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INCREASING FLEXIBILITY IN ESTONIAN TAX AND CUSTOMS BOARD INFORMATION SYSTEMS

Master's thesis

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TALLINNA TEHNIKAÜLIKOOL
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EESTI MAKSU-JA TOLLIAMETI INFOSÜSTEEMIDE PAINDLIKKUSE PARENDAMINE

magistritöö

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Author’s declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

In this rapidly changing environment, technological solutions are constantly improving and businesses have to keep up with these to stay competitive. The Estonian Tax and Customs Board system's flexibility can be considered as a very important part of it. The costs that are spent on different technological solutions should done be with the view of making the systems more sustainable and flexible for not having to invest excessively extra on improving or changing them.

The author concentrates on finding the possibilities to increase flexibility in the Estonian Tax and Customs Board systems. For that, the author used the qualitative research method and conducted 7 interviews with experts which were later analyzed by using thematic analysis with the tool NVivo. The assembled themes from the interviews' answers gave a good foundation for answering this thesis research questions.

For knowingly applying flexibility in the system the author gives few recommendations for the development process. The results brought out clearly that the analysis is the foundation and must be thorough and detailed for making the system more flexible in a sense of future changes. Also, it cannot be left out to mention that people's involvement is also essential and have to be organized properly. Understandably, there are also few challenges that the Estonian Tax and Customs Board has to face which are mostly resource issues like time and money, but with a strong management and project plan, everything can be exceeded.

This thesis is written in English and contains 74 pages, including 8 chapters, 7 figures, and 2 tables.

Eesti Maksu-ja Tolliameti infosüsteemide paindlikkuse parendamine

Lõputöö on kirjutatud inglise keeles ja koosneb 74 leheküljest, 8 peatükist, 7 joonisest ja 2 tabelist.

List of abbreviations and terms

EU	European Union
ETCB	Estonian Tax and Customs Board
MF	Ministry of Finance
IT	Information Technology
IS	Information System
ICT	Information and Communication Technologies
VAT	Value Added Tax
KMDinf	Annex for VAT Return Declaration
MAIS	Revenue Stamps Management System
MASP	Multi-Annual Strategic Plan
RIHA	Administration System for The State Information System
ISKE	Three-level IT Baseline Security System
NFR	Non-functional requirement
XML	Extensible Markup Language

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1 Introduction

We are living in a rapidly changing world where information systems have been constantly developing over the years. “The world changes very fast, so the organizations must have to be changed quickly for the development and surviving of the organization.” [1]. An information system is identified as a bunch of information activities that the system performs. The information system is like a chain where all the activities are connected [2].

In the modern environment, information technology is the center of every business process [3]. The changing environment improves technology daily and new opportunities arise all the time. Many improvements are more important than others and oblige businesses to follow these. The organizations have to understand what is needed to implement and what can be left out. Unfortunately, everything that is left out is not always valueless and can cause problems because of its ignoring.

It is understandable that to keep up with the time in an information systems environment every system needs to be kept up-to-date. It should be self-explanatory for every system that for staying competitive it has to consider constant changes from time to time. Demands that require systems to adjust and follow the amendments can be due to many different circumstances. The trigger that makes systems to be changed can be for example due to security issues, law enforcements, business process changes, etc. [3]. Continuous development of information society along with information technology trends, which is accelerating over the years, puts all the systems in the position where it has to decide whether to keep up with the times or to hope that continuing is doable without any modifications. Overall, it is most likely that to be competitive, the systems need to make changes to keep up the pace.

Public institutions generally face the need to obey orders from the law. The requirements that come from the legislations are mostly not optional but mandatory for the institutions to consider. Avoiding changes from the law can incur penalties or bring legal issues [4]. Amendments that come from the laws can affect the systems very differently. The

implementation time of the changes can vary from weeks to years, depending on how tremendous is the change or how responsive is the system [3].

Besides amendments that come from the legislation, the changes can be more trivial. Possible changes can also just come from someone's thoughts to change the system, for example, the system's owner's decision to change the design might actually demand the system to accommodate transformations. Besides this, the general system's requirements can also be changed, so the system is more forced to make modifications.

Implementing changes can be very troublesome for some systems and cause many problems. Prevention of complications should begin already in the initial phases of the system development. In the project's analysis, it is not always considered what the future might bring in 1, 5, or 10 years. Many changes might be preventable and can be taken into consideration already when starting with the project.

The reason how effectively the changes can be implemented comes mainly from the fact of how flexible the system has been built. To build a sustainable system the flexibility must be considered as one of the main factors of the system. It can be said that every system can be changed, but how costly will it be, comes from the aspect of how flexible the system is, meaning how well the change can be implemented. However, is it always worth the cost? Many changes will stay unimplemented because they need a lot of resources. For example, one new requirement can cause writing-off the whole system and require a new system to be implemented just because the new requirement is not rational or even not possible to be resolved in the old system.

Unlike the public sector, the system's development in the private sector can be more convenient because the customer has more space for making different decisions, e.g., choosing the technology, design, or timeline. In public sectors, many criteria and norms have been set, which are mandatory to be considered in new system development. These terms limit the choices the public authorities have.

The information system development in the public sector goes through procurement processes [5]. For starting the procurement, the authorities put together the terms and other requirements that the developers need to take into account in their offers. After the procurement has been initiated the companies can decide whether to participate and make an offer. Even though the procurement process is usually quite complex and needs a

thorough description of what the authority wants from their possible development partner, the future possibilities the system may face are not usually so well analyzed. This, in consideration, might deteriorate the system's sustainability and flexibility. At the same time, one of Estonian IT architecture principles for inoperability systems is flexibility [6]. Also, Estonian interoperability aims to decrease the expenses spent on technological solutions [7]. It infers that making less costly amendments could help to spare the money and same time pursues the mentioned aim. Therefore, a flexible information system that is capable to implement changes and required new amendments with fewer resources should achieve one of the goals of Estonian interoperability objectives. Unfortunately, the time-critical projects demand attention on many other important aspects and the analysis of possible future actions has been put aside with low priority.

Many Estonian information systems have been developed under conditions set by the European Interoperability Framework [7], including Estonian Tax and Customs Board projects. Taxation and customs are fields where requirements and conditions can change often. New taxes or measures can be added, customs warehousing rules can be changed or many other features can be concerned. Possible change needs can be divided into two main categories, whether they are national or from the European Union. Generally, the main difference in implementing such needs is the timeline. The requirements that come from European Union can have a strict deadline that the countries need to stick to and implement the obligations, whereas the timeline of the national changes can be more flexible. It can be said that for the Estonian Tax and Customs Board's information systems to be sustainable and responsive to constant changes, they need to be built in a very flexible way so the following changes would not need a lot of resources. "Flexibility is important for both innovation and the ability to adjust the IT solutions to changes. This is also one of the prerequisites for the success and sustainability of the information system development project." [6]

1.1 Motivation

Flexibility and sustainability are very common topics nowadays, but most of the researches already conducted is usually from the businesses' point of view or just very broadly studied.

The author's motivation for doing this research and writing this thesis comes from her everyday work. The author works in a company that is one of the Estonian Tax and Customs Board's development partners. As a system analyst, the author works with several large-scale information systems that need constant changes due to the changing requirements. The author's everyday work includes analyzing new features or different changes that need to be implemented into the ETCB systems. The author can see why different changes have to be done and what are the factors that drive the systems to be changed. The projects that the author has worked with have given her the realization that many required changes might be done with lower costs if they would have been taken into account already in the first phases of analysis of the project. Even the smallest changes can demand a lot of resources financially and in manpower.

Intuitively it is easy to say that flexible systems are easier to change and they are more sustainable – they can be successfully used for longer periods without a costly rewrite. Every project has its own face and its own kind of changes. In the scope of this work are the changes and the factors that concern the ETCB's systems flexibility more and have a higher probability to be improved.

1.2 Objectives

In this thesis, three Estonian Tax and Customs Board systems will be researched to get more insight into the current situation of this field. The systems are the following:

- KMDinf is an annex for the VAT return declaration system which is called KMD. It was first released on the 1st of November 2014. The KMD is a VAT return system where every person who is registered as a value-added tax payer or has other obligations for declaring their VAT must submit a VAT tax declaration and its annex. The system KMDinf was developed because of the tax hole that the Estonian government saw in Estonian taxation systems. For filling the tax gap, the Government enforced new laws and measures [8]. The new regulation obliged every VAT payer to declare their more than 1000 euros invoices in detail [9].

- "Complex2 is an electronic customs' declarations processing system. It is based on the European Commission's e-customs vision and the multi-annual strategic plan MASP where one of the requirements is the transition to paperless customs

clearance." [10]. Before Complex there was a system called ASYCUDA. The need for developing a new customs' declarations processing system came from the European Union's new requirements which gave the push to develop a totally new system because the requirements required too many complicated changes that would have been difficult to implement in the old system. It was first released on the 1st of May 2006 [11]. The system Complex has been in use since then. After the European Union's new requirements in 2016 Complex is supposed to be divided into two separate systems – import declaration system and export declaration system. The new import declaration system is currently in the development process and should be released on the 1st of July 2021. The new export declaration system is now just passed the procurement process and Cybernetica AS will start analyzing and developing this system shortly.

- "MAIS is an electronic system for the management of revenue stamps. In the system MAIS, you can make and notify about different operations considering revenue stamps, i.e. ordering, affixing, releasing for consumption, etc." [12]. MAIS was first released in February 2017. The demand for information systems like MAIS came from the will to bring together strong alcohol and tobacco revenue stamps so that their managing process could be more convenient. Until then activities related to tobacco processes were done manually by using excel, emails, phones, and other means for communications and data soring.

The author will analyze these systems' flexibility and how constant changes have been considered in the analysis of the projects. The author will research how they have changed over time – how frequent are the changes, what is the nature of the changes, how easy it has been to implement the changes, etc. The insight helps to understand the readiness of the systems to accommodate the required changes that will show the level of flexibility and sustainability in them.

The main idea is to gain an understanding of what and how should be analyzed and taken into account when starting to develop a new information system. The result should help to build a system that is easily changeable and flexible enough to not require many resources for constant changes. The outcome of this work consists of recommendations for developing new Estonian Tax and Customs Board systems. The results can be

beneficial for the authorities that start to put together a new systems development plan and also be valuable for the developers of these kinds of systems.

1.3 Research Questions

The main question for this master's thesis is the following:

- **How can flexibility be improved when building a new Estonian Tax and Customs Board system?**

The main question of this thesis builds a roof for this research. Increasing flexibility is rather a broad concept and can be taken in many various ways. The author has narrowed it down to avoid scattering out themes and hold the direction of this work. The author has chosen characteristics to define flexibilities improvement in the Estonian Tax and Custom Board systems that will satisfy the needs of this research. The characteristics or directions are brought out as sub-questions.

To answer the main question, the author has come up with four sub-questions that can help to find the most accurate and analyzed answer. The sub-questions are the followings:

- **SRQ1 How can future prediction be developed with the most accuracy?**

When talking about flexibility in systems to accommodate changes, it all comes down to sustainability. The more flexible is the system the more sustainable it can be, meaning when the system is capable to take in a different type of changes without an enormous amount of resources then it can be taken sustainable and it can be considered to keep function longer. There is no certain technique in development processes in the ETCB projects to predict the future, meaning no extra time is spent on something that cannot be seen as profitable at first without thorough analysis.

So, by answering this sub-question the author aims to understand the impact that future changes can bring to the system and tries to acknowledge how these can be developed with the most accuracy. The purpose is to understand what needs to be considered and examined to be taken into consideration in the development and also the analysis should point out what is not always reasonable to be put under extra attention. Even if the analysis

should result differently by overriding this concern it is still valuable to know the need of this matter.

- **SRQ2 How can rules and regulations from the European Union affect the flexibility of the Estonian Tax and Customs Board systems?**

This question is important to answer for understanding what kind of changes can come from the European Union and how they can affect the Estonian Tax and Customs Board's systems. Rules and legislations that the European Union applies are usually rather obligatory and need to be taken more seriously. Knowing frequently changing regulations from the EU can help to put together a plan for developing a flexible information system. For example, knowing that the change from the EU is often about some small rule alternation or some kind of data that needs to be started to collect could give the project an insight that these components or parts of the system should be made more flexible to accommodate the changes. Overall, the EU can send different kinds of changes to the member states to implement and it is clearly understood that everything cannot be foreseen, so the author will try to get the awareness of which kind of changes can be taken more importantly and be considered in the projects.

- **SRQ3 How can a database be managed in a way that increases efficiency?**

When talking about changes in an information system it can often come down to requiring changes on the database level. The database plays a crucial role basically in every information system because data management is one of the key criteria of creating an efficient information system. Almost every organization needs some kind of data and roughly every area of life is based on it. Each system that collects and stores data has to process it in one way or another. The processing is essential to get out the information that the data contains [13].

The chosen database structure and technology play a very significant role in the system's flexibility. The poor choice can decrease the system's efficiency and can lead to very costly alterations. Every system is different and so requirements for the databases can also vary. One might need to process and store an enormous amount of data when the same time the other might only need to store up some basic, simply structured data. The decision for the system's database needs to be made properly to ensure its efficiency in the long run.

For answering this sub-question, the author will get an understanding of how databases have been built and managed for the Estonian Tax and Customs Board systems. Also, the author expects to get answers on how to design a database that can increase the system's efficiency in general and aims to give recommendations and tips on creating a suitable database for a system.

- **SRQ4 Is the initial bigger cost that is spent on flexibility worthwhile?**

Mostly, every system has its own obstacles and challenges. One of the hindrances for most projects is definitely finding the necessary amount of resources. Having additional requirements to initial project plans can increase costs that developing information systems require. Generally, if a project has a certain deadline and requirements to meet it has a well-established project plan with a fixed schedule and budget. Every extra investment or cost might insist thoroughly explained reason why it is needed and how the system benefits from it. It can be complicated to find extra assets for features that were not required in an initial offer. For example, finding out that some tool, component, decision, etc. should be changed because of the impact it has on the system's flexibility and sustainability. Everybody might not see it as important as it actually is.

Particularly complicated to get extra resources for improving the system's flexibility are for public authorities. These systems have concrete fundings that are set by their project plan and it is not simple to change it afterward. It is really important that every expense is well explained and shows usefulness so it would simplify the process of acquiring extra money. Answering this sub-question is important for every system because the analyzed explanation of why the initial costs have to be higher is essential to get extra investments. Even, when the results show that extra resources are not worth it, the outcome is still useful.

1.4 Thesis structure

The master thesis consists of 8 chapters. In the first introduction chapter, the author explains the background of the problem and brings out the motivation. Also, objectives and research questions are defined. The second chapter is about related work which reflects the researches that have been done and the theoretical background that can be considered connected with this topic.

The third chapter gives an overview of the methodology and analysis that will be used for researching the objectives and gathering information to answer the research questions. The fourth chapter assembles the analysis and defines themes that will be used in the fifth chapter in the discussion section to help answer the research questions.

In the sixth chapter, the author will try to improve one process in a sense of flexibility and models AS-IS and TO-BE diagrams for showing the effectiveness and benefits of this process improvement. In the seventh section, the author provides recommendations, brings out this research's limitations and possible future work. The conclusion is written in the eighth chapter to bring together work that has been done by this research.

2 Related Work

2.1 Theoretical Framework

The theoretical framework is important for understanding the general notion around this research topic. For this thesis, three main theories that can have some relation with the research idea have been brought out. Having theories to consider in research are necessary because they support the views the author has.

2.1.1 Good Governance

The term 'Good Governance' has been in use since 1990 when the World Bank started requiring effective performances from other governments [14].

Good Governance connects legislative performance with ethics and sets goals for governance. European Commission brings out official suggestions for values to improve governance in the European Union's institutions and member states. The main purpose to follow good governance theory is to achieve organizational goals. The core values of good governance are to make governing more open, to be more transparent and accountable, to involve people, and to be more efficient and coherent [15]. Unfortunately, these characteristics are more like subjective standards and are related to people's values towards society, so it is not always so clear for everybody and might be incomprehensible. "Good Governance in a free society means honesty towards community, organizations, and myself." [16]. It is necessary to involve everybody in process planning. It helps to understand the actual needs and gives a broader conception of good governance.

Openness and transparency in an organization, mean to have clear roles and rules that every person related to that organization knows about. It is also necessary to keep decision-making open to everybody, so people would understand why and what decisions are made. Every change requires transparency, which means it is important to let people know why is something changing and how are things done afterward. Problems that come from lack of information decrease trust in people towards the organization [17].

People's involvement in decision-making processes can benefit in later work of the organization. It is important to have people, who are related to a certain decision, present and has a say in the decision-making process. Involving more people increases quality and trust towards the decisions [15].

Efficiency is important to establish the desired goals of the organization. It is essential to choose the most efficient and expedient tools for business. It means tools for management, production, development, analysis, etc. Bad choices in appliances can hold back the organization's success. Every choice has to be thought through and all possible expenses need to be considered [18].

Regarding the master thesis aim, the necessity of considering good governance in the business process is also affected by changing information systems. The common line here is the decision-making processes, chosen methods, and openness towards employees to accommodate changes and to do it flexibly.

2.1.2 Change Management

"Change is crucial for organizations in growing, highly competitive business environments." [1]. Change management is often left ignored and has not taken into account when imposing changes in businesses. Changes can come in many different factors – the board and its members can change, processes can change, working equipment can change, a work environment can change, etc. [19].

For change to go through smoothly among the employees it must be well introduced. Weak adoption and resistance of a change is a bad reaction for the business, this can show that the amendment has not been thought through and the employees' needs are not considered [20]. Companies need to acknowledge the main principles of change management. The principles shall be shared all over the company and the change acceptance should come from every employee. It is necessary to understand that changes are not coming without a reason. The need for change must be made clear for the employees. Every organizational change might require an individual change from the employees [21].

Change can be considered successful when a majority of an organization's people have adopted them, because if there are only a few people who understand and accept the

change but a lot of those who do not adopt then overall the change is not welcomed. Changes not only need awareness among the employee but they also need management. It is one thing to slightly introduce a new process by just pointing at it but without any management of that new process or change, it will not be a success and it could lead to failure. In change management leading the people is essential to achieve in adopting changes [22], [21].

Kurt Lewin played a huge role in social psychology and is “recognized as the founder of modern social psychology” [23]. He also contributed a lot to organizational psychology. In Lewin’s opinion, the organizations were in a dynamic tension being in between of trying to maintain the existing and trying to change it [24].

Figure 1 Kurt Lewin’s three steps change model

His theory for organizational changes is divided into three phases. The first phase is ‘unfreezing’, which refers to that to get rid of old behavioral patterns and getting used to with new ones one must get over its protection mechanisms. The possible changes are brought out and people are being motivated to collaborate. People are more open to participate when they are aware of the advantages of the new method. It is clearly pointed that employees are more afraid to go along with the changes when things are more incomprehensible [20].

The second phase of Lewin’s model is ‘changing’. The start of adapting new skills, information, and behavioral models. New values are being introduced and employees are being educated about the new processes. The period is more about transformation and can be quite confusing [20].

The third phase is ‘refreezing’ where the focus is set on ensuring the new processes' effective functioning. The new situations are being stabilized and new policies and standards are introduced [24], [20].

2.1.3 Theory of Constraints

The theory of constraints is established by Eliyahu M. Goldratt. Every standpoint that Goldratt had had always a logical explanation. The theory of constraints should help establishments to achieve their goals. Every institution must have at least one constraint that holds them back from achieving their goal [25]. The object of the theory is to identify all the obstacles that hinder achieving the targets of the company and try to relieve or eliminate these problems. The obstacles are the constraints [26]. When identifying the bottlenecks, it is necessary to concentrate on eliminating this. The elimination process should take into account other processes that might be affected by that bottleneck. It should be determined that nothing else is negatively affected by eliminating this bottleneck [27].

The theory on constraints implementation focus is increasing the profit [25]. Regarding this master thesis research objective, the theory of constraints can be applied by concentrating on identifying problems, namely the bottlenecks of the system. Goldratt's idea's meaning lays on understanding that even when you cannot see and identify the problem right away it is still there. The hidden bottlenecks need to be found for the system to be developed more effectively [26]. For example, the bottlenecks can be considered as a complicated structure of the ETCB's system or strict restrictions from the legislation. On the other hand, the constraint can be considered to be the nonprofitable institution that is oriented more on creating functioning services rather than developing it regarding its later flexibility. The restriction here can be resourced where they make developing in public institutions more difficult.

2.2 Literature Review

The literature review constructs a pillar for the research. In this chapter, the author defines general understandings for the related topics of this thesis research that come necessary for answering the research questions later. The author tries to determine the right definition of flexibility regarding this thesis. Also, the concepts of information systems in general and in a view of Estonian are explained. Similarly, the overview of Digital Europe is shortly described.

2.2.1 Flexibility

“In a world of increasing uncertainties, the ability to utilize company assets flexibly plays an ever more important role. The need for flexibility applies to many assets, including capital investments; employees and business partners; organizational structures; and information systems (IS).” [28].

For an information system to be enduring, it needs to be flexible and be able to handle changes to some extent [29].

Flexibility as a term can be taken in many different ways. “It can be used as an integral property of an entity such as an information system, functional area, or organization. It can also be regarded as a response capability to predicted or unforeseen changes in the organization or environment.” [2]. Some researchers define an information system’s flexibility as “the range of possibilities provided by an information system until a major change is required”. [2].

Information systems that are having a hard time dealing with changes and implementing these are defined to be inflexible. If even smaller modification needs hard work, then things are not balanced and the system is not flexible [30]. “Flexibility in a system means the ability to accommodate a change in business requirements with a minimum of modification to system components.” [30]. Changes can vary from a small modification (changing a translation) to a completely changed system with for example new architecture solution [30].

One possibility to consider the flexibility that is brought out from few pieces of literature is to follow a flexible design approach. Its purpose is to create a system where the changes can be made not only by the programmers but also by the business employees themselves [30]. Another relevant part of the flexibility in a system is reusability. If some part of the system can be used for other purposes as well then it is beneficial for the business and makes the system already more flexible. Reusability must be considered in the initial phase of development when setting up an architecture plan for the system [30]. Also, it is essential to emphasize the parts of the business that are already known to be constantly changing, because if it is already known that there are processes or things that definitely will change and it can be predicted with high probability it can be considered already in the development process and with that we can increase system’s flexibility and reduce

the needed resources that the changes will demand. It is necessary to understand and ask questions if needed, why something is done in the way it is done. Implicit assumptions can make analysis and development complicated because they can leave important issues ignored by being so obvious [30].

Another article brings out that flexible information systems "must be able to accommodate a certain amount of variation regarding the requirements of the supported business process." It is necessary to be flexible to keep up with the pace in information society. Flexibility becomes important already in business organizational levels where the management board should support their system's sustainability to participate in a growing society and to be aware of the newest technological solutions. It gives a great advantage to be open for innovation [2]. "It is shown in technical studies that flexibility is a latent construct, a characteristic of an information system that can not directly be discerned by observing the system at runtime." [2]. There are two dimensions that can help to divide and understand flexibility. The first one is structural flexibility which puts in place the following attributes - "modularity, acceptance of change or consistency." [2]. The other one is process flexibility which means the system's readiness to take in changes. Flexibility can be measured in four different ways. Firstly, efficiency - which can reflect on how well the system performance can be managed in deterioration. The next important measurement for flexibility is responsiveness. This can be measured as the speed of how fast the system takes the changes into account. Another important point is versatility. This shows how well is the business arranged to answer the possible environmental changes. The fourth one is robustness, which is important to give the knowledge of how ready is the organization for the uncertainty that all the surroundings can bring [2].

Judith and Franz are dividing the understanding of flexibility into two. First, built-in flexibility which is the system's ability to adopt changes with low uncertainty and is about the flexibility to use an information system, while process changes with high uncertainty require more general flexibility change management, so the other division is the flexibility to change the information system. The main difference in this distribution is that the first one is mostly how flexible is the system for the user before it requires a major change and the other one defines the system's structural flexibility to respond to the changes to be made [28].

A built-in flexibility information system is described as a system that can be used in a flexible way after its first release. It is more about the system to be able to perform the different business processes without any additional developments. Judith and Franz bring out four factors to characterize flexibility. The first one is about the functions a user can execute with this system - 'functionality'. The second one to describe flexibility to use the information system is the system's database. It is the databases' capacity that determines how what and to what extent can be done in the system. The user interface is defined as the next factor. It involves the interaction between the business and a user, how the client sees and uses the system, and its functions. Besides the already mentioned factors, the fourth one is a general processing capacity that sets the system's capability to perform in different situations [29].

The other division is the flexibility to change the information system. This needs to be determined when are we talking about the major changes where the system is forced to make amendments and we need to think about the flexibility of that system. Every system is somehow different and requires various amounts of resources for necessary changes. For example, for one system changing a structure of a table on the website needs 10 minutes but at the same time, this change can be much more time-consuming for other systems. So, for one system it is about the flexibility to use the information system and for others to change the information system. This brings out the conception that having a high level of flexibility demands more investments. Everything starts with the information system's architecture, how well it is built and designed to adopt forthcoming improvements and amendments [29].

Judith and Franz also bring out four elements that classify information technology infrastructure – "platform technology, network, and telecommunication technologies, key data and core data-processing applications". [29]. Besides this distribution, they also mention few issues regarding the planning of the system – "the alignment of IS plans to business objectives, information technology plans or architecture and the skills of all personnel involved in IT resource management." [29]. For having a flexible information system, the architecture has to be developed in an adjustable way, so where possible different parts of the infrastructure should be made reusable and sharable. The system should also be built in a modular way, so particular components can be changed separately, which makes the system more approachable for the changes in which case the system is more flexible. In the analysis process of a new information system, it is

necessary to compose long-term planning for the system. This method helps to prepare for possible future changes by identifying how different parts of the business could change. This also puts more attention on things that can cause necessary changes like new rules, new needs, new or changed processes, etc. [29].

Judith and Franz's research includes a model (Figure 1) that is a combination of business process characteristics and performance and the system's flexibility. The idea of the model is to calculate the certainty and use this in future decision-making processes [29].

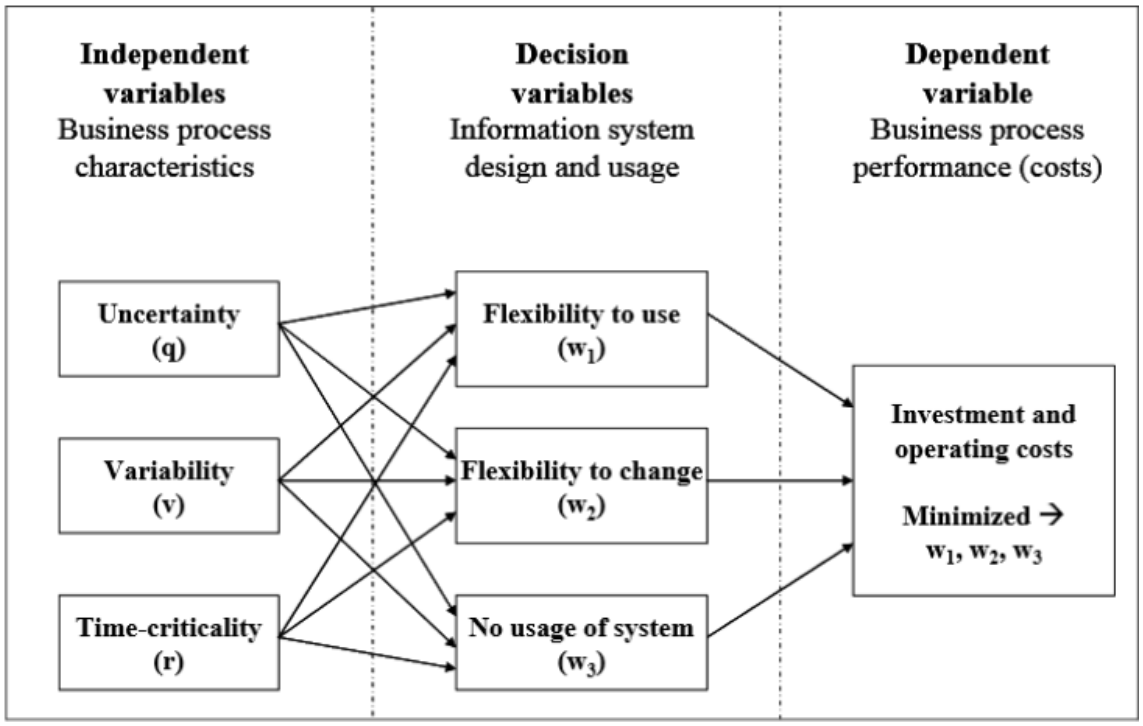

Figure 2 General model of relations for flexibility [29]

Researches on the information system's sustainability have shown that analysis of system requirements that are not system-oriented and without any structure can affect the information system's efficiency. Businesses that want to consider flexibility in their system's development usually have to consider that it comes with a price. It must be taken into account that flexibility can bring along complexity and most likely will require some extra investments [29].

On the other hand, researches show that super flexible systems are not the best either. This can however restrain the usage of a system in another direction, with being super complicated to use by some user groups [29].

The author of this master thesis defines the flexibility for this research by using one of the previously mentioned definitions. The interpretation is to see the flexibility as something that measures and determines the system's capability to respond to predicted and also unknown changes in the information system [2].

Overall, the type of flexibility that is considered in building an information system affects the system's performance and lifespan. Especially important are the first amendments that are needed to implement after the initial release. This can show how flexible the system actually is. Sufficient flexibility in systems "could lengthen the life cycle of information systems and expand the efficacy of IT investment." [2]. In general, flexibility to change the information system is a choice. It is an option that every system's owner must choose [29].

2.2.2 Information System

An information system is identified as a bunch of information activities that the system performs and where all the parties are IT actors. The information system is like a chain where all the activities are connected. In business, most of the activities are done by information systems, and at the same time activities in information systems are done by information technology. So, it is a chain where a small change at one end can affect the actions on the other end. In general, the smallest changes in business will bring along possible changes in technology. Business must be connected to the technology underneath it, so there would not be problems with business intentions to change and information system capability. As a result, when structuring information systems regarding business actions, it can benefit the business with later changes [2].

Regarding information technology, in public sector systems, the scheme that is used in each one is rather comparable. The main role that drives these solutions is the e-Government which guides public institutions towards ICT solutions. In the public sector, the ICT is more like a mechanism for delivering the services better. Cordella and Iannacci signify that the public sector should not concentrate on implementing already built information technology frameworks but rather focus on concrete system's specialties and 'complexity' to choose the right solutions to profitably develop this system [31].

2.2.3 Estonian Information System

According to the Digital Economy and Society Index, Estonia is one of the most advanced digital countries in the European Union. The report shows that Estonia has well-developed digital and public services. The final result is composed of many separate figures – e-Government users, pre-filled forms, online service completion, digital public services for businesses, open data, e-Health services, medical data exchange, e-Prescription. e-Service usage improves every year, with people moving online and not visiting the governmental offices so often anymore. Also, for businesses the public information and services that are accessible online is increasing year to year [32]. Estonian businesses are very advanced in the integration of digital technology. The main factors to show the capability are: "electronic information sharing, social media, big data, and cloud solutions." [33]. Even though Estonia is doing well, it is still needed that all participants continue developing and aim to achieve and hold our digital level on services. Decreasing competence is a big factor in why companies are losing investments and cannot continue to grow and come up with new innovative solutions [34].

The administration system for the state information system 'RIHA' is "the state's information system catalog, procedural and administrative environment." [35]. It is mandatory for every national institution that collects data in any way to register their system in RIHA [36]. RIHA has information of all Estonian state's information systems, how they are managed, which information they collect, who are the owners, how to integrate with other systems, how is the data processed etc [35]. Every system that is registered in RIHA follows a procedure where the system is being analyzed and controlled by the RIHA. It has to be consistent with the regulations and rules that have been set up by the state. The system owner has to register their initial intention of the system already before the development process. Only after the coordination, it is possible to start the development process. Parallel with the development the legislation for this system is being made and it has to be completed before the system's first release. After the system is being put to use, the information in RIHA needs to say up-to-date, so every small or big modification is needed to register in RIHA also [37].

Estonian system that needs to interact with another system can use a data exchange platform called the X-road. It is built for more safety and simple integrations. After the

company has registered its system in RIHA it can register for the x-Road and make it accessible for other systems to start exchanging data [38].

Also, Estonian state systems have to have applied ISKE, the three-level IT baseline security system. “The goal of implementing ISKE is to ensure a security level sufficient for the data processed in IT systems. The necessary security level is achieved by implementing the standard organizational, infrastructural/physical and technical security measures.” [39].

Every Estonian citizen can use the state’s e-services. It is essential to keep the public services information up-to-date and ensure its quality [40]. Nowadays, 99% of the state’s services are accessible online [41] and most of the administration in the public sector takes place electronically. Whereas the digital society is evolving day after day, every digital solution is in some way affected by that change and must try to keep up. However, if the private sector has more liberty to choose whether or when to modernize their systems, the public sector has bigger responsibility towards citizens to offer convenient and up-to-date services with the best customer experience.

Developed information society in Estonia is a strategic approach to stay competitive and increase society's well-being. The public sector sets an example in front of others by following the principles of a developed information society. In Estonia, the procurements are very open for different innovative solutions for the public sector’s services. With having no strict rules and regulations for procurements the state helps the growth of information technology in Estonia. Continuous developments in Estonia’s public services are not only useful for the certain system but every development must be thought through and take into account the impact on other systems. The development plan for 2020 puts in place many standards that the public sector should follow. Even though the technological solutions for services can be very innovative and have no rigid limits, some standards and specifications set general conditions and are highly recommended for institutions to follow, for example, they give options for platforms, hardware, software, security, etc [42].

Estonia’s state information technology architecture document should be a basis for every public sector’s services. Coordination is a key element in a sustainable information society. The state’s architecture document specifies strategies and support systems that

help to ensure the state's information systems interoperability. Estonia's information system is built on service-based architecture. The backbone for interoperability is the five important starting points – "technical interoperability, security, openness, flexibility, and scalability." [6].

Besides State's development plan and architecture document, there is also Interoperability of the Information System's Framework. "The aim is to ensure a secure, security-conscious, and development-friendly information society in Estonia." [43]. Interoperability Framework provides general recommendations to contribute to a service-based information society, to make decisions more transparent, to support co-development, and to reduce the public sector's cost on information technology [43].

According to the latest forecast, the budget of Estonian state information society technological solutions was 223 million euros. Unfortunately, all the projects are not successful and sometimes fail to succeed. Some reasons why projects have been failed are the following – new and changing requirements/regulations during the development process, not considered user needs, too optimistic development plan, problems with cooperation, issues with old systems, no analysis on subsequent sustainability, unspecified rules, unsuitable development method, etc [44].

Project's sustainability and success should be ensured by the following factors – approved and optimized basic processes, project members are competent and tasks are divided already in an initial phase, smaller development phases, regular feedback from different parties, changes in legislation shall be thought through regarding the development process, etc [44].

Developing a new service is not only about programming, it starts already with clarifying the actual needs and gathering requirements, and ends with the system's first introduction which is later followed by consistent maintenance. Choosing the right method for development comes with initial analysis which gives the understanding of what is needed to do and how it can be done. The highly recommended method is agile development which is characterized by speed, flexibility, small development cycles, and regular feedback and reviews. Unfortunately, European Union is not so flexible in supporting agile methods for development. Institutions have to request money with structural funds, which means that the project has to be divided into smaller pieces for applying for

structural funds. Determining the development process, it is necessary to consider all the different specificity that the project has. The chosen method for development has to be flexible for this certain project [44].

Every project has risks that it has to face. At the beginning of the project analysis, it is possible to reduce the risks. For example, big risk relies on choosing the right technological solutions – platform, software, hardware, coding methods, working methods, legal restrictions, etc. If the foundation comes from the European Union it is necessary to follow the rules that have been set by legislation. As the legislation may change during the development process it is essential to take this into account and be aware that there might come changes even at the end of the development, that are needed to be made [44].

Estonian State's Information System Authority has not defined an information system but has a firm understanding of the dataset which is a set of data that is being processed in the information system. Estonian systems are mentioned to be more data sets than information systems, because of the collection of data all the systems have. "An information system is a broader concept than a database, as it contains, in addition to data, the rules for processing and managing them, as well as hardware." [44]. The database is the core of every information system. "Database - a set of data supporting information processing and retrieval organized according to a conceptual structure, which describes the properties of this data and the relationships of the entities corresponding to this data." [44]. Flexibility in the system is greatly connected to the database and its structure

The system's database is highly connected to this system's flexibility, it is even mentioned to be "the most critical element of a flexible system." [30].

2.2.4 Estonian Tax and Customs Board

"The Tax and Customs Board manages state revenues, implements state tax and customs policies, and protects society and legal economic activities. The state has set us two main expectations: to collect the state's tax revenues and to protect society from the dangers of the shadow economy." [45]. Services by the ETCB have the conception to offer simple and convenient solutions for customers that make them more motivated to fulfill their obligations to the tax authorities. The ETCB considers technological solutions automatization as one of the main directions towards successful and sustainable services.

Automatization limits the possibilities for making mistakes. In developing new services ETCB considers customer involvement as a very important part of development. While designing new services the customers are asked regular feedback about the usage of the service. It helps to find out the actual needs and expectations that the end-user has [45].

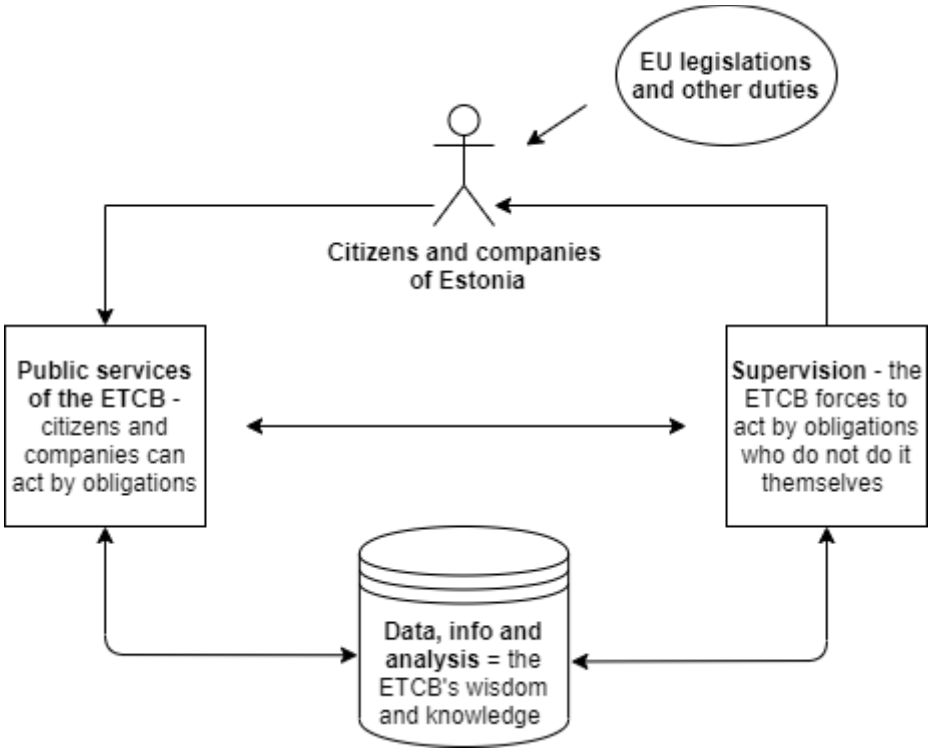

Figure 3 The ETCB role in the state's society [45]

2.2.5 Digital Europe

Digital Europe is one of the European Union's goals. The European Parliament has a major role in creating an information society in the European Union. It demands member countries to follow certain rules and regulations [46].

European Commission has put together a plan with several actions to proceed with digitalization in Europe. Their vision includes "promoting international connectivity, incentivizing the rollout of clean digital technologies and improving the regulatory environment for start-ups and scale-ups" [47]. These determinations together with many action plans are the foundation towards Europe's Digital Decade goals [47].

One part of the EU's plan for digitalized Europe is the Electronic customs project. The main purpose is to guide all customs-related activities towards digitalization and to

replace paper-based actions with electronic means. By this, they want to achieve “to create a more efficient and modern customs environment” [48]. They have created a plan called Multi-Annual Strategic Plan for electronic customs (MASP-C). This includes EU-wide customs developments that member states can take into consideration. Every development and future project’s information included is well-analyzed and put together with the final result and requirements for development. The member states can use this as a preview of what is planned for the future and can see the projects with details that the EU has set out [48].

Regarding the public sector, the European Union aims to create a public policy that would increase the public sector’s availability to increase their decision-making processes by themselves and to ensure that public services are kept up-to-date and are offering the best possible solutions they can to the citizens [49]. It is brought out that everything should be done for the public good. The data processed and generated by the public services are only to improve the public services and makes “a significant contribution as public goods” [49].

European eGovernment Action Plan 2016-2020 considers public sector digitalization to help to maintain an integrated society between the member states [50]. Every new requirement that comes from the EU has its regulations that the member states need to take into account. The regulations can vary and sometimes be very strict or very flexible. The member states are obliged to implement required specifications by a certain deadline [51].

3 Research Methodology

In this master thesis, the chosen research methodology was qualitative analysis. The method was used to gather various perspectives on the research questions.

The qualitative research method emphasizes an interpretive and logical approach to the world [52]. The process of this type of analyzes method is inductive where the substantial role lays on details to get abstractions, concepts, hypotheses, and theories from the results. Data from this kind of research method is not usually numeric, the main idea is to focus on in-depth analysis of the research basis. Important is to get answers to why and how questions to describe the situations and objects [53].

The qualitative research method helps to understand human systems, their behaviors, and thoughts. The method allows one to gain a really detailed overview of what and how one sees and senses the researched object. The main aim is to describe the process of life by analyzing it and bringing out real facts or new aspects, instead of emphasizing things that are already well-known [54]. "Qualitative research follows an interpretive tradition resulting in its aim which is to describe and explain social realism through people's individual interpretations, in other words through the meanings that people attach to aspects of reality." [54].

The method stands on constructivism which relies on understanding that people by themselves are the ones who construct the reality to ascribe meaning to objects and phenomena [54]. One of the data collection methods in qualitative research is conducting interviews which are also taken into use in this thesis.

The advantage of using the qualitative research method is that the method of analysis is more responsive and accurate. It helps to notice the phenomena that happen rarely or are unique. The researched object is not usually changed into simplified form nor numbers. The disadvantages can be that qualitative analysis does not allow you to compare the data in a way that the data could be taken equivalent. Also, it is difficult to go through an enormous amount of data. The main weakness in using the qualitative research method is the chosen viewpoint and hypothesis which can be done unconsciously and can affect the direction the research will take [55].

3.1 Data Collection Method

The chosen method for the collection of data was conducting interviews. The advantages of choosing the interview method stand on the point where people give direct information about what they are actually thinking and how they are feeling about the topic.

The emphasis of applying the qualitative research method lays on the questions. Questions that are asked during the interviews are regularly what, why, and how types. Also, the set of interviewees is rather small but definite and fixed [54].

In research, it is important to well document and collects the information that was given by the interviewee. In this research, the interviews were recorded so that the analysis could be done with more accurate data. Also, the value of recording and not taking notes while having an interview is the involvement. Because being committed to the interview helps to understand the interviewees' statements and views better.

The interviews were taken in Estonian because every interviewee was Estonian and if it is possible then having an interview in their mother tongue helps them to express their thoughts and feelings better. The recordings were transcribed and translated into English. The questions were prepared based on the research questions. The interviews aimed to get answers for the author’s raised problems. Even if the questions were prior prepared, they were not taken as a strict scheme for the interviews. The questions just helped to direct the course of the interviews by giving the author the understanding of what needs discussion and by letting interviewees talk about their experiences and thoughts. The questions and topics for interviews were more open so that the answers could give a more subjective overview.

The author interviewed 7 experts where 6 of them are working in Cybernetica AS and one person was from the Estonian Tax and Customs Board. The people were chosen by their knowledge and experience with ETCB systems and projects. The people from Cybernetica AS were divided into 3 groups, where each group with 2 persons was intended to talk about one project. The person from ETCB was chosen because she has a long history and a lot of experience with many projects and systems in the ETCB. Even though the aim of the interviews with people from Cybernetica AS was to talk about one project specifically but yet other topics and projects were also mentioned and discussed. All the interviews were around 1 hour long.

Due to the situation in the world with the Covid-19 it was not possible to have all the interviews face to face. Three interviews were done face-to-face but four had to be done by using online means.

The next table gives a broader notion about the background of the interviewees.

Table 1 Interviewees

Name	**Position**	**Experience in this field**	**Information about the interview**
Subject A	Senior analyst at Cybernetica AS	26 years	Face-to-face
Subject B	Lead analyst at Cybernetica AS	8 years	Face-to-face
Subject C	Analyst at Cybernetica AS	5 years	Through an online mean
Subject D	Lead analyst at Cybernetica AS	10+ years	Face-to-face
Subject E	Technical analyst-project manager-developer at Cybernetica AS	20 years	Through an online mean
Subject F	The head of development at Cybernetica AS	30+ years	Through an online mean
Subject G	Development specialist at the Estonian Tax and Customs Board	20+ years	Through an online mean

3.2 Data Analysis

The author chose thematic analysis for analyzing the collected data. To interpret the data with thematic analysis the author chose a tool called NVivo which would help her to conduct a thorough and detailed analysis.

Thematic analysis

The thematic analysis is one of the most used approaches for analyzing qualitative data. It is a process of structuring and arranging data in a way that is helpful for the research's

aim. The purpose of using thematic analysis is to find the hidden meanings and understandings from the data [55].

Thematic analysis is coding the qualitative data where all collected data is going through and marked with different codes. After everything necessary is marked the next process is to categorize the found codes which can be said is also finding common patterns to create themes. The themes are necessary for later analysis where these are brought together with thesis' research questions. The biggest advantages of using thematic analysis are the potentiality to increase transparency and reduce bias [56].

Braun and Clarke demonstrate how to use thematic analysis and offer to use a systematic six-phase approach to this method. This process should teach and help to conduct thematic analysis. These six phases determine what a researcher has to do and what needs more emphasis. A specifically drawn-up plan benefits on achieving the desired results and reduces the possibilities of receiving poorly analyzed research results [57].

The following are the six phases that Braun and Clarke advise which was also taken into use by this thesis author:

- Familiarization – After collecting the data it is essential to getting to know the data. Records should be transcribed and re-listened and transcription should be re-read. The emphasis should be put on reading the data analytically and critically not just to understand what is meant. It is necessary to acquire the understanding and meaning of what was said [57].

- Coding – The next step is to start the systematic analysis of the data and for this coding is suggested. It is essential to label data that is relevant to the research questions. Coding is the first step of finding patterns of the data [57]

- Searching for themes - After all the codes are found and data is labeled the next thing to do is to start aggregating the codes with similar meaning to come up with potential themes. It involves going through the collected codes and finding similarities and overlapping between the codes. It is more about generating these possible themes rather than discovering already existing ones. Themes should somehow represent and be in relation to the research questions. Searching for themes should end with generating a thematic map [57].

- Reviewing themes – This step is necessary to make sure everything that has been done so far is clear, understandable, and correct. The themes are reviewed regarding the generated codes and the foundation data. Possible new themes might come out [57].

- Defining and naming themes – After making sure the coded data is gathered into possible themes in a correct way it is needed to define the found theme by naming these. If found necessary a description for every theme could be written. Each theme should have a clear focus and aim. It is possible to have sub-themes to better divide the codes [57].

- Writing the report – After the previous steps are done and data is thoroughly analyzed the found result must be written. The aim is to write down what did the analysis find from the data. The report should draw together all the themes and give an assembled view of the analysis [57].

Analysis through NVivo

NVivo is a tool to help analyze qualitative data. NVivo helps to put focus on the places that are more important and need more emphasis. It simplifies managing the outcomes of the research. NVivo is capable of conducting many different astonishing analyses. NVivo helps to organize data and your ideas, challenge the data by making different queries on the information that is provided for the tool. NVivo is also highly rated for its capabilities for visualizing data with different diagrams and models and also enabling the creation of different reports of the data [58].

In this research, NVivo is used for in-depth analysis. All the interviews in their transcribed and translated form are imported into the tool. NVivo enables you to “code your data in a way that makes the most sense for your research.” [59].

4 Results

In this paragraph, the results of the done research are brought out. For analyzing the data the previously mentioned Braun and Clarke six-phase method were used. By using NVivo the interviews were gone through many times to find suitable codes. After categorizing codes by their similarities and relations the suitable themes for this thesis were elaborated.

4.1 Themes

The themes that were created are brought out in the next table. Also, the author created thematic maps for every theme which are brought out in Appendix 2.

Table 2 Themes of the thesis

Development for future prediction
Increasing efficiency
Rules and regulations affecting flexibility
Obstacles and challenges in increasing flexibility
System management

Next, every theme is described and explained by using interviewees' views and answers.

Development for future prediction

Predicting the future or thinking about the future plays a huge role in developing a flexible and sustainable information system. All interviewees deem it to be important to acknowledge future predictions and consider these since the beginning of the system's development.

One of the most important factors about this theme that came out from the interviews is a very thorough analysis. It was said that analysis determines the focus of the development and limits what is in and what is out. It is essential, both from the client's side and also from the developer's side, to see the big picture, to understand the different parts

intersections, and relations. When setting up the system's big picture it should not be gone into too detailed use case level because this approach could leave many necessary things out which is the purpose of drawing the big picture. Also, getting into specifics already at the beginning of development can bring many wrong decisions. Many interviewees brought out that their analysis always starts with the big picture either developing something totally new or implementing a difficult change. Understanding, why something is required in the way it is required and how something is actually done is essential for developing an effective information system.

Making the client's needs clear for yourself helps to find different hidden exceptions which might not come out in a typical requirements analysis. It is relevant to listen to the client and if possible, to monitor the client while their working to understand how things are actually done. With this approach by stepping into the client's shoes, the developer can learn more about what is actually needed and what the system must require. Also, listening carefully can give information on what might change in the future or what will be done differently and all of this can be taken into consideration to build a more flexible system for accommodation later changes more easily.

Respondents also bring out the importance of making assumptions or predictions and often listening to what your gut feeling says. Listening to a client is not always giving you all the information you need directly, some information may be hidden between the lines. For becoming acquainted with everything that is essential for the development it is suggested to ask a lot of questions and try to come out and offer different ideas for possible solutions. This method should make the client think broader and also about the facts that she did not come up with herself at first.

The other important factor that the interviewees brought out regarding future prediction in a system's development is the general structure of the system. It was clearly said that when the system is built poorly then every change can cause difficulties and might require many resources for implementation, even the ones that should actually be the easiest. The architecture of the system should always go together with the system's analysis. One of the interviewees said that "I think it is really important to have an experienced analytic and experienced architect. An analytic who can realize what complexity some business process can bring. Like what types of functionalities, the client might need in the future, like she should be able to envision the things a little farther than only what the client

requires right now. And also keep the architect close and updated with the requirements and ideas.". The architect and analytic are like an inseparable couple that should listen to one another and understands everything that is said. The information system's architecture is considered by the respondents to be one of the most important parts in the development of a new system. The structure shall enable every solution that is determined in analysis and must consider the possible changes that are brought out during the analysis process.

Regarding the system's structure, two approaches stood out more than others - reusability and generalization. It is practical to map out these parts of the system that can be necessary for future developments or even for some other system. In customs systems there are many parts that are similar so here comes the recommendation to implement these parts in a more reusable way. For example, to create separate modules or a base platform for similar applications, so that it could be reused whenever it is needed. From the researched systems and also from other examples that respondents brought out many have used one platform which defines the basic structure for the systems. It was taken into use around the time when Estonia joined European Union and had to change or add new systems. Because the systems had quite similar structures the platform could be used for many systems. The platform enabled to use of already set architecture and many functionalities that were already put into this platform.

Also, every interviewee acknowledges that over time it has been considered relevant to keep profiles and rules separately. In most customs systems they are kept apart which makes it possible to simplify changing these. The experiences of keeping rules and profiles separately in customs information systems have been rather positive and this kind of approach has been in use for at least 15 years.

The other approach regarding the customs system's architecture that came out from many answers is a generalization. Under the generalization, the interviewees mean the architecture solutions where the exceptions are not solved at the data model level. For example, if it is known that some data is needed to collect and the first understanding is that it is needed only in a one-to-one relationship for the main entity then it is not always recommended to implement it like this because it would lock the possibilities that the data could ever be collected in a one-to-many relationship. Also, it should not be defined whether some field is mandatory or not in the data model, because even though in the

beginning it is said that the field must be mandatory there have been many situations where during the development process it turns out to be mandatory only with some extra conditions. So, the field's obligatory could be easily changeable with rules or profiles.

Increasing efficiency

It is clearly understood that every system should emphasize the system's efficiency. Every respondent said that the system's lifetime greatly depends on its efficiency, how responsible and how durable the system really shows its sustainability. For example, the system's KMDinf one part which is called Agregaator does all the calculations for vat. The calculations are the reasons why Agregaator's performance is really important and the effort that was put on it is remarkably bigger than some other functionalities got. It is necessary that the system could calculate and re-calculate many extra difficult algorithms and at the same time respond to an incoming request with live data.

One interviewee talked about the changes that were needed to be made in systems IMF and OMF. The adjustments required to change the way the goods data was presented in these systems. In the initial plan, it was not considered that the data sets could increase rapidly and could affect the system's performance that much. For making sure that the system could keep its performance for other necessary functionalities the goods data were removed from IMF and OMF and the needed information was started to request from other systems. It is also mentioned that even if these systems could have had the capability to accommodate the data in their systems then many other related systems could still have had problems.

Architecture is also mentioned as something that increases the system's efficiency. The respondents have brought out the concept of related systems. Closely related systems are committed to considering how some solution might affect some other application that it is linked to. Many customs applications that are implemented under European Union requirements like ECS, ICS, NCTS have a really similar structure and are tightly related to each other. So, when changing something or creating something new in one of these systems it is necessary to analyze the impact on these related systems as well.

It is often repeated in the answers that everything should be done within reason. Every suggested solution should be suitable, reasonable, and actually necessary for a system, and indeed help or solve some kind of problem or functionality. One of the interviewees

emphasized that a happy medium should be found from different kinds of solutions to increase flexibility to avoid overthinking and going over the board. It is essential to find a solution between very strict and too flexible systems. Always seemingly ideal solution might not necessarily help or be needed in a long perspective. So, it is recommended always to think through every wish and idea and of course to go over everything with the client. One example from the interviews was about the system called LIDO, which had additional development for users to add their own types of documents but in reality, since the release of that system which was more than 5 years ago the only document type that has been into use is the one that was already added there with the initial development. Although, the time and money spent on that functionality were not small. This example shows that the initial idea to make it easier for users and make the system more flexible and efficient were not actually needed and no one has ever used it.

On the other hand, the system MAIS has had positive feedback on its functionality to enable users to add new excise rates and related designs, and other information. The functionality was developed because the analysis showed that this could be constantly changing. Even though it has been used only a few times per year it has completely paid off when comparing the development of this functionality with every change that new excise rates would have brought.

Also, positive effects have been brought by creating prototypes. The prototype that was created in the KMDinf project by the client gave a really concrete and clear understanding of the client's wishes. Creating prototypes has not been very regular and important in the developments of old customs systems but with introducing a new stylebook the creation of prototypes has also increased. Also, it has recently been added to the development process requirements to create a prototype for systems in development by the Estonian Tax and Customs Board.

As well as with the previous theme it is mentioned that monitoring system's user work process helps to increase its efficiency. It has been considered to be useful to sit down with the user at her workstation and to just observe her doings. This method could help to pinpoint activities that might be developed with more efficiency.

Also, efficiency could be increased by using classifiers where possible. Estonian Tax and Customs Board has developed a classifiers system that every other customs system can

use. By using this central classifiers system small changes can be done easily and painlessly. The respondents mentioned about the system MAIS that many things could have been possibly resolved with classifiers rather than writing everything straight into code. For example, only one tobacco type was added to MAIS because there were not any other tobacco types with revenue stamps in use in Estonia. However, in a short time, many new tobacco types have been added into MAIS, all of which need extra developments although they could have been managed with classifiers.

Lastly, but also very importantly, interviewees brought out the importance of the projects' teams. On one hand, it is essential to have a competent team from the client's side, people who understand the system and also who understand the capabilities of technical solutions. Here, the positive experience was said to be with the KMDinf project where the client was really firm and knew exactly what and how she desires same time doing active and good cooperation with developers. But, also there have been situations where the representative from the client's side changes and the subjects and topics are not well handed over so that many necessary facts are left unnoticed. On the other hand, the team on the developer's side is also crucial to be competent and qualified. Analysts with more experience can definitely think broader and recognize even the tiniest things that maybe junior analysts would miss. Regarding the team, testers and general testing, also play an imperative role in creating an efficient system. The interviewees mentioned that many problems occur only during testing so the testers have to be competent and know the system by heart.

Rules and regulations affecting flexibility

Estonian Tax and Customs Board systems are defined by national, European Union's, or both legislation and regulations. New regulations evolvement by European Union involves every member state's participants so every country has the knowledge of what is to await. Especially, when it includes bigger adjustments that bring upon more than just a little field or rule change. For bigger changes, the documentation and necessary processes are set and worked out by all the member state's participants. Every member state must follow the European Union customs code. Besides, the custom code, the countries can follow the MASP which includes plans for at least for next 5 years, some plans can even be for a longer period of time. One of the interviewees who are from the Estonian Tax and Customs Board introduced the process of what is used in this

establishment. Estonian customs has the obligatory to have at least one year plan with its budget specifications. European Union also sends KEL's which are not always prior known for the countries because they are rather smaller changes and should be easily applicable. It turns out that especially last year's changes had caused problems among customs officials. Some years ago, European Union took the approach to start to digitalize all customs applications. Unfortunately, the officials who have been working in the Estonian Tax and Customs Board for over 15 years have issues with adapting to the changes. It is difficult for them to understand and accept this total digitalization because they are used to do their work like they have done it so far.

It comes out clearly from the responses that everybody agrees that regulations from European Union are really well specified and documented. Working with these documents is simple and understandable compared to the national changes where the legislation is needed to decipher with the client. European Union regulations are well described and the desired solution is basically written down. Even though, the specifications are well written three respondents bring out the issue that these specifications can sometimes change even after they are confirmed. This means that when countries have started to build their system upon these specifications then changes that come afterward could require some alterations. It is acknowledged that this does not happen often but only when something important has been left out or when some member state truly requires some changes. But still, these situations happen and these are quite unpleasant for the client because this is something that was not taken into account in systems project planning and this alteration could entail additional resources.

One interviewee brought out issues with established deadlines by European Union. It comes out that these can often change and be postponed, a situation where some deadline has bought forward is not the case. The concern with postponing the deadlines is that when for example the system which release date is postponed has relations with other systems where the data exchange and interface are essential is affecting the work progress in other projects. One example has been brought from system Impulss and its interface with system Certex where Certex's release date has been postponed many times and the possibility that the data sets or rules are not finally set is high. This also affects the work in Impulss which needs to stay put until the Certex is finally ready. The interviewee notes that when somebody started to build the interfaces regarding the initial Certex specifications then they must have changed it at least 15 times.

The interviewee from the Estonian Tax and Customs Board states that there have been many situations where enforcing new laws or regulations is leaving out the affected information systems that will need attention. Especially national changes which are decided by the politicians are often thoughtless. For example, the system's KMDinf realization process where the law was adopted six months before it came into force. This meant that ECTB had basically six months to get ready for that law and create a system like KMDinf. This time pressure limited every possibility to think about broader and hindered building a flexible system. At the same time, it is said that deadlines by European Union are rather long- and the-time reserve should not cause troubles and the development could have time for thinking more about efficiency and flexibility. Unfortunately, one thing that demands a lot of useful time is the process of formal actions. For example, things related to procurement including acceptance, analyzing the offers, deciding the winner, signing the documents, finding the funding, etc. Even though, European Union gives time with some spare time is not being used for development. It mainly depends on ETCB when the development can be started and how much time is left for it.

Positively affects the system's efficiency and flexibility the possibility to use software of your own choice. It is not restricted by the European Union or Estonia what tools must be used. The closest to some kinds of restrictions are the non-functional requirements (NFR) which are set by MF. For example, NFRs determine that customs systems must use either Oracle or Postgre SQL database, also some rules for naming fields are set.

Obstacles and challenges in increasing flexibility

Regarding implementing flexibility in systems some obstacles and challenges often prevent increasing systems efficiency and flexibility and need to be exceeded. The main challenges that are brought out are the resources. Customs projects are always very limited by time and finances. On one side, the constraints can come from a very intense project plan, deadlines that are around the corner, or difficult promises that have been made. On the other side, the restrictions come from finances. Because the finances are set according to the project plan so the interviewees admit that it puts strict boundaries on what solutions are chosen for analyzing and developing. As one of the interviewees said „you have to build the system with this money and this time, and so all the focus goes to

creating this project and you can't think about what future might bring", so, unfortunately, the time and money cannot easily be found.

All respondents agreed that every extra cost, either financial or time, should be acceptable and is 100% essential to increase the system's flexibility and make it more sustainable. All systems might not require extra costs for flexible solutions but these are rather smaller ones. Customs systems are quite large with an expected lifetime of at least 7 years so these should be made as flexible as possible for accommodating later changes.

Interviewees acknowledge that seemingly easy change is not always easily implementable. It is admitted that even analytics' first estimation can go into conflict with later programmer's assessment and the first estimation needs to be enlarged. Also, comes out that client sometimes tries to make their own estimation on some changes they may want but this sometimes ends with slap on the wrist because the estimation was too optimistic and the actual number of resources that are needed are much higher.

As already many times mentioned, analysis is a really important part of developing a system. Strong, detailed, and thorough analysis can bring benefits when weak, not thought through, and lacking analysis can cause many problems and affect the system's lifetime. For one example can be brought out one thing from the system's KMDinf development. There were great challenges regarding identifying persons which came out quite late in the process. This clarification caused the need to change many parts of the Agregaator's algorithm. Even now, nobody still does understand how the client and developer understood each other so differently and how it did not come out earlier. The other bad example comes from the system LUBA. LUBA has entailed many expenses because of its complicated structure. Every change that is needed to introduce this system is complex and requires some kind of programming. It is a sweet situation for developers but quite unpleasant for the client who needs to pay for that.

Other obstacles for creating a flexible information system that is brought out are actually the requirements and restrictions which can come either from business needs or technical capabilities. Hereby are not meant the specifications and documents that are taken for the foundation of the system but the technical solutions and how these can affect other related functionalities. For example, one interviewee brought out an issue from one system which was built basically on user stories. Every user story was taken as a separate business

process and all the logic was written into each separate story. This kind of approach caused many troubles with overlapping parts because when something was changed it should have been changed also in other processes where the same part was in use but unfortunately, it was usually forgotten or just all the places could not be found. To prevent these kinds of problems respondents emphasize the importance of state machines. State machine should be the centric place where all the data operations are written. This approach enables to have a better overview of the business logic and helps to prevent situations where the same thing functions differently with reasons unknown.

System management

As it came from the interviews that system management is not only about database management but it plays a great role in the system's general structure. It turned out that customs databases cannot be taken unequivocally. Every system has its own purpose. Every solution made or every database created has to fulfill its own purpose. Lately, the chosen approach is to create databases that are more normalized and reduces redundancy. Although, some interviewees admit that this is not always appropriate and beneficial to every system. For example, system MAIS's database has some amount of data that is duplicated. This form was chosen because of certain reasons so that storages inventory information could be promptly accessible. Also, the solution for system KMDinf Agregaator's database is quite original, even the interviewee said "it is the most hideous thing I have ever seen". The database structure is totally denormalized and everything is put together into one enormous table. This solution also has its own reasons and purposes. Even though when the solution does not seem very practical and easy to be managed in the beginning it is not always the case. Agregaator's database is built on a complicated algorithm but is not so difficult to change and also the huge denormalized table can quite easily be alternated.

One of the respondents acknowledged that on one side it is tried to create a database that is more optimal and relational so they could decrease redundancy but at the same time they are making the databases even more complex by distributing everything so changing these are even more complicated. The interviewee brought out that there should be put more emphasis on the fact that it could be simply changeable after, but so far it feels that all the emphasis is put on the first creation to find an efficient solution.

Also, important in meeting European Union requirements is to understand the messages communicated between the systems. European Union has defined these as XML messages and has set requirements for them. It is necessary to understand that this actually already puts in place the data model. Interviewees also say that in last years they are not putting much emphasis on creating a new database but rather analyze and build everything upon the XML messages and their structure.

5 Discussion

This paragraph brings out this thesis' qualitative analysis' results with the author's analysis. In this chapter, the author will answer the research questions that were established in the first chapter. The questions will be answered based on the theoretical framework together with the literature review and most importantly the results from interviews in the form of the themes from the previous chapter. Firstly, the sub-questions are answered and after the answers are together the author will compose an answer to the main research question.

5.1 Outcomes of The Research

SRQ1 "How can future prediction be developed with the most accuracy?"

Given today's information society's rapid growth, systems must take into account the possible changes in the later stages of the system's life. For the system to remain sustainable and later changes to be implemented without any high cost and effort, it must be developed as flexibly as possible. In this research the author has set a concrete definition for flexibility which was brought out in the first chapter: "flexibility as something that measures and determines system's capability to respond to predicted and also unknown changes in the information system". By this, the author clearly defines that flexibility as something that shows how responsive the system is. So, to improve the responsiveness we should improve the flexibility of the system. But what can be done to ensure that our system is ready to accommodate different possible changes with no big trouble?

It is clearly understood that every system's development should require some kind of analysis either business or systems but there are times when it is not taken as seriously as it should be. From the research, it came out that thorough analysis's importance is considered a very important part of the system's creation. The analysis has to be a foundation for the created system. The analysis is not only about writing documents it is everything from the very beginning starting with the first contact with the client. The analysis should be built around the business processes, the big picture of the business should be made clear and understood. It is necessary to listen and be attentive by paying attention to every little detail that could give insights into future doings.

Predicting the future is not always easy. Every extra work has to be thought through whether it is necessary or not. It is important to consider every information that is known about the future and the changes that the system might have. For example, for the Estonian Tax and Customs Board systems, the MASP should be considered when creating new systems or implementing new functionalities. The MASP can help to understand what might need more emphasis to predict future activities in the best possible way. The previously mentioned need for the big picture and thorough analysis is also necessary for predicting the future. They can hold hidden information which can help to create a more flexible system.

Another thing that can be thought about for predicting the future is the structure of the system. It has to be built in a way that can accommodate change without a big effort. Putting together a system's architecture has to take into account the specifications and exceptions of the system. It has to be understood what parts of the system might require constant changes. In the examples of ETCB systems, the positive experience has been brought by allocating profiles and rules from the overall systems code. The rules and profiles are seen to be more changing parts and can be changed rather easily, sometimes even without any participation from programmers.

Regarding creating new systems or implementing new amendments these activities should always include management. Managing new processes with transparency and openness is crucial for adopting changes among business employees. For ensuring that changes are implemented and set with the most accuracy it is useful to include as many people as possible to make sure that every specification and exception are studied. Good governance is essential to ensure employees' trust towards managers of the business.

To conclude, it can be said that it is necessary to analyze everything very thoughtfully, create solutions with more generalizations, and include employees were possible to increase the accuracy and efficiency of predicting future changes.

SRQ2 "How can rules and regulations from the European Union affect the flexibility of the Estonian Tax and Customs Board systems?"

Because of today's European Union's goal and ambition to move towards digitalized information society every regulation and legislation they give out guide member states towards the goal. By ensuring that the member states follow these ambitions the EU has

obliged them to comply with the specifications which can also help them for implementing different solutions.

The EU's specifications and plans have rather longer deadlines so countries should have enough time to implement necessary requirements, but it is completely up to each system owner to do it themselves. One of the Estonian IT architecture's principles for interoperability systems, as mentioned in the first chapter, is flexibility which should lead to creating systems in a way to reduce the public sector's costs on information technology. The specifications set by the European Union are well defined and the needs and requirements are plainly brought out.

After the EU informs member states of new upcoming changes the countries need to start getting ready to release the changes on the given deadline. The positive sides of this are the deadlines that are usually known in advance and give the countries enough time to prepare. Usually when a country has built all its systems according to the EU's specifications without many additional internal solutions then it should not be complicated to implement the new changes that the EU sets. So, to ensure that the EU's changes would be effectively implemented it is necessary to follow these specifications and reduce the internal solutions developments where possible.

Besides, member states need to follow the MASP and consider its set future developments. It is not mandatory to follow MASP thoroughly but it is definitely beneficial. It helps institutions for making plans and finds possible solutions. It gives an understanding of whether the system can manage with a more simple solution or needs a rather complicated one. In general, it helps to acknowledge if something is necessary to implement in a way one wants or no.

Different additional internal solutions that countries implement make their system less responsive to the EU's rules and regulations. The effect that these special solutions might bring can be unfavorable for the system. Extra solutions can require more resources and analysis for implementing required subsequent EU changes when at the same time having the system built according to the specifications given by the EU can bring benefits with a simpler implementation.

SRQ3 "How can a database be managed in a way that increases efficiency?"

The Estonian Tax and Customs Board systems store and process data in many various ways. Every chosen database structure should meet the needs of its system. Even though member states have quite an open hand to choose the suitable way how to structure their database it is still necessary for the EU-specified systems to follow the European Union specifications and rules about the XML message exchange.

It has come out that the emphasis put on database's detailed creation is not that essential anymore. Lately, it has come more important to follow the written XML structures and define the database based on the XML messages. The possible changes can be operated by XML structures and it is important to acknowledge that every special solution decreases the system's efficiency and makes them more complicated. One of the aims for managing the system's database with the EU's written XML structure is to create readiness to accommodate possible subsequent changes from the EU.

SRQ4 "Is the initial bigger cost that is spent on flexibility worthwhile?"

It can be said that resource-related topics are causing distress in every project. Possible resources can cause many barriers and obstacles that organizations need to exceed. The main issues with resources regarding the Estonian Customs and Tax Board projects come from the need to change the initial project plan and to acquire extra money for that. It causes distress because of the formal process it requires. The procedure can be protracted and demand excessive justifications. The issues come up when the initial project plan is set but later during the development process, new requirements are needed to consider.

One of the solutions how to ensure that the project plan would not need many additional amendments and any extra money with a long and tiring process is not needed to acquire the initial plan and analysis should be made as thorough as possible. Detailed, thorough, and better-planned project plan leads to a more efficient and sustainable system that does not require that many additional resources later. The analysis also showed that most of the time when solutions that are chosen for their flexibility have brought benefits. All interviewees stated that every project should be put more emphasis on flexible solutions.

Unfortunately, it is not always very understandable for the project leaders that some required solutions are more expensive and complicated because of their different decision

that is necessary for being more flexible. They need more persuading and justified reasons. This all comes together in a good and thorough analysis which should point out subjects that might require a more flexible solution and which probability to change afterward is high.

This kind of approach should help to bring the leaders on board and to ensure them that the costs are necessary and worthwhile in a long perspective. This would also satisfy one of the aims of Estonian Interoperability which is to decrease the costs of the public sector's expenses on technological solutions.

Main research question "How can flexibility be improved when building a new Estonian Tax and Customs Board system?"

The main research question was subdivided into four previously mentioned sub-questions. So, for answering the main question the previous answers can be combined and it can be said that flexibility can be improved by a very good and thorough analysis including a clear understanding of the business processes and becoming acquainted with every unseen factor. Besides analysis, the other aspect which could help to improve the system's flexibility is the generalization in the system's development.

One of the possible challenges that have to be exceeded on the Estonian Tax and Customs Board side is the management of new or changed processes. It is not always substantial but is definitely important when more people are affected by the changes.

One of the obstacles to improving flexibility in the Estonian Tax and Customs Board systems is the formality. The needed resources (employment or money) for improving flexibility can come only through the managers and formal processes so every extra resource demand justification and detailed explanation. The costs that flexible solutions demand are the biggest obstacles for most projects but using the right ways they might be exceeded.

6 Implementing Flexibility

System flexibility can be affected by most of the processes of the business. Regarding this master thesis, the author chose one of the processes in the ETCB systems creation where she tried to improve the process to increase the system's flexibility. For modeling AS-IS and TO-BE models, the author used an open software called Bizagi Modeler.

Modeled AS-IS diagram describes the process from the system's initial analysis until the release of the first phase. It reflects the process that is done when a new system is needed to build. It can be seen in Figure 4 how the order is received by the development partner and how an offer is made followed by its acceptance. The diagram is not bringing out any specific loops but a group has been drawn that reflects the tasks which can be recurrent in a sense of the entire project period. As previously mentioned, this AS-IS model ends with the release of the first phase but could actually continue by going back to task 'Start phase'.

The author tried to increase flexibility in this process by adding meetings between the developer and ETCB's managers and officials into the sub-process 'Create an offer' which can be seen in Figures 6 and 7. The change helps to set down and define concrete needs already before putting together the project plan. Its advantages in decreasing the possibility to need to change the plan later and reduces the time of formal process for the ETCB. The formal process might be needed when new requirements come out not until the development period and are not suitable for the written project plan and would require more money. Changing project plans can be complicated and might require changes already in the development system. Regarding formal means, the new requirement can be quite time-consuming because of the processes it has to follow to request or justify the need for extra costs.

Setting down the right requirements already before the development is rather useful and beneficial. The solutions that will be chosen for the system's architecture can be more accurate. Also, during this initial analysis as was mentioned many times in interviews shall be thought about the future and the probability the future changes have. For this it is likewise important to talk to the officials, the real users of the previous system, to obtain this understanding and information. The AS-IS model shows that the creation of the offer does not involve participation from the ETCB side and so the analysis is all done by

developers' own understanding of the pre-analysis that is provided with the order. Unfortunately, the developer does not always know the system that well to think about everything and to write down every necessary requirement.

The TO-BE diagram would be a perfect solution regarding the analysis process where the involvement of the ETCB employees can be considered already in the process of the offer's creation. Altogether, it can be said that the author's idea with the TO-BE diagram can improve the system's flexibility and might benefit in reducing costs.

6.1 AS-IS

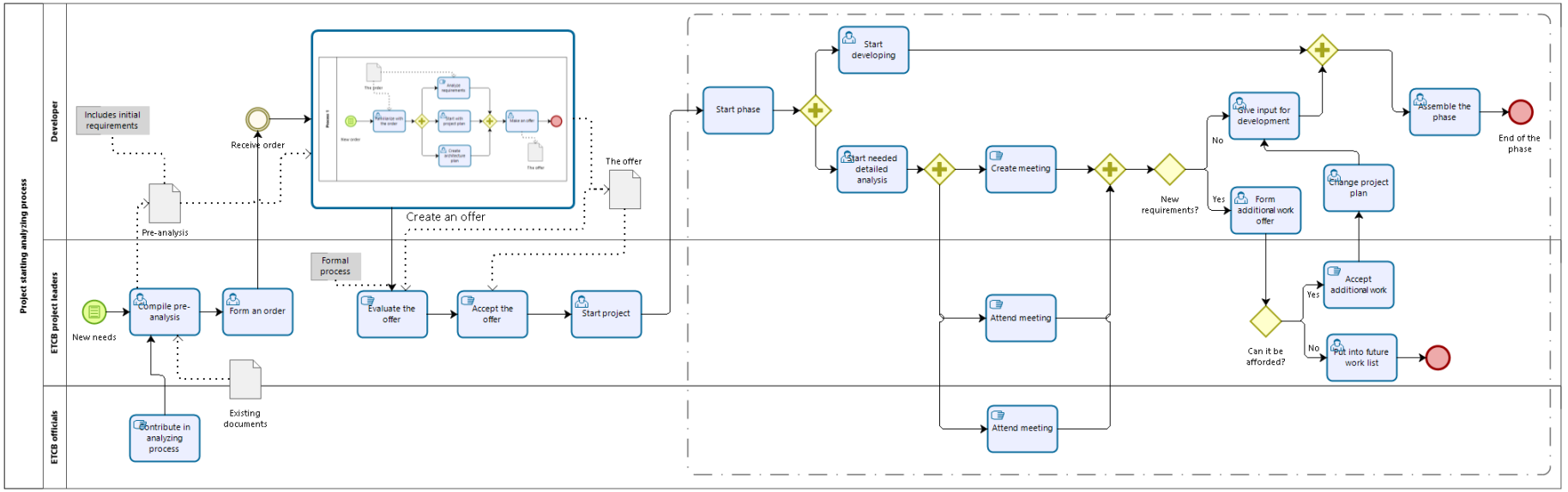

Figure 4 AS-IS process model

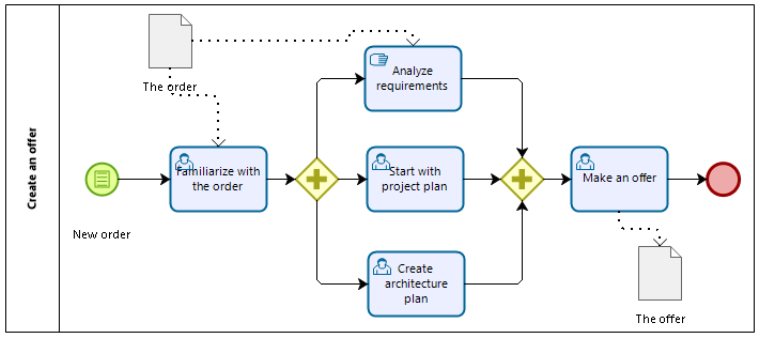

Figure 5 AS-IS sub-process 'Create an offer'

6.2 TO-BE

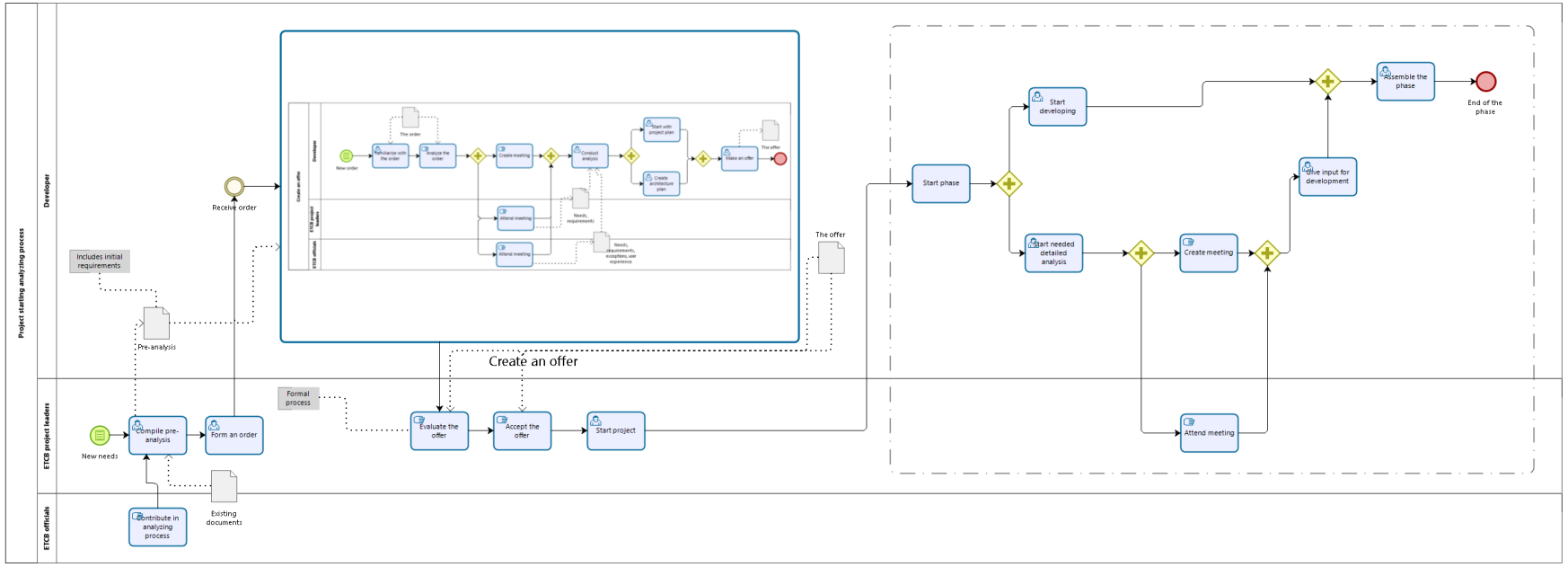

Figure 7 TO-BE process model

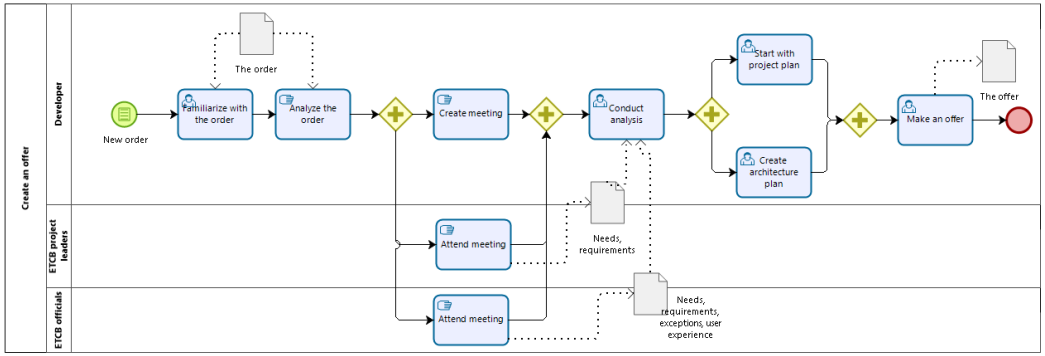

Figure 6 TO-BE sub-process 'Create an offer'

7 Recommendations

Based on the interview responses and the analysis which has been conducted the author will provide some recommendations for increasing flexibility in the Estonian Tax and Customs Board systems. While the interviewees brought out many factors that might affect the system's flexibility and several processes that can be improved, the author will emphasize only a few of these that were brought out more often. The recommendation will be put together based on these previously mentioned factors and the author's personal opinion on the necessity of increasing flexibility. It has to be mentioned that the models described in the previous chapter are also part of the recommendations given by the author. The TO-BE model is a suggestion for improving the process of analysis in regards to flexibility. In this recommendation chapter, the author will give rather a general overview of the overall project's development improvement.

Firstly, every project should set down a clear purpose for its creation. The aim cannot always be only to implement new requirements or to change some technical solution the purpose of the system should also satisfy other aims that are set for the Estonian Information systems. For example, like noted in the first chapter costs of the IT solutions in Estonian Information systems should be reduced. This should also be one of the triggers for the ETCB to build a system sustainable and flexible enough to not require too many extra costs afterward to change it. Everything should be done in the best possible way already with the initial project plan and analysis.

Secondly, as mentioned one of the recommendations the author provides is about the analysis that was modelled in the previous chapter. The analysis process should have a concrete structure depending on what is the goal and on how the system will be built.

Thirdly, the author considers it important to point out the generalization of IT solutions in systems. More generic solutions enable the system to be more flexible in a sense of accommodating other requirements' needs. Even though, if this flexibility of this generalization does not seem beneficial at first it should not be left out because the effectiveness can come out later during the system's lifetime when there will be changes to implement.

Lastly, one of the most important parts of any project's development process is the team. By the team, the author means people from the developer's side and also from the ETCB's side. The people who are involved in this process have to be competent, they have to know the field, they have to know how to search for hidden exceptions and they have to be familiar with the goal of the project and pursue it. The participants have to understand their role and its importance and to behave according to that. It is essential to understand the importance of the time and money the project has built on.

To sum up, the author highly recommends that flexibility would be taken as an essential part of every system's creation process. These recommendations ought to achieve the success of the system's creation in a long run. However, it has to be understood that these suggestions are rather general and have to be adapted and clarified according to one's system.

7.1 Limitations

The main aim of this master thesis was to study the flexibility of the Estonian Tax and Customs Board systems. However, these systems were researched based on only one organization's work but the ETCB has many different development partners who are related to their developments. Therefore, it has to be acknowledged that the results of this thesis might be a little bit tilted by this one organization's point of view. Ideally, the research would benefit a lot when confirmation about this topic's importance would be given also by these other partners.

Other limitations can be brought out from the experts that were chosen for this research where six of them were from Cybernetica AS and one from the ETCB. It was realized from the answers that it would be useful to get more insights from the ETCB employees. In addition, to the interview method, the questionnaires could have also been prepared to involve more people who are also dealing with processes of these systems. Unfortunately, in this context, it was not reasonable to carry out because of the time consumption the analysis process could have demanded. Also, in addition to interviews and questionnaires, another beneficial method for this research would have been an observation approach. Although the interviews provide a good understanding of how the work is done, the observation method would have provided a clearer understanding of the ETCB's work processes and helped to provide more specific and precise recommendations.

Unfortunately, the observation method could not have been performed because of the current situation in the world. The pandemic restrains the possibilities researchers have for conducting research. Because the observation method should have been mostly conducted in person then it was not possible to use this approach for research. Although the situation also limited the interviews the author had to do, she still managed to perform three interviews face-to-face.

7.2 Future Work

Considering the relevance of this study the topic should be researched more and even further. One course that the additional research could take is to study more the work on the ETCB side. This research was done using insights from the developers' point of view but as it came out from the research many decisions have to be made by the client. So, it could be beneficial to involve more people from the ETCB to study possibilities to improve flexibility in their systems.

Also, one of the possibilities for future work on this topic could be a more detailed study on a specific system's development process. This could include one whole system's creation process observation and mapping of necessary components which would start with an analysis process from the ETCB side, followed by different formalities and later examination of the system's creation process from the developer's side.

8 Conclusion

In this chapter, the author will conclude this master thesis research by bringing out the aim of this work, what was done and what was found out. The main problem that the author wanted to tackle was the flexibility in the Estonian Tax and Customs Board systems. The objective was to research three different ETCB applications and find out information that could help the author to understand the need for flexibility and how and in which direction it could be improved.

For analyzing this topic, the author conducted 7 interviews by using qualitative research methodology which gave her a broad understanding of the development process concept in the ETCB systems creation. The results were studied and the themes were assembled based on these.

The analysis showed that flexibility is considered to be a very important part of a system's creation and should definitely be considered from the very beginning. The benefits might not appear right after the development but will bring advantages tomorrow or the day after that. It can cause more troubles in the beginning and might require extra expenses but all this will be profitable and worthwhile. The author provided some recommendations (chapter 7) based on the results from interviews and the analysis that was done.

One of the challenges that the Estonian Tax and Customs Board might face by changing their development process is the people and also the change management. For people to be more enthusiastic and eager to adopt new changes they have to be involved in the process so that they can feel the need for existence and usefulness. The other obstacles which the ETCB might face are the resources. It has to be well defined and explained why something is needed and for that, the author modeled the TO-BE diagram to give the interpretation to change the structure of the project to make it easier to understand the quantity of the needed resources.

The system's development process could bring benefits when researching this topic more from the Estonian Tax and Customs Board side in the future. It can help to understand how flexibility is considered in this institution and give insights for increasing it.

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Appendix 1 – Interview questions, topics, structure

1. From where came the need for the system/project creation?

2. Discussion on the requirements of the system:
    a. Were there changes during a development process?
    b. Were the requirements well established?

3. When developing this project/system was future possible changes taken into consideration?
    a. YES (if yes then trying to get answers to the following questions):
        i. How were the possible changes predicted?
        ii. How were these taken into consideration? Just for know-how or were considered in analysis and development as well? Or how accurately were these considered?
        iii. How much time was spent on this aspect?
        iv. Do you think it has brought some benefits?
    b. NO
        i. Why?
        ii. But now when you think back would you do things differently?
    c. What do you think about predicting future changes?

4. What do you think about the European Union's rules and legislation?
    a. How can they affect the system's lifetime?
    b. Can this kind of change somehow be predicted or can a system prepare for some type of changes?
    c. Are the deadlines that the EU puts brought any issues? What do you think about the deadlines?
    d. In comparison – whose deadline is stricter and taken more seriously EU's or national? (some extra clarifications)
    e. Are the requirements/laws/regulations actually useful? How they can help?

f. To what extent do these rules limit the conditions for setting up the system?

5. How is the database build into your system? (Small discussion on this topic)
    a. Why these decisions were made?
    b. What is necessary when choosing and putting together the database for a system?
    c. Did you think about possible future changes when creating a database?
    d. Are changes to the database often?
    e. Are changes to the database easy to implement in this system?
    f. Is EU set some requirements for the system's database?

6. Does your system have some certain type of changes that it needs to implement often?

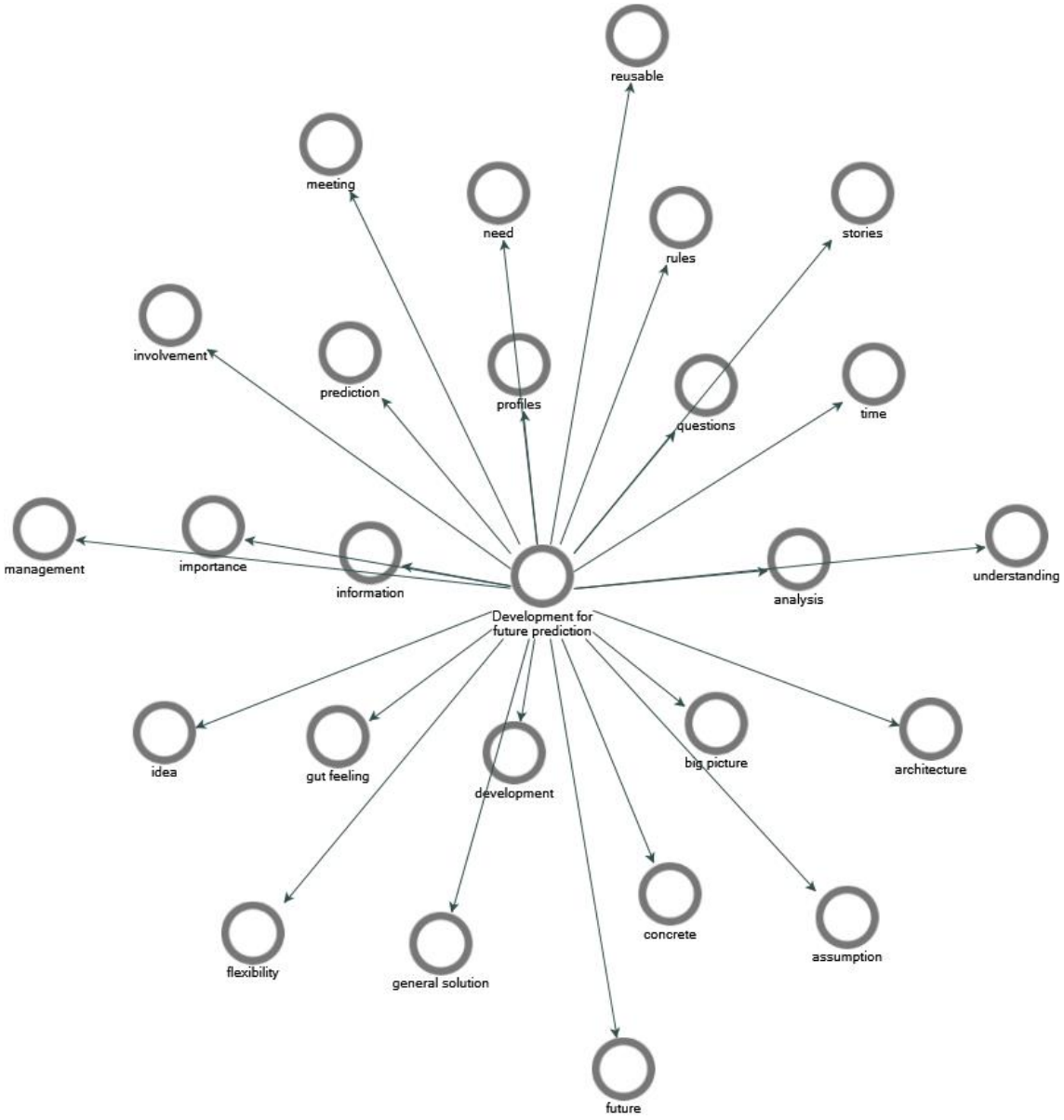
7. What do you consider to be a small change? (Resources for measurements)

8. Are the changes that at first seem easy to implement always in fact easy to do?

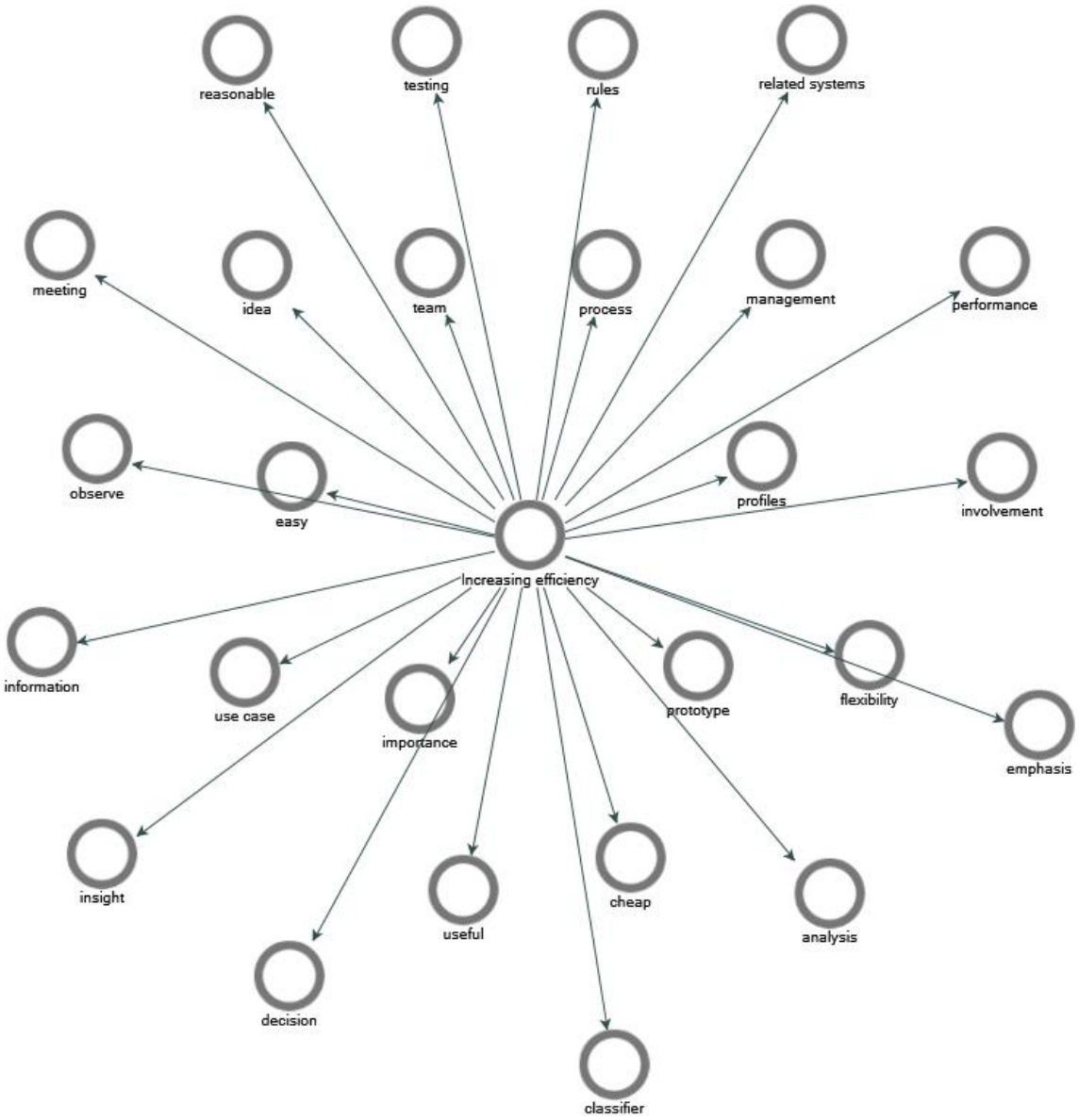
9. What do you think about the costs that could be spent on flexibility at the beginning of development? Do you think it could be worth it? Do you think it could help in the future when new requirements or needs are set?

Appendix 2 – Thematic maps

Appendix 2.1 – Thematic map – Development for future prediction



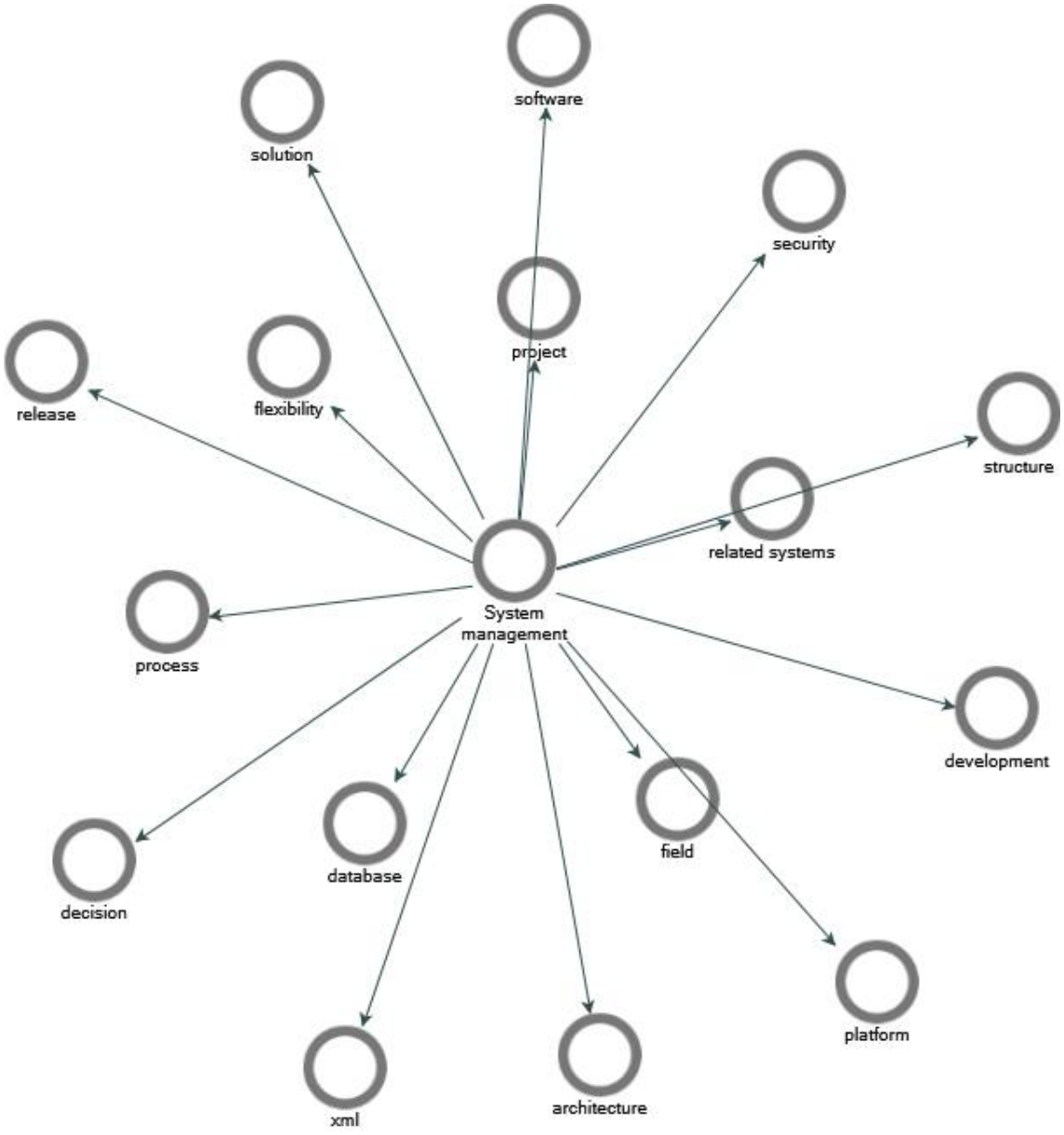
Appendix 2.2 – Thematic map – Increasing efficiency



Appendix 2.3 – Thematic map – Rules and regulations affecting flexibility

Appendix 2.4 – Thematic map – Obstacles and challenges in increasing flexibility

Appendix 2.5 – Thematic map – System management



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