) and electronic prescription in the cross-border setting (Expert 01, 2021). Expert 05 stated that important issues were already tackled during the project for cross-border exchange. The service was launched in 2014 together with Finland and Sweden and as Expert 08 claimed that the success of this pilot benefited the country in the development of other CBS including ePrescription service with Estonia.

At present, this pilot was already scaled up to become a standard service involving other MS and for the time being, four countries are doing the cross-border ePrescription such as Croatia, Portugal, Finland, and Estonia. This standard continuous service is part of the wider project which is the eHealth Digital Service Infrastructure (eHDSI) or the “My Health at EU” and more countries are joining other CBS in health such as exchange of patient summaries and the like (Expert 01, 2021).

5.2.4 eService Features as Drivers for Success

Another identified theme that can be attributed as a success factor is the positive features and characteristics of the cross-border ePrescription. These service features are accessibility, inclusiveness, ease of use, feasibility, system quality, and system security. Figure 12 presents these characteristics.

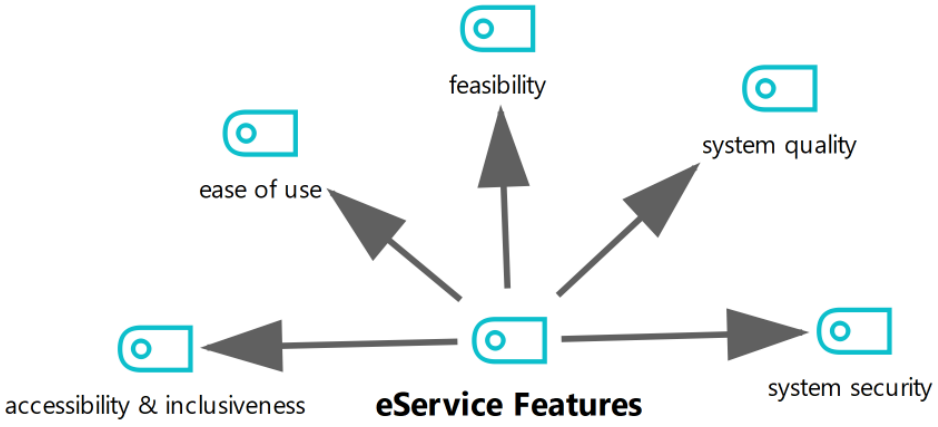


Figure 12 eService features as success factors

Ease of Use. One positive feature of this service is the ease of use. Expert 01 mentioned that the service is straightforward and easy to use. For instance, a Finnish patient can simply provide a consent, travel to Estonia and present an ID and get the medicine. When a service is easy to use, this may probably mean that the business process, workflow, or care pathway behind it is easily integrated and simplified for cross-border use.

Feasibility to Implement the Service. One advantage of this service is its feasibility. Expert 07 suggested that the service can easily be deployed and that there will only be addendums to what they already have like expanding the service to include other health information domains such as patient summaries, medical and laboratory reports, and the like. As what she stated:

> *If you think about the European perspective, I would say that one benefit is that these services were the first ones that could actually prove that the common architecture and infrastructure are working through the joint efforts by the National Contact Points.* (Expert 07, THL)

Expert 01 discussed that the EU baseline and requirements are very feasible to implement and that many Member States have done at least the implementation and testing of CBS although not yet in the production or deployment stage but they are progressing to set up their services for wider integration.

Quality of the System. It has been noted that the service is working and functioning as it is expected to. Expert 03 reported that the ePrescription project lives on its own wherein it is properly working and if there are any technical errors, they are notified and they check and fix it as soon as possible but she said that this rarely happens and reiterated that the service is up and running and everything is good. Expert 07 highlighted that the ability and capacity of the people behind this collaboration, taking into consideration all kinds of safety and security measures, are a very huge thing. She emphasized that this service deals with patient health data which should be managed with high standards and this is one thing that both countries have been able to maintain.

Accessibility and Inclusiveness of the Service. In the interviews, participants were asked about the main measures taken to boost awareness and adoption and the solutions implemented to make the service accessible and inclusive to vulnerable sectors such as senior citizens or patients with low digital skills. This is important to be asked since it is mostly the older population who would use the ePrescription service and get their medicines in the pharmacy because of their evident health conditions and if this case has been carefully looked at. Expert 01 implied that this segment of the population in Finland is using the Kanta services, the national health portal, partly because of the fact that they have more diseases and are more interested to see what the doctor has told them but he did not see any hindrance for accessibility and inclusiveness. Expert 07 added that the topic on inclusiveness in Finland has been discussed already as part of the bigger national digitization projects in healthcare although there is no specific interest in looking at cross-border aspects but it has been noticed and realized that there are groups of people that will not be able to make the most use of different digital services, not only the elderly but other segments as well. The Finnish government is looking closely on the issues on accessibility and inclusiveness as digitization proceeds further (Expert 07, 2021).

Expert 01 believed that in the coming years there will be more support for older segments of the population like acting on behalf of another person or giving consent or authorization to be dispensed of the prescribed drugs. He confirmed that the rules or specifications for this are already in place as the first step in taking into account the needs of the elderly people. Expert 08 revealed that recently it is possible to purchase medicines on other people's behalf such as children or elderly people through an ePrescription consent form.

As Expert 08 illustrated:

> *In Finland, we have this electronic authorization as well as a consent form on paper so other people can go to the pharmacy and buy medicines on others behalf, for instance older people who can't go there.* (Expert 08, THL)

On the Estonian side, Expert 02 informed that there is still an option for paper prescription for people who are digitally incapable and this can be directly given to the attending pharmacist and present their ID cards. Expert 03, however, considered this as not an issue anymore. She reported that the majority of the prescriptions in the country are done electronically and this is already known information in Estonia that they only need their ID card to purchase drugs. Even the elderly, they know how to use the digital prescription. For cross-border use, she added that there is still an option to have a paper prescription when travelling abroad.

5.2.5 List of the Identified Critical Success Factors

Overall, the critical success factors in the deployment of cross-border ePrescription can be grouped into four (4) major categories. This is according to the researcher's own analysis resulting from coding the interview data through the MAXQDA code analysis.

Table 5 Summary of the critical success factors of cross-border ePrescription

Themes/ Categories	Critical Success Factors and Drivers
Organizational and Country Resources	National digital infrastructure and digital maturity
	Technical and legal experts
	Political commitment and support
	High digital literacy/ digital skills of the population
Cross-border Cooperation	Collaboration of key agencies
	Coordination with system vendors
	Bilateral communication
	End-user participation (patients, pharmacies, etc.)
	Long tradition and culture of trust
	Strong interest and need for cross-border ePrescriptions
	Legislation for cross-border service
	Project management and assessment of risks
Support at the European Level	Connection Europe Facility (Telecom) funding
	eHealth Network's guidelines, standards, and frameworks
	National Contact Points (NCPs) for eHealth
	Past epSOS project pilot
eService Features	Ease of use
	Feasibility to implement the service
	Quality of the system
	Accessibility and inclusiveness of the service

5.3 Value Proposition and Main Benefits of Cross-border ePrescription

In the interviews, all respondents were asked about the public value or main benefits of this e-service (i.e. ePrescription/ eDispensation) to the end-users or patients, health practitioners such as doctors or pharmacists, and public managers or the government. From the interview data, the researcher identified seven (7) categories which are the value or main benefits of this service. Figure 13 presents such values.

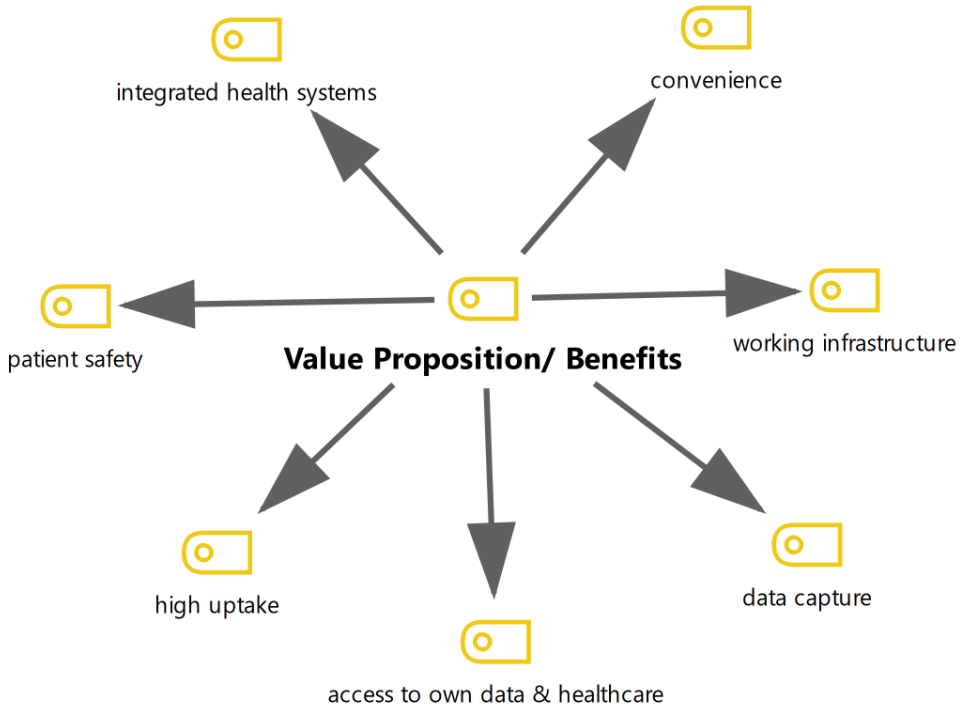


Figure 13 Value and benefits of cross-border ePrescription

Access to Health Data and Healthcare Abroad. It is reported that the use of this service would empower patients to have greater control and access to their personal health data and medical records. Expert 08 asserted that this cross-border healthcare directive gives every European citizen an opportunity to have the same level of access to health and care as well as medicines without any borders. Additionally, Expert 03 illustrated that one good example is during the Covid lockdown where patients were stuck in another country as they did not need to visit a foreign doctor and just called their local doctor who electronically prescribed their drugs. She elaborated that: *"You don't have to worry whether you're getting enough medication, whether you have to look for a doctor abroad, just know that you have your digital prescription where you can access it in any pharmacy abroad."* Expert 02 found that the use of this service has given patients and end-users greater ease and convenience in retrieving their prescription information.

Retrieval of Dispensation Data. Expert 07 stated that the system can receive and document the dispensation information from the ePrescriptions used abroad. The collected data will then be a part of the special medical information of the patient which can be easily retrieved through the national health portal. This feature is also important for patients who seek reimbursement when they return from abroad. Expert 03 emphasized that:

> *The value or idea is a free flow of information in Europe that when you come back, the information on the dispensed medicine will be seen and it is really good to get the information back from the other country and right now, we get the dispensation information back and mark it as used in the system.* (Expert 03, TEHIK)

Integrated Healthcare Systems and Working Infrastructure. Although this cross-border ePrescription may be a bit limited in terms of its scope, this is the first step to demonstrate that this common infrastructure works as expected (Expert 07, 2021). Expert 01 recognized that the service is not cheap to build but the impact is slightly larger than the national impact because this is bringing the health systems of different member states closer to each other and we have clearly realized the benefits of this integration and interoperability across borders. Expert 02 mentioned that it is feasible and possible for other countries to integrate into the system anytime when they are ready because the European central system has already been in place.

High Uptake and Acceptance. Expert 07 reported that there have been over 10,000 Finnish prescriptions dispensed in Estonia. On one hand, there are only some 1,000 Estonian prescriptions dispensed in Finland because the service was only opened in 2020 so it is rather new yet and remains to be seen but the uptake has been good among the population (Expert 07 & Expert 01, 2021). In Finland, the uptake is 100% because every pharmacy is now able to dispense Estonian ePrescriptions which is a huge thing (Expert 07, 2021). Expert 05 confirmed that:

> *We have the 100% coverage with digital prescriptions nowadays so that even the paper based or telephone or fax prescriptions they turned and recorded in the electronic ones. This service is available even in a cross-border setting.* (Expert 05, THL)

Expert 01 revealed that when they started the service they did not expect so much use of it and it was rather surprising that Estonian prescriptions dispensed in Finnish pharmacies are used on a daily basis by the people. In the dispensation of drugs, Expert 08 reported that approximately there are 25 Finnish prescriptions being dispensed in Estonia per day and in the other case, an average of 7 Estonian prescriptions administered in Finland per day.

Patient Safety. Expert 08 claimed that the use of this service contributes to patient and medication safety. As Expert 03 elaborated that pharmacists can see enough information such as strength and amount of medication in order to safely dispense the drugs to the patients and this will prevent mismatch in medication. Expert 07 highlighted that from the perspective of healthcare providers and pharmacists, ePrescriptions bring a lot of patient safety with it because it is a much safer way of dispensing medications as there are risky active substances in certain drugs and the information obtained from dispensation can be used to evaluate patient's health and safety in their medication. The data from the cross-border system can be used to determine patients' adherence to the prescription as well as the number of uptake and adoption in the use of the service.

5.4 Interoperability Solutions and Ongoing Development on CBS in Health

This section highlights the interoperability solutions in the deployment of cross-border ePrescription undertaken by the involved agencies in Finland and Estonia as well as at the European level. In addition, ongoing and future development on cross-border digital healthcare is also discussed in this section.

5.4.1 General Descriptions of the Implemented Interoperability Solutions

In the interviews, specific questions on eHealth interoperability were asked to the key experts. Using the refined eHealth European Interoperability Framework (reEIF), the researcher classified responses from the interview data that fall under each level of the framework. There are six eHealth interoperability levels such as legal and regulatory, policy, care process, information, applications, and infrastructure. This however covers general discussion of the implemented solutions taken by both countries. Table 6 presents the solutions for interoperability in ePrescriptions.

Table 6 General descriptions of the eHealth interoperability solutions

Levels of eHealth Interoperability Framework	General Descriptions of the Implemented Solutions
Legal and Regulatory	***Amendment of National Legislation.*** Finland amended their legislation during the epSOS pilot in 2014 (Expert 07 & Expert 05, 2021) and Estonia also changed their legislation for cross-border health data exchange. This entailed a lot of coordination among involved key agencies. ***Compliance with GDPR and Policy of Consent.*** When GDPR came into force in between, both countries had to rethink the policy of consent as patient health data have privacy implications (Expert 07, 2021). Both countries confirmed that they conducted risk analysis and data protection impact assessment as deemed as mandatory (Expert 01, 2021). In the Estonian policy, a patient's electronic health data is at the very start open for cross-border data exchange and the consent is basically granted by default (Expert 03, 2021). On the Finnish side, a patient has to indicate his consent beforehand through their My Kanta national patient portal to allow cross-border access and transactions (Expert 01, 2021). ***EU's eHealth Network.*** The eHealth Network has published several guidelines that would support the development and deployment of electronic cross-border health services. Expert 01 articulated that the eHealth Network was providing quite high-level guidance as well as technical work which was needed to put in place so that those guidelines on ePrescription are actionable and feasible. He also stated that the European baseline and the basic description which is transferred between member states is more or less the same and this makes CBS organizationally and technically feasible. Expert 07 explained that both countries had to refer to the European common interoperability requirements and specifications to ensure consistency and feasibility especially on the technical and semantic aspects as well as evaluating their business models for cross-border use cases.
Policy	***Memorandum of Understanding.*** The collaboration agreement for cross-border happened at the highest level of authority in both countries. The memorandum of understanding declared at the Prime Minister level to legitimize the cross-border cooperation between Finland and Estonia has been a huge factor in making all the resources and efforts converge to successfully implement this CBS. Expert 08 argued that both countries were enthusiastic in deciding to have this cooperation, underscoring the strong political will and support to push forward the deployment of cross-border ePrescription. ***National Contact Points.*** Two organizations play an integral role for cross-border health data exchange. The Social Insurance Institution or Kela is the NCP of Finland while the Health and Welfare Information Systems Center (TEHIK) is the NCP of Estonia. These two organizations are working closely together to design and develop any CBS including the ePrescriptions, Patient Summaries, and other health information domains. Expert 01 emphasized that the existence of NCPs in the brokering and smoothing out of country differences in the processes of prescription and dispensation was a key driver in coming up with common models for the interchange of health data.

Care Process	The integration and harmonization of care pathways and shared workflows as well as business models or processes in the prescription and dispensation of medicines in both countries happened on the European level and also decided on a national level (Expert 07, 2021). ***Validity of ePrescriptions.*** Prescriptions are different in each country, for example in Estonia, they are valid for 6 months while in Finland all prescriptions by default are valid for 2 years (Expert 01, 2021). ***Type of Prescribed Drugs.*** In Finland, drugs are prescribed in brand names and can be exchanged in the pharmacy to another brand name (Expert 01, 2021). In Estonia, most prescriptions are generic where they prescribe the active ingredient or substance and pharmacists can choose the cheapest medication the patient wants (Expert 03, 2021). ***Acting on Behalf of Others during Dispensation.*** In both countries, it is now possible to purchase drugs on behalf of other people like children or senior citizens. In Finland, consent should be made to be able to represent a child or elderly as the authorized person (i.e. parent, guardian, or next of kin) (Expert 08, 2021). Despite the differences in prescription and dispensation, Expert 07, however, argued that there were no major changes that interrupted the default processes in prescribing drugs and as what she illustrated, Finnish pharmacies are dispensing in the same manner as they would do with the normal Finnish ePrescriptions even with cross-border prescriptions coming from Estonia. Expert 05 also believed that the process is rather similar in the way when it comes to pharmacy systems because of the same service environment.
Information (Semantic)	Most of the data models and data structures were already designed in the epSOS pilot. There was harmonization during the project. As Expert 01 stated that there were a lot of additions and revisions and they analyzed several profiles in the pharmacy domain. During the system testing, there were some findings and they changed some specifications in ePrescription for cross-border use (Expert 01, 2021). At present, new wave specifications are being brought up and handled by the semantic task force and ePrescription cluster of the eHealth Member States Expert Group of the EU's eHealth Network and the set of data structures and value sets are constantly updated every year (Expert 01, 2021). Additionally, there are newer drugs that already appear in the market which are used by some people and this is not found in the coding system yet and needs updating and proposal to change this code system, so it is a continuous process (Expert 01, 2021). In Finland, the master information on the list of medicines is coming from the Finnish Medicines Agency (Fimea) which is distributed and integrated to different systems.

Applications	Each country has their own national patient portal as well as an ePrescription system. In cross-border use cases, their eHealth system is connected to the central services of the EU's eHealth Digital Service Infrastructure (eHDSI) and the exchange of data happens in the central European system open interface or the OpenNCP (Expert 03, 2021). In Finland, the Social Insurance Institution (Kela) maintains a pharmaceutical database that contains medical information. This database is distributed to all eHealth record systems and also in pharmacy systems and there are three different pharmacy systems from two system vendors in Finland (Expert 01, 2021). In Estonia, TEHIK is responsible for the same integration. Expert 03 pointed out that in Estonia the software they developed was tested together with the pharmacists and feedback was gathered to identify technical and semantic issues. ***Change Proposal.*** If a country or a solution provider has experienced technical obstacles or issues and would propose something better, the national contact point can prepare a change request (Expert 03, 2021). A change proposal is a written procedure from the solution provider that specifies what they want to change and how the change is implemented, for instance a change in the code of the software (Expert 03, 2021). This change proposal is sent to the eHealth Member States Expert Group for feedback if the change is implementable from their sides and once this agreement is suitable and the solution feasible, the change is implemented in the open interface or OpenNCP wherein upgrades and changes happen once a year. ***System Audit and Risk Assessment.*** Furthermore, risk audit and analysis as well as data protection impact assessment have been performed in both countries to ensure that the applications are secure and safe during cross-border data exchange (Expert 01, 2021). Expert 03 also pointed out that part of the development process was the system audit by the European central developer that checks all the data and evidence that were produced from the system testing. This is an important step that is needed to be passed before any CBS system can be integrated and deployed.
IT Infrastructure	When it comes to infrastructure, the EU central services are deployed to integrate the ehealth systems of both countries. The Connecting Europe Facility (CEF) Telecom deployed the eHealth digital service infrastructure (eHDSI) and broadband networks to facilitate this cross-border exchange of health data (European Commission, 2021x). This data exchange happens in the OpenNCP platform.

5.4.2 Ongoing Development on Cross-border Exchange of Health Data

In Estonia, they have launched a service to assist doctors in making helpful decisions when prescribing drugs to avoid any conflict or mismatch in medications and this is also connected to the pharmacy software to display this kind of information directly to the pharmacists (Expert 03, 2021). The next step is to integrate the reimbursement of drugs purchased abroad as what Expert 03 illustrated: *"when you go abroad you have to pay the full price of the medication and you can basically ask for some money back."*

For cross-border ePrescription, the recent update of the ePrescription guidelines by the eHealth Network was launched in June 2021 and this is a continuous process (Expert 01, 2021). One ongoing project is the European Health Data Space that facilitates and promotes the exchange and access of various kinds of health data for both primary and secondary use. The primary use is mainly to support healthcare delivery while the secondary use is for health research, innovation, and policy making in health (Expert 01, 2021). This health data space will be built on a strong system of data governance and rules for data exchange, data quality, and strong infrastructure and interoperability (European Commission, 2021). With regards to the secondary use of health data, the Joint Action Towards the European Health Data Space (TEHDAS) is developing principles and concepts for the secondary use of health data which involves 25 countries to benefit public health research and innovation in Europe. As Expert 01 stated in this health data space, *"we don't have a final design of the system yet and we just ran a public consultation on that and analyzed the results of the feedback but it will take some years to launch the services."*

Another development is in the exchange of patient summaries that contain electronic health records and medical history such as allergies, current medication, previous illness, surgeries, among others (Expert 05, Expert 02, & Expert 01, 2021). The patient summary can also contain the digital Covid vaccination certificate which will be an interesting project for cross-border setting and as Expert 01illustrated:

> *The patient summary can contain the vaccination data for care purposes, not for travel purposes, but still remains essential. We are seeing that EU member states are launching different mobile apps and putting this service as part of their national patient portal. We can extend and leverage the capability to include some other use cases for example, EU vaccination cards or some parts of patient summary where access of patients to their translated health data is possible.* (Expert 01, DG SANTE)

6 DISCUSSION AND ANALYSIS

This chapter presents the analysis of the challenges and success factors in cross-border ePrescription by applying the theoretical and conceptual frameworks in eHealth interoperability and integrative public value model. The first section presents the types of constraints while the second provides the classification of success factors based on the different interoperability levels and integrative public value environments.

6.1 Types of Constraints in Cross-border Collaboration and Interoperability

Integration and interoperability in cross-border settings can have major challenges, limitations, and constraints because developing and deploying a digital service entail complex processes that involve various agencies.

Constraints in government integration. Scholl and Klischewski (2007) identified different types of constraints in the integration and interoperability in eGovernment information systems. These constraints, although could limit the integration and collaboration in eGovernment, are being considered to have an enabling role for actions and interactions to happen (Scholl & Klischewski, 2007). The researcher referred to Scholl and Klischewski's literature review of constraints to classify the identified challenges in the deployment of cross-border ePrescription.

Constraints at eHealth interoperability levels. Additionally, the refined eHealth interoperability framework is used to determine at which level these challenges take place. The eHealth interoperability framework can be used as a non-technical model to describe and analyze the problems in eHealth solutions (eHealth Network, 2015). The types of constraints in the different levels of eHealth interoperability are further described at which specific environments in the integrative public value framework these domains take place. These constraints occur in the following environments:

- *Micro (focal service environment)* - country level
- *Meso (collaborative environment)* - Finland x Estonia integration level
- *Macro (authorizing environment)* - pan-European level

Table 7 presents the types of constraints in government integration and eHealth interoperability encountered in the cross-border collaboration.

Table 7 Types of Constraints in Cross-border ePrescription

Identified Challenges in Cross-border ePrescription	Types of Constraints in Government Integration	TAKES PLACE IN:	
		Levels of eHealth Interoperability Framework	Integrative Public Value Framework
Different healthcare systems and models in prescribing and dispensing medicines	Jurisdictional, Organizational, Constitutional	Care Process	Meso
Different national legal frameworks for cross-border exchange of health data and policy of consent	Constitutional	Legal/ Regulatory	Meso
Limitations in the CEF funding	Cost	-	Macro
Limitations in the human resources (technical experts)	Organizational	-	Micro
Challenges in the semantic interoperability in the pharmaceutical data structures	Informational	Semantic	Meso
Out-of-scope and new drug prescriptions in the pharmacy markets	Informational	Semantic	Meso
Concerns on technical and system integration to pharmacy systems	Technological	Applications	Meso
Measuring impact and evaluating actual benefits in the uptake and adoption of ePrescription service	Collaborative, Organizational, Managerial	Organizational	Meso

As can be seen in the table, most challenges take place at the Meso level or in the collaborative environment and usually happen at both the legal, organizational, and semantic levels where reported problems were attributed to these areas of interoperability.

This study infers that these constraints typically happen in the collaboration process because provisioning of cross-border service entails complex processes such as amending legislation to formalize cross-border cooperation, harmonizing health and care business processes to come up with an integrated pathways and workflows, among others. When processes become complex, many agencies are being involved and each one has their own interests and expectations that need to be balanced to produce shared public values.

6.2 Success Factors in the Multinational eGovernment Collaboration Model

Using the model for multinational eGovernment collaboration, information sharing, and interoperability by Navarrete et al. (2010), the researcher maps out the identified success factors based on the various perspectives that affect and influence the eHealth collaboration between Finland and Estonia. Figure 14 illustrates these four perspectives.

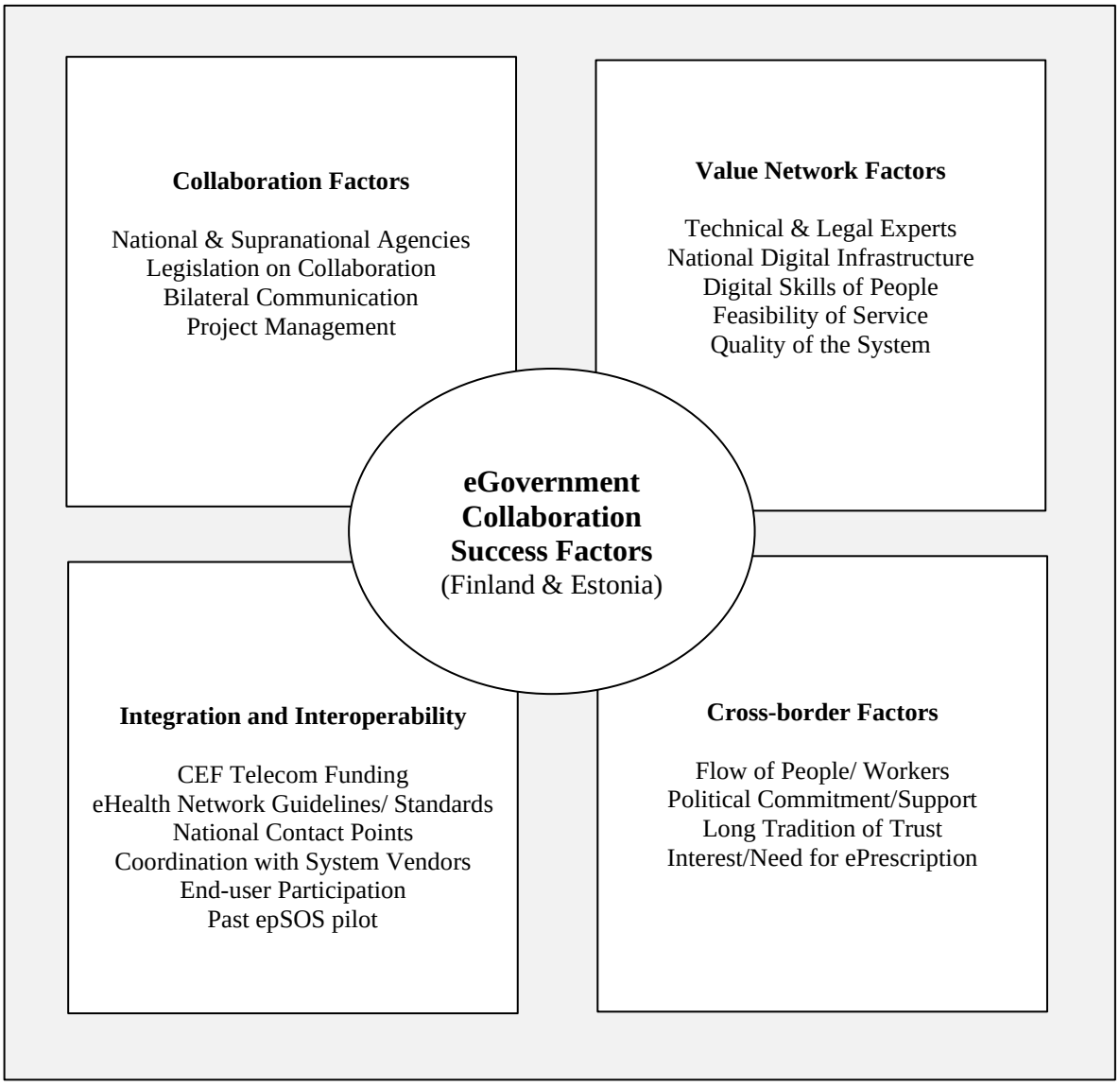


Figure 14 Factors affecting the cross-border collaboration in ePrescription service

The identified success factors can be classified into the four perspectives proposed by Navarrete et al. (2010). As shown in the figure, these common factors affect the collaboration of the involved countries and should be taken into consideration when implementing a cross-border digital health solutions.

In the first perspective, the success factors that can be considered as ***collaboration factors*** include the cooperation of all national and supranational agencies such as the respective institutions of the governments of Finland and Estonia as well as the role and support of the European Commission to strengthen the trust in this collaborative network. Within the interactions of these agencies, formalizing the cross-border collaboration through memorandum of understanding, the efficiency of communication between the countries as well as the management of the service all contribute to the success of the collaboration.

For the second perspective, Navarrete et al. (2010) proposed various factors affecting the value of a network greatly depend on the *roles* of the individuals and organizations, *transactions* or activities that add meaning and contribute to the goal, and *deliverables* both tangible and intangible resources that produce positive outcomes and efficiency within the network. In this study, the factors affecting the ***value of a network*** consist of the level of knowledge and expertise of technical and legal experts of both countries, the establishment of their national digital infrastructure and high digital maturity and digital skills of the people as well as the feasibility of the project and quality of the system in place. As a result, these factors contributed to producing positive outcomes and public values and efficiency of the value network.

The third perspective deals with the ***cross-border factors*** such as the market forces and trade flows which includes the flow of people, skills, labor, and investments across borders, the policy activities of multiple levels of governments, the political entities that influence border relations, and the culture of borderland communities like common language, cultural differences, and socio-economic resemblances (Navarrete et al., 2010). In this paper, the flow and exchange of people and workers of both countries created a strong need and interest for cross-border ePrescription. It has often been pointed out that the feasibility of cross-border cooperation is attributed to the long tradition or culture of government and public trust between Finland and Estonia. The political commitment and support declared at the Prime Minister level has strengthened the value network (i.e. responsibilities, activities, deliverables that produce shared public values) between the two countries for cross-border collaboration.

The fourth perspective revolves around the challenges and constraints in the ***integration and interoperability*** of eGovernment projects and initiatives such as legal, organizational, financial, technological constraints, among others (Navarrete et al., 2010). Results of this study suggest that the support by the European Commission and guidance at the European level all contribute to the successful integration and interoperability of cross-border ePrescription service like CEF funding, National Contact Points, eHealth Network as well as the coordination with pharmacy system vendors and involvement of end-users.

6.3 Mapping Out of Critical Success Factors

This section presents the application of theoretical frameworks in eHealth interoperability and the integrative public value model to classify the identified success factors and enablers in cross-border ePrescription in which specific interoperability levels and environments they typically take place.

- *Micro (focal service environment)* - country level
- *Meso (collaborative environment)* - Finland x Estonia integration level
- *Macro (authorizing environment)* - pan-European level

Table 8 Success Factors in various interoperability levels and environments

Critical Success Factors and Drivers	**TAKES PLACE IN:**	
	Levels of eHealth Interoperability	**Integrative Public Value Framework**
The established national digital infrastructure and digital maturity of both countries like their own national patient health portals, prescription centers/systems, pharmacy systems, etc.	-	Micro
The technical and non-technical human resources like system developers, legal experts, project managers present in various key agencies.	All Levels	Micro, Meso
The political commitment of higher authorities to support cross-border exchange of health data.	Legal/ Regulatory, Policy	Micro, Meso
The high digital literacy/ digital skills of the population/ patients in both countries.	-	Micro
Collaboration of key agencies and institutions	All Levels	Micro, Meso
Coordination with pharmacy system vendors	Information, Applications, Infrastructure	Micro, Meso
Bilateral communication in cross-border collaboration	Policy	Meso
The involvement of the end-user (i.e. patients, pharmacies, doctors, etc.) during planning and deployment of the service.	Care Process	Micro, Meso
The long-tradition or culture of trust in cross-border cooperation	Policy	Meso

Strong interest and need for cross-border ePrescriptions	-	Micro
Legislation for cross-border service declared at level of Prime Ministers	Legal/Regulatory	Micro, Meso
Project management and assessment of risks	-	Micro, Macro
Connecting Europe Facility (CEF) Telecom funding	-	Macro
eHealth Network's guidelines and frameworks	-	Macro
National contact points for eHealth (i.e. Kela and TEHIK)	Policy, Care Process, Information, Applications, Infrastructure	Meso
Past epSOS project pilot	-	Micro, Macro
Ease of Use	Applications	Micro, Meso
Feasibility to implement the service	Applications, Infrastructure	Micro, Meso
Quality of the system	Applications	Micro, Meso
Accessibility and inclusiveness of the service	Care Process, Applications	Micro, Meso

As can be seen in the table, the critical success factors revolve around all levels of eHealth interoperability. In the legal interoperability, the key enabler is the legislation to legitimize the cross-border exchange of health data undertaken by Ministries of Social Affairs of both countries as well as the political commitment declare at the Prime Minister for cross-border digital development. In the organizational level (policy and care process), the quality of communication among key agencies, the culture of trust, and involvement of end-users are the key enablers. In the semantic level, the national contact points (NCPs) play an important role in the implementing the common standards, models, and requirements for health data exchange. In the infrastructure level, the quality and feasibility of the cross-border service and coordination with pharmacy system vendors are key drivers. These success factors usually take place in Meso and Micro levels.

Through the lens of integrative public value framework, the important factors at the Macro level or in the authorizing environment are the CEF funding and eHealth Network of the European Commission for supporting cross-border services and providing common reference frameworks, policies, and infrastructures.

7 CONCLUSIONS AND IMPLICATIONS

Most constraints in the cross-border eHealth service occurred at the Meso level or in the collaborative environment. This study infers that these constraints typically happen in the collaboration process because provisioning of cross-border service entails complex processes such as amending legislation to formalize the cross-border cooperation and harmonizing the national health and care processes to enable integrated pathways and shared workflows. When processes become complex, many agencies are being involved and each one has their own needs, interests, and expectations that require to be balanced to produce shared public values and positive outcomes in a cross-border setting.

Most challenges in the interoperability of cross-border ePrescription usually happened at the legal/regulatory level and semantic level. In terms of interoperability of cross-border ePrescription, most constraints occurred in the legal/regulatory and semantic levels where it has been pointed out that legislation and policy took a longer time to be amended that delayed the deployment of the project and structuring datasets and models is challenging because new drugs and new prescriptions emerge in the market that needs updating in the central coding system, pharmaceutical database, and medication listings.

Through the lens of multinational eGovernment collaboration model, this study revealed that the flow and exchange of people and workers in both countries created a strong need for cross-border ePrescription. It has often been pointed out by the key experts that the feasibility of cross-border ePrescription is attributed to the long tradition and culture of government and public trust between Finland and Estonia. The political commitment and political support declared at the Prime Minister level has strengthened the value network (i.e. responsibilities, activities, deliverables that produce shared public values) between the two countries for cross-border collaboration. Given that this cross-border exchange of health data has data privacy and security implications, establishment of trust and political commitment are considered as two important drivers to overcome constraints.

Critical success factors in the deployment of cross-border ePrescription can be classified into four major drivers/enablers and value perspectives. (1) organizational and country resources (2) cross-border cooperation (3) support by the European Commission (4) features and characteristics of the cross-border e-service. These four main drivers all happened at the micro, meso, and macro levels and all occurred in different interoperability levels. Similarly, these critical factors can be grouped into four different perspectives that influence the collaborative value network of Finland and Estonia: namely, (1) collaboration factors, (2) value network factors, (3) cross-border factors, and (5) factors in integration and interoperability.

8 SUMMARY

This case study explores the challenges in the interoperability of cross-border digital prescription between Finland and Estonia and identify the critical success factors that contributed to the success of the service. This study delves into the different constraints and challenges that have taken place at every stage of the six different levels of the refined eHealth interoperability namely legal/regulatory, policy, care process, information, applications, and IT infrastructure. The implemented solutions and the critical success factors, in addition, are identified in detail and further mapped out at which environments they typically occur whether in micro, meso, and macro levels.

The data collection, furthermore, was done in multi-method by which semi-structured interviews were conducted and secondary sources were gathered to reinforce the primary findings. A total of eight (8) key experts from Finland and Estonia were interviewed. These experts are involved in the planning and deployment of cross-border ePrescription coming from and working in the involved key agencies responsible for this cross-border digital service. All the interviews were recorded, transcribed, and analyzed using the MAXQDA software.

Using the proposed integrative public value framework, the researcher identified various challenges and mapped out critical success factors at various levels of eHealth interoperability and public value environments. The identified challenges include different healthcare systems, policies, and processes in Finland and Estonia, different national legislations on the policy of consent, limitations in financial and human resources, constraints in the semantic level as new drugs and new prescriptions emerge in the pharmaceutical markets, and the need to conduct impact assessment to measure the actual benefits. Overall, the identified challenges typically happened at the Meso level which means in the collaborative environment as collaboration of two countries in cross-border setting entails complex processes and involves many actors. In terms of interoperability, most constraints occurred in the legal/regulatory and semantic levels.

On one side, the critical success factors in cross-border collaboration between Finland and Estonia can be grouped into: (1) organizational and country resources (i.e. digital infrastructures, technical and legal experts, political commitment declared at the Prime Minister level), (2) cross-border cooperation (i.e. quality of collaboration and communication among stakeholders, establishment of trust, strong interest and need for cross-border service, end-user participation), (3) support by the European Commission (i.e. CEF Telecom funding, eHealth Network's guidance, National Contact Points for eHealth), and (4) features and characteristics of the e-service (i.e. ease of use, quality of the system, feasibility of the project, inclusiveness of the service).

9 SUGGESTIONS FOR FUTURE STUDY

The researcher recommends extending the research scope to include other pioneer countries that have recently joined in 2020 in cross-border ePrescription and eDispensation namely Croatia and Portugal. The study could examine how the governments of Croatia and Portugal overcome the constraints and challenges in eHealth interoperability and analyze the success factors and drivers in their ePrescription systems in cross-border settings. The study can be done in qualitative manner by doing primary interviews with specialists from various key agencies and institutions like their national contact points (NCPs) for eHealth, health insurance funds, ministries of health and social welfare, among others. Future study can also cover all four countries in the cross-border ePrescription (i.e. Finland, Estonia, Croatia, Portugal) by making use of what has been documented and analyzed in this paper. Descriptions of the implemented solutions and strategies for overcoming challenges can provide a practical information to other EU member states that are yet to adopt and join these countries.

On one side, future research can include other health information domains for cross-border use cases such as patient summaries, hospital discharge report, medical images, lab reports in addition to ePrescription. This can be in a form of comparative multiple case studies to document actual barriers and perceived strengths and weaknesses of the current design of the cross-border service. Public value proposition can be identified by understanding the benefits and impact produced form collaborative governance and cross-border cooperation and technology integration.

Another angle to study the cross-border digital prescription is measuring the actual uptake and adoption of the service, patients' medication safety as well as their adherence to prescriptions. A quantitative survey can be carried out in partnership with the involved key agencies which will be administered to patients, travellers, and pharmacies to obtain a primary data on the dispensation events of ePrescriptions. In parallel, user-centered research is possible by interviewing patients and community pharmacies on various aspects for improving the service design and functionalities. Secondary research can include a review of policy documents, organizational materials, news, press releases, websites, articles, and the like to validate and complement the primary data from survey and/or interviews conducted.

In analyzing the eHealth interoperability framework, careful attention should be put into gathering key experts that specialize on each level and this entails more agencies and institutions involved both at national and European levels. Key informants can be legal experts (lawyers, data protection officers, etc.), technical experts (developers, architects, etc.), health practitioners, project managers, policy officers, and even ministers.

References

Alduraywish, Y., Xu, Y., & Salonitis, K. (2017, September 8). *Evaluating state of information systems failure in developing countries using ITPOSMO model.* DOI:10.23919/IConAC.2017.8082032

Alford, J., Douglas, S., Geuijen, K., & Hart, P. (2016, August 25). Ventures in public value management: Introduction to the symposium. *Public Management Review, 19* (5), 589-604. https://doi.org/10.1080/14719037.2016.1192160

Bonina, C.M., & Cordella, A. (2009). Public sector reforms and the notion of public value: Implications for eGovernment deployment. http://aisel.aisnet.org/amcis2009/15

Chouvarda, I., Maramis, C., Livitckaia, Trajkovik, Burmaoglu, S., Belani, H., Kool, J., & Lewandowski, R. (2019). Connected health services: Framework for an impact assessment. *JMIR Publications, 21* (9). doi:10.2196/14005

Crosby, B. C., Hart, P., & Torfing, J. (2016, August 25). Public value creation through collaborative innovation. *Public Management Review, 19* (5), 655-669. https://doi.org/10.1080/14719037.2016.1192165

De Felice, F. & Petrillo, A. (2014). *Critical success factors for e-healthcare: Integrated set of performance indicators system (ISPIS).* L. Pecchia et al. (Eds.) 6th International WorkConference on Ambient Assisted Living (IWAAL 2014), pp. 398-401, Springer International Publishing Switzerland

De Sousa, L. (2013). Understanding European cross-border cooperation: A framework for analysis. *Journal of European Integration, 35* (6), 669 – 687. https://doi.org/10.1080/07036337.2012.711827

eHealth Network. (2015, November 23). *Refined eHealth European Interoperability Framework.*https://ec.europa.eu/health/sites/default/files/ehealth/docs/ev_20151123_co03_en.pdf

eHealth Network. (2016). *Guideline on the electronic exchange of health data under CrossBorder Directive 2011/24/EU: ePrescriptions and eDispensations.* https://ec.europa.eu/health/sites/health/files/ehealth/docs/ev_20161121_co10_en.pdf

European Commission. (2019, June 2). *Commission recommendation on a European electronic health record exchange format.* https://digital-strategy.ec.europa.eu/en/library/recommendation-european-electronic-health-record-exchange-format

European Commission. (2021). *Electronic cross-border health services.* https://ec.europa.eu/health/ehealth/electronic_crossborder_healthservices_en

Granja, C., Janssen, W., & Johansen, M.A. (2018). Factors determining the success and failure of eHealth interventions: Systematic review of the literature. *JMIR Publications, 20* (5), 1-21. doi: 10.2196/10235.

Grant, B., Tan, S.F., Ryan, R., & Nesbitt, R. (2014). *Public value summary background paper.* https://www.uts.edu.au/sites/default/files/ACELG_Public-Value-Summary-Background-Paper-v2.pdf

Heeks, R. & Mathisen, H. Understanding success and failure of anti-corruption initiatives. *Criminal Law Social Chhange, 58,* 533-549. DOI 10.1007/s10611-011-9361-y

Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of Basic and Clinical Pharmacy 5* (4), 87-878. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4194943/pdf/JBCP-5-87.pdf

Katehakis, D.G., Pangalos, G., & Prentza, A. (2016). Research Note: A European ehealth space for moving cross-border eprescription and patient summary services forward. *Emerald Insight 10* (3), 478-504. DOI: 10.1108/TG-07-2015-0032

Kaye, R., Kokia, E., Shalev, V., Idar, D. & Chinitz, D. (2010). Barriers and success factors in health information technology: A practitioner's perspective. *Journal of Management & Marketing in Healthcare, 3* (2), 163-175, https://doi.org/10.1179/175330310X12736577732764

Kohl, S. (2019). European advances in the field of ePrescriptions. *Eur J Hosp Pharm 26* (2), 119-120. https://ejhp.bmj.com/content/26/2/119

Kond, K., & Lillevali, A. (2019). E-prescription success in Estonia: The journey from paper to pharmacogenomics. *Eurohealth 25* (2), 18-20. https://apps.who.int/iris/bitstream/handle/10665/332593/Eurohealth-25-2-18-20-eng.pdf

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly, 28* (2), 283-322. https://www.jstor.org/stable/25148636

Mintrom, M., & Luetjens, J. (2015). Creating public value: Tightening connections between policy design and public management. *Policy Studies Journal, 00* (00), 1-21. DOI: 10.1111/psj.12116

Moore, M.H. (2000). *Creating public value: Strategic management in government.* Harvard University Press.

Navarrete, C., Gil-Garcia, J.R., Mellouli, S., Pardo, T.A., & Scholl, J. (2010). *Multinational e-government collaboration, information sharing, and interoperability: An integrative model.* DOI:10.1109/HICSS.2010.282

Nguyen, T.T.H., Saranto, K., Tapanainen, T., & Ishmatova, D. (2014). *A review of health information technology implementation success factors: Importance of regulation and finance.* DOI:10.1504/IJHTM.2016.10005029

Official Journal of the European Union. (2011, March 9). *Directive 2011/24/EU of the European Parliament and of the council of 9 March 2011 on the application of patients' rights in cross-border healthcare.* https://eur-

lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0045:0065:en:PDF

Page, S.B., Stone, M.M, Bryson, J.M., & Crosby, B.C. (2015). Public value creation by cross-sector collaborations: A framework and challenges of assessment. *Public Administration, 93* (3), 715-732. doi: 10.1111/padm.12161

Parv, L., Kruus, P., Motte, K., & Ross, P. (2014). An evaluation of e-prescribing at a national level. *Inform Health Soc Care*, 1-18. DOI: 10.3109/17538157.2014.948170

Rahimi,B. Vimarlund, V., & Timpka, T. (2009). A health information system implementation: A qualitative meta-analysis. *JMIR Publications, 33* (5), 359-368. doi: 10.1007/s10916-008-9198-9.

Saldaña, J. (2009). *The coding manual for qualitative researchers.* https://pdfs.semanticscholar.org/ec7c/c4db483717c8f77bfb0cf449c008b5ec7988.pdf?_ga=2.158542204.756142918.1578869253-893315987.1578869253

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th ed.). In Pearson Education, UK.

Scholl, H.J., & Klischewski, R. (2007). E-government integration and interoperability: Framing the research agenda. *International Journal of Public Administration, 30,* 889-920 https://doi.org/10.1080/01900690701402668

Standing, C., & Crisps, H. (2015). Critical success factors in the implementation of electronic health records: A two-case comparison. *Acta Informatica Medica, 23* (2), 102-104. doi: 10.5455/aim.2015.23.102-104

Stroetmann, K.A., & Artmann, J. (2014). *The set-up of guidelines in support of ePrescription interoperability.* https://op.europa.eu/en/publication-detail/-/publication/f2bbf7bd-f1b8-11e6-8a35-01aa75ed71a1/language-en

Van Gemert-Pijnen, J., Nijland, N., Van Limburg, M, Ossebaard, H., Kelders, S.M., Eysenbach, G., Seydel, E.R.(2011). A holistic framework to improve the uptake and impact of eHealth technologies. *JMIR Publications*, *13* (4). doi:10.2196/jmir.1672

Wellington, J., & Szczerbinski, M. (2007). *Research methods for the social science.* The Cromwell Press, Trowbridge, Wiltshire.

Williams, P., & Cutler, S. (2020). Qualitative Methods and Analysis. *Medical Imaging and Radiotherapy Research: Skills and Strategies.* https://doi.org/10.1007/978-3-030-37944-5_16

Yin, R. (2009). *Case study research design and methods.* https://www.academia.edu/30849709/CASE_STUDY_RESEARCH_Design_and_Methods_Second_Edition

Appendices

A Interview Guide Questions

Good day! I am Nino Sevilla Palma, a digital governance Erasmus master student and I am researching the critical success factors on the deployment of cross-border ePrescription in Finland and Estonia. This aims to delve into how these pioneer countries overcome the interoperability challenges in cross-border healthcare. This study is being pursued to provide practical information for other digital governments that are yet to adopt this breakthrough.

This interview will run for about **35-50 minutes**. The following are a set of questions regarding the drivers, success factors, and challenges in the planning and deployment of cross-border digital prescription. This covers specific themes on public value proposition, levels of interoperability, and common success factors in digital health.

I thank you for your time and attention to this research. May I ask for your permission if I can record our conversation for transcription, analysis, and documentation purposes.

Organization's Role and Contribution

1. Can you explain the role of your organization in planning and deployment of cross-border digital prescription. If applicable, discuss the methods used, stakeholders involved, and activities conducted.
2. What was your personal role in this project?
3. Can you discuss the deliverables/tasks carried out that made up your organization's contribution to this project.

Common Challenges During the Planning and Deployment

1. Were there any administrative issues and governance challenges in this cross-border collaboration between agencies during planning and deployment?
   Probe:
   a. structural obstacles (i.e. breaking silos)
   b. coordination issues (i.e. managing complexity/ project management)
   c. resource constraints (i.e. HR/workforce, financial/budget)

2. What were the implemented solutions?
3. What are the drivers and success factors in overcoming these hindrances?

Refined eHealth European Interoperability Framework (EIF) Challenges

Legal and Regulatory

1. What set of legislation/ regulatory guidelines were followed?
2. Given that each country has their own health policy and healthcare frameworks, were there any issues in compliance and compatibility to EU and national legislation and regulations?

Organisational (Policy)

1. How did the collaboration agreement happen for cross-border ePrescription and how did you establish the trust?
2. How did you overcome the challenges of the standardization of policies and processes?
   Probe:
   a. legal framework for dispensation (e.g. In Estonia, prescriptions can be dispensed on behalf of a family member)
   b. validity of prescription (e.g. In Estonia, prescriptions are valid only for 6 months)
   c. dispensation of medicines (e.g. Finnish pharmacies allow partial or half amount)
   d. naming medicinal products (e.g. brand names versus active drug/substance); Is there a common taxonomy for naming medicinal products?

3. Given the complexity of the project that has involved a multidisciplinary team with diverse backgrounds from various agencies, how has this contributed to the success of the project and what do you think of the performance of the involved agencies?
4. Who do you think are the key project champions that have been enthusiastic in making the project technically and organisationally feasible?

Organisational (Care Process)

1. How were the business processes, care pathways, and shared workflows (i.e. prescription, dispensation, reimbursement) integrated and harmonized? Were there misalignments?
2. Were end-users involved in the design and implementation and what activities were conducted to ensure end-user participation?

Semantic (Information)

1. How did you come up with common standards to harmonize data models, terminologies, and formatting?
2. What data model and data elements are required? How are they collected and interoperable?

Technical (Applications)

1. What agreements are made in the import and export of medical information? How are they handled by your country's information systems?
2. How did you integrate and process the exchanged information in the applications and what technical issues you have faced?
3. Given that this system has privacy implications, what do you think about the quality of the system and the infrastructure? What are the appropriate technical measures that were implemented to ensure the system is secure? Have you identified cybersecurity risks?

Technical (IT Infrastructure)

1. What communication and network protocols and standards are being adhered? How has that been handled?

Public Value/ Value Proposition

1. Can you discuss the public value or main benefits of this e-service (ePrescription/eDispensation) to the end-users, health practitioners (doctors/pharmacy), public managers/government?
2. In general, how those benefits/values were achieved? Have there been any evaluation/assessment activities done to measure the benefits ?
   (Probe) economic benefits, cost-effectiveness, uptake/adoption rates, access to services, adherence to prescription
3. What are the main measures taken to boost awareness and adoption? What has been done to make this accessible and inclusive to vulnerable sectors (i.e. senior citizens/ low digital skills)?

Future Project Development and Recommendations

1. What do you think are perceived strengths and weaknesses of the current design of this cross-border service?
2. How do you see the future development of the system?
3. Given the desire to scale up cross-border health services to other member states and expand its scope to include related health information domains and health datasets, do you think this cross-border ePrescription is technically and organizationally feasible when implemented to other MS? What problems still exist?
4. Has there been any efforts to maximize this cross-sectoral data sharing for secondary use of health data for improving policymaking, research, and innovation in Europe?

Thank you so much for sharing your insights and experiences and your knowledge on this project is vital to the development of this topic. Once again, thank you.

B Interview Participants (Key Experts/ Specialists)

The following are key experts and specialists who were interviewed for this research. These people have previously worked or are currently working at government institutions involved in the planning and deployment of the cross-border digital prescription in Finland and Estonia. There are a total of six (6) key agencies responsible for cross-border healthcare collaboration of both countries and were directly contacted to provide in-depth knowledge about this cross-border ePrescription project. Overall, a total of eight (8) experts were interviewed from May to July 2021 via online video chat.

Appendix Table 1: List of Key Informants

European Commission (DG SANTE):

Expert 01
Policy Officer
Unit B3 Digital Health, European Reference Networks
DG Health and Food Safety (SANTE)

Past: IT Architect, Social Insurance Institution of Finland, Kanta Services

Finland	Estonia
Expert 04 Senior Specialist Unit for Digitalisation & Information Management *Ministry of Social Affairs and Health*	Expert 02 Head of Digital Development Smart Development Support Department *Estonian Ministry of Social Affairs*
Expert 05 Chief Specialist Performance Assessment of the Health & Social Service System *Finnish Institute for Health and Welfare*	Expert 03 Project Manager Cross-border Health Services *Health and Welfare Information Systems Center*
Expert 07 Team Leader International Affairs & Research Support Office *Finnish Institute for Health and Welfare*	Expert 06 Project Manager Development Department *Estonian Health Insurance Fund*
Expert 08 Specialist Healthcare Information Management *Finnish Institute for Health and Welfare*	

C Codebook (List of Interview Codes and their Frequencies)

The following are a set of outputs generated from MAXQDA 2020 during the analysis of all the interview transcripts. This was done using the software to identify significant codes and emerging themes as part of the preliminary analysis (i.e. code system and its frequencies, associations, categorizations, among others).

Appendix Table 2: List of Codes and Themes

Success Factors/ Drivers	Frequencies
development partner	1
project management	1
digital literacy	2
legal experts	2
eu frameworks	4
ehealth network	2
cef funding	5
national infrastructure	6
mass media	2
communication	3
technical experts	4
long tradition	4
feasibility	3
risk assessment	2
system security	1
system audit	2
system quality	1
ease of use	1
end-user participation	2
project champion	3
efficient agencies	1
national contact points	3
legislation	3
political will	3

need for eservice	6
strong interest	1
collaboration:agencies	4
collaboration:vendor	3
inclusiveness	6
Value Proposition/ Benefits	
access to data & care	3
convenience	2
medical information	2
patient safety	5
working infrastructure	1
value:uptake	2
value:health systems	2
Challenges During Planning & Deployment	
system integration	2
inclusiveness	1
internal: experts	1
testing during covid	1
secondary data use	2
semantic aspect	2
new people	1
new stakeholders	1
out of scope prescriptions	1
legal aspect	7
consent/gdpr	5
impact assessment/evaluation	10
size of country	2
complexities	1
different systems	5
financial	3

Implemented Solutions	
risk audit	1
data exchange	1
application level	1
change proposal	2
semantic level	2
Definitions/Processes	
dispensation	4
open ncp	2
business process	1
ongoing development	5
drug names	2
validity prescription	1
expand health info domain	1
eu health data space	1
new ehdsi service	1
epsos project	3
organization role	7
personal role	10

D Interview Transcripts (Digital Files)

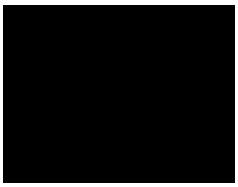
The researcher asked for permission from all key informants to record the interview for transcription, analysis, and documentation purposes and they all fully agreed to have the conversation recorded.

- Interview transcripts can be retrieved through this link: https://bit.ly/3rDyXgi

Declaration of Authorship

I hereby declare that, to the best of my knowledge and belief, this Master Thesis titled "DIGITAL HEALTH BEYOND BORDERS: INTEROPERABILITY CHALLENGES AND CRITICAL SUCCESS FACTORS IN THE DEPLOYMENT OF CROSS-BORDER E-PRESCRIPTION IN FINLAND AND ESTONIA" is my own work. I confirm that each significant contribution to and quotation in this thesis that originates from the work or works of others is indicated by proper use of citation and references.

Tallinn, 09 August 2021

Fl  ma

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Title of the thesis: DIGITAL HEALTH BEYOND BORDERS: INTEROPERABILITY CHALLENGES AND CRITICAL SUCCESS FACTORS IN THE DEPLOYMENT OF CROSS-BORDER E-PRESCRIPTION IN FINLAND AND ESTONIA

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