Integrating design thinking into front-end of innovation process in a traditional manufacturing company

Minna Perttu

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Minna Perttu
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The front-end of innovation is many times fuzzy and the decision making for evaluating new product and service ideas to be implemented is challenging. The aim of this thesis is to apply the main topics from service-dominant logic to change the front-end of innovation process of a traditional manufacturing company to be more customer centric. A design thinking process is used to make the change happen. The front-end of innovation process of the case company will be reframed and the design thinking process is tested and integrated to it.

This thesis utilizes the theory of service-dominant logic by embracing the point of view that the value of service, in this case the processes, does not come from the fact that someone has drawn a process picture of it, but in its use. The key issues in service dominant logic considered in the thesis are collaborative innovation process, service as competence application for benefiting another, and as basis of exchange and integrating resources as the basis for innovation. The value proposed of the process can only be realized when it is used in the correct way, so that resources are integrated to the co-creation. The thesis also considers customers who are the ultimate reason why this process is made—to create value for them.

A single case study with two units of analysis and qualitative research approach is used to understand how the suggested design thinking process works in the case organization. There will be two pilot projects to test and validate the process. Interviews are used to understand the value of the process from the user’s point of view. Participatory observation is used to gain understanding about the actions and reactions of process users to find out what was experienced complicated, easy and important. Another target is to validate the company language with these methods in the design thinking process description. For reframing the case company’s front-end of innovation process there is a set of co-creative workshops to first understand the current user journey and then to draw and test a new process description.

As a result, there is a suggestion for the case company of a front-end of innovation process that includes a validated design thinking process. The thesis offers understanding of the value of such a process used in innovation activities and more detailed understanding of how it could be organized in a company like the case company. Further development should include leveraging the use of design thinking to other projects, as well, such as internal service development or support services.

Perspectives from service-dominant logic, front-end of innovation and service design are guiding the work of process development. The results are being used in the case company and the implementation work has started. The findings and approach can be used in other process development and the organizations’ innovation work.

The user of the process is a co-creator of value and needs to have sufficient understanding and skills for using it right. Therefore, it is important to have a facilitator for these projects and have process descriptions that are in company language. The language can change, so the descriptions must be checked every now and then. The perspectives of employees alongside with those of the company and other stakeholders should be considered when developing processes.

Keywords: Service design, design thinking, innovation management, front-end of innovation, service development
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1 Introduction

Megatrends, like climate change, digitalization, urbanization and growing middle class are shifting the world. These changes set new requirements for products and services. For example, climate change will affect on outdoor durability of available outdoor products and there is a need for innovations. Today, also the complexity of business and technology is increasing, and people and companies need to make sense of it (Kolko 2015, 5). This is a clear trend in business that drives people to use methodologies like design thinking to help in the sensemaking process. Big companies like IBM and GE are using design thinking as core competence for simplifying and humanizing their services. Large consulting organizations are also attending the design thinking journey by acquiring smaller design firms. (Kolko 2015, 6)

Design management institute has studied design-led publicly held companies and has revealed that they perform over 200 percentage better compared to the S&P 500, the 500 biggest companies in US based on market value. (Westcott et al. 2013, 10) Jeneanne Rae (2015) argues that design has become a critical element for resonating with customers, building brand loyalty and creating compelling products and services. Also, McKinsey report (2018) shows that the top-quartile companies with their McKinsey Design index grew 56 % faster and total returns to stakeholders grew 32 % faster than industry benchmarks between 2012 and 2017.

Traditionally the more goods you can produce and sell the better. The same is probably still valid but there are new ways of defining value that have emerged. Goods-dominant logic has been dominating the business world since the industrial revolution. The value of goods was determined by the ownership. When a customer buys a product, the value is transferred from the producer to the customer. (Vargo and Lusch 2004)

Newer ways of thinking are defining the value as the value in use. The focus of firms is shifting from product and service features to value. The value is co-created with the firm and the customer when the innovation or other resource is used. (Lusch and Nambisan 2015, 160; Prahalad and Ramaswamy, 2000, 85) Therefore, service design and understanding of users and customers are hot topics in today’s business and many companies advertise that they are customer-centric. Vargo and Lusch suggested in 2004 a new dominant logic for marketing which emphasizes the individual service experience and co-creation in the value creation (Vargo and Lusch 2004).

Ordanini and Parasuraman concluded in their research that collaborating with employees, business partners and customers helps firms to improve their performance through innovations. (Ordanini and Parasuraman 2011, 18) Business partner collaboration affects on radicalness and customer collaboration on volume of innovation. According to the case company
strategy, both are desired. The thesis is continuing the discussion of service-dominant logic perspective in the front end of innovation.

David Matheson (2018) claims that stage-gate, the traditional process model and other hierarchical processes tend to kill innovation. Usually these processes are also circled by a culture that kills it (Matheson 2018). Thus, an iterative design thinking process that could form the culture towards more flexible one will be combined with the traditional stage-gate process.

It has been studied that only 29-33 % of the innovation performance comes from innovation activities and even 53 % are constructed from organizational attributes such as culture and senior management involvement (Koen et al. 2014a, 40, 2014b, 29). A case study will be made to find out if the same attributes are affecting in the case study research.

The aim of this thesis is to apply the main topics from service-dominant logic to change a front-end of innovation process of a traditional manufacturing company to be more customer centric. Design thinking process is used in practice to make the change happen. As part of the development work, two pilot projects are conducted to test the suggested design thinking process within the company environment and network.

The research design is a single case study with two embedded units of analysis (projects) where qualitative methods are used to gain understanding of the cases. The projects are made in one case company so in the same context, same culture and organizational structures, and it is a representative case in a manufacturing company (Yin 2009, 46, 61).

This thesis focuses on front-end of innovation process (later FEI process), how to gather the internal and external insights needed to make concept ideas and validations for easing the decision making. This study gives an example of changing design language to a company language when preparing a design process and offers a validated way of using design in pre-studies in a traditional manufacturing company.

Westcott et al. (2013) report that there is a communication gap between designers and brand and business management (Westcott et al. 2013, 12). Thus, in this study the communication with business management was started in the beginning of the transformation project. The pilot project participants were treated as users of the process when the process was being designed and tested.

The further development in the case organization should include leveraging the use of design thinking to also other kinds of projects, such as internal service development and support services. By slowly expanding the use and making more and more people understand the value in use and what it means to be customer-centered, the case company can truly become what it wants to be: a customer-centered market leader.
1.1 Research questions and development objectives

The main research question of this thesis is

How can design thinking be used to gather customer insight and defining solutions in front-end of innovation process in a manufacturing company?

I will approach this main question by means of sub questions of how does design thinking work in the case company’s environment and how it can be integrated to the FEI process. The development target is to frame and test a design thinking process that could be used in making product and service innovations in the case company. Simultaneously I will explore how service-dominant logic can be applied in front-end of innovation to change the company’s mindset to a more customer-centric one.

In the Table 1 I have listed the projects of the case organization related to this thesis and their contribution to the thesis. In the FEI project the front-end of innovation process of the company will be reframed. Related to that I will think about how to combine the tested design thinking process to the FEI process. The pilot projects are solution development projects for specific customer groups where the framed design thinking process is tested. A company-specific language for the process will be explored.

<table>
<thead>
<tr>
<th>Target for development</th>
<th>Research question /research contribution</th>
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<tbody>
<tr>
<td>Research part of the thesis</td>
<td>Frame and test a design thinking process for the case company</td>
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<tr>
<td></td>
<td>How can design thinking be used for gathering customer insight and defining solutions in innovation process?</td>
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<td>How can service-dominant logic be applied in front-end of innovation to change the company’s mindset to a more customer-centric one.</td>
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<td>FEI project</td>
<td>Reframe the front end of innovation process</td>
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<td>How to combine design thinking process to a company’s FEI process?</td>
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<td>Pilot project 1,</td>
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<td>Pilot project 2,</td>
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<td></td>
<td>Testing of the way of working (design thinking process) in a real project. Is the process working in this environment?</td>
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Table 1: Research and development contributions of the thesis and the projects related to it.
1.2 Case company and the context of the thesis

The company to which the thesis was made for is a multinational, traditional manufacturing company. By traditional I mean that the company has long roots since it was established in the 19th century and it has a mindset from the goods-dominant logic. There are altogether 3000 employees in the company and the revenue was close to 600 million euros in 2017. The case company operates mostly in Europe and Asia. It is a market leader in its central operation countries and has strong brands. The industry is also traditional and new innovations generally occur when raw material suppliers have something new to show.

The company produces products that are sold to mostly retailers who then sell the products to consumers or professional customers. Part of the products go straight to industry customers. The company’s revenue has been decreasing steadily and restructuring for meeting targets has been made. The need for change has been recognized and one of the key changes will be focusing on needs instead of products in customer dialogue. Goals for the company are to be a customer experience focused expert and offer more solutions, not only products.

The company has recognized four main megatrends that drive their business. Urbanization has been a megatrend for a while and for this company it means that certain products are sold less than before and some more than before. It can also mean that the emphasis will shift from consumer business more towards the professional segment. Growing middle class may influence in sales volumes if the company can take an advantage of it and listen to the real needs of the consumers and professional customer’s customers.

As an old and traditional manufacturing company, digitalization is enabling a lot of development in internal processes but also in solution offering and user experience. The company is targeting to development of digital services and since it is not part of its core competences, the company needs to understand the customer needs well enough to be able to offer profitable offerings. The last of the four driving megatrends, climate change, sets new requirements for the products. Durability issues come into play. Warmer summers and radical changes in weather may cause problems with the use of the products, so new innovations are needed.

The environment, market and the company itself change and there is a need for a process that will enable customer need-based ideation, business and concept development. Offering solutions and digital services require working models that will make successful development possible. The front end of innovation is the most crucial part as it is the part where the customer’s needs are realized and translated to offerings.

Even though innovation can be done and initiated by all the people working in the case company, FEI in this context is focusing on the company’s Offering function’s tasks. It is because there is a need to define the process especially to product and service innovation.
development and not so much to other kind of innovation, such as process development etc. The Offering function is divided into marketing, research and development (R&D) and product and portfolio management departments. The FEI process has been defined previously in 2013 but during this research, it was redefined.

FEI of products and services has some connections to other parts of the organization and it would be good to include more people to gather all the potential from inside and outside the firm. Nevertheless, this thesis will mostly concentrate on the Offering function’s processes but in some parts also include people from other functions such as sales or customer service.

The people in the offering function mostly have some level of university degrees from for example engineering, chemistry, marketing or business. The careers in the company are long which means that many people also in offering have been working in the company for more than 30 years. This may cause some change resistance since people are very rooted to the ways things have been done in the past.

The FEI process includes gathering ideas, prioritization, evaluation and defining them until a business case document is ready and evaluated by the offering management team. The business case document defines the development project and evaluates the benefits and costs of it. The process merges with product and service innovation process that was recently defined in the company. It starts from a business case and continues to the launch of a new product or service. The bigger process is a traditional stage-gate process that includes activities and gates as decision points for getting a project further. It also indicates who is responsible for each activity and decision in the process.

In the case company there has not been a clear process of how to do feasibility studies for finding out more about an idea in an effective and systematic way especially related to finding information related to markets and customer needs. Studies for new product ideas have been normally conducted by research and development department (R&D) as benchmarking existing competitor products and then combining internal knowledge of the subject. Service or solution ideas have been handled in different ways since there is no clear responsibility nor defined process for them.

Since now, a product manager has been making a brief with help of R&D. Then R&D has studied the subject and it has been decided if the project can be started. Basically, it has been figured out if it is chemically possible to make such a new product and different technical specifications for being able to write the final brief.

In addition to the technical study, in some cases, there has been a larger pre-study made. This pre-study has included a market study to find out what other companies are doing in regards of the topic at hand. This information has been then used for making the final plan,
financial calculations and decision making where it is decided whether to start the development project or not. The front-end of innovation process for products seems to be clearer in the company than the process for service innovations. In my opinion it would be good to combine products and services in the same process and make a change in the mindset when idea- ting for new innovations for helping the customers.

The idea of using design thinking in the case company is based on value co-creation. When the customers are understood better within the company, the value co-creation is better. In service-dominant logic and thus in this thesis the value co-creation is about resource integration. The actors, firm and a customer, both use their knowledge and skills to create value. In the case company the target is also to increase the co-operation between functions and this way value co-creation can be better also when using processes such as the FEI. Only if the processes are used with a proper knowledge and understanding, there is value in the use of them.

1.3 Structure of the thesis

The thesis is divided into 5 chapters. The first chapter is about the background for the whole thesis: what were the objectives of the study and what kind of case company was in the center of it. The second chapter is introducing the theoretical base for the thesis. It will explain the service-dominant logic and its fundamental premises. The front-end of innovation literature will be presented and what is affecting to the success of the FEI process. Lastly the chapter presents design thinking and service design process and their differences.

The third chapter of the thesis is dedicated to the thesis process and the used methods. First, I will present the process on general level and explain what methods and tools I used and why. I will introduce the used process in detail along the whole chapter, the process steps of the thesis: insight gathering, process description, testing the process in the pilot projects and analysis. I will explain what I did in each phase of the process and how the pilot projects and FEI development project were organized.

In the fourth chapter I will share the results of the thesis. How the design thinking process was defined after the testing and how it can be incorporated in the case company’s FEI process. The last chapter is about conclusions where I will share my thoughts about how to take this subject further in the case company and how it contributes to the research on the field. In the last chapter I also evaluate the work and used methods.
Some parts of the thesis were done by me (research part) but the pilot and FEI projects were done in project teams. When I write in a form that “I” have done something, I was acting on my own or the issue at hand is my own thinking. When I write “we”, I mean that the activity or thinking was done by a team, usually the project team of a project that is under discussion.
2 Theoretical framework

The theoretical framework is built on service dominant logic. I will explain what front end of innovation is and how design thinking and service design can be used in product and service development. I will also shortly describe how the project model used by the company, state-gate model, could be used in combination with other kinds of process models such as design thinking.

2.1 Value creation in different logics

Service-dominant view of service is different than that of the G-D logic that separates service innovation and product innovation from each other. In S-D logic products are mechanisms or tools to delivering service. (Lusch and Nambisan 2015, 156) In S-D logic the resources are divided to operant and operand resources. Operant resources are skills and knowledge whereas operand skills are tangible assets, such as raw materials and production machines. Based on S-D logic all actors in the economy, firms, customers, organizations etc., are resource integrators. For gaining value, all resources need to be combined with other resources. (Lusch and Nambisan 2015, 160). Thus, also innovations are results of combining resources. In today’s business world where human resources are cut, and savings are made constantly, it seems that the operand resources are dominating the decision making over the operant resources.

Service-dominant logic has 10 fundamental premises of which 4 are the main axioms of the logic. (Vargo and Lusch 2004, 1-17)

Axiom 1 and FP 1: “Service is the fundamental basis of exchange”.

People have physical and mental skills that can be exchanged with other people. Those skills can be used to make goods but still the skill is what is being exchanged. Performance of the specialized activities - a service is being exchanged.

FP2: “Indirect exchange masks the fundamental basis of exchange”.

Using money and selling goods looks like selling goods for money but as S-D logic sees it, we are still exchanging services. Money and goods are only intermediates in exchange. When a person uses money to pay for services the money is enabling the service seller to buy other services.

FP3: “Goods are distribution mechanisms for service provision”.

People use natural resources to make tools that they use to deliver service. The value of a product doesn’t come from only owning it but also using it, the service the product provides.

FP4: “Operant resources are the fundamental source of competitive advantage”.

Operant resources, skills and knowledge enable the use of goods and natural resources (operant resources). Without skills and knowledge to use resources, they would be useless. Actors’ jobs-to-be-done are changing constantly and operant resources are needed to change the offering according to those changes.

FP5: “All economies are service economies”.

All eras (hunter-gatherer, information etc.) are based on service exchange.

Axiom 2 and FP6: the customer is always a cocreator of value.

The value of a good or service depends on the user and not only on the product itself. It depends on what kind of service is needed by the user. Thus, the customer is always a cocreator of value.

FP7: “The enterprise cannot deliver value but can only offer value propositions”.

Because the value is co-created with the beneficiary, the firm cannot deliver value. It can only offer value propositions, invitations to engage with the firm for benefit.

FP8: “A service-centered view is inherently customer oriented and relational”.

Activities of exchange are combined, over time to co-create value. The firm creates value together with the customer.

Axiom 3 and FP9: “All economic and social actors are resource integrators”.

Resource integration happens when someone creates resources by combining other resources. Resources can be something that can be bought, things that are exchanged in social networks or public resources. This way all actors are resource integrators. All the actors are co-creating value in the large system.

Axiom 4 and FP 10: “Value is always uniquely and phenomenologically determined by the beneficiary”.

Every time the service is exchanged, the experience is different.

The basis of S-D logic is that value is co-created collaboratively. Consequently, dialogues and conversation enhance effectiveness of service offerings. S-D logic is about applying resources
for the benefit of others. When collaborating more and in a better way, actors understand what the customer needs are and give better value propositions. Collaboration’s role is vital for service exchange since the service network is everywhere and drives collaboration. Enterprises can take advantage of networks and connectivity by organizing communities for their beneficiaries and this way co-create the firm’s value propositions. (Lusch and Vargo 2014, 57-59)

To transform a company to service-dominant one, it needs to have a transparent and symmetric information exchange process and develop customer relationships with a long-term view. It should also think of goods as channels for exchanging operant resources and invest in skills and knowledge that are the basis for economic growth. (Lusch and Vargo 2006, 415). The perspective needs to change in processes, roles and methods and the focus has to be in the human-centered innovation and not so much on the technology. (Sebastiani and Paiola 2010, 90) Using design thinking is a good start to the change.

Sandström et al. describes the link between service experience and value in use in figure 1. The physical and technical enablers of product or service allow value propositions that can be either functional (this drill will help you drill a hole in the wall) or emotional (you will feel great after drilling because you accomplished something). For each person and each situation, the real outcome can be very different, and the value is co-created between a company and a customer. Service experience is the sum of the functional and emotional outcomes of the service. Value is determined by the user during the usage of a service and cannot be predefined by the provider company. (Sandström et al. 2008, 117-121)

Figure 1: Service experience can be linked to value in use like in this framework. (Sandström et al. 2008, 121)
In addition to service-dominant logic, there are other business logics that focus on customer value creation: Customer-dominant logic by Heinonen et al. (2010) and Service logic by Grönroos (2011). Service logic takes service-dominant logic discussion further by stating that customer’s value-in-use defines value creation. Other actions by the company are only supporting the value creation, still leaving a possibility to the producer to take part in the value creation and benefit from it. (Grönroos 2011, 296)

In comparison to service-dominant logic customer-dominant logic contrasts the provider-dominant logics (goods- and service-dominant logics) to customer-dominant logic and guides to understand customer’s experience of service in their own context. By understanding the customer’s logic to experience value and fulfil tasks customer-dominant logic may help companies in supporting the value creation. (Mickelsson et al., 2010, 531). All of these three logics discuss about the same issues, customer-centricity in value creation and value co-creation.

Companies lack tools and knowhow for implementing business logics that focus on customer value (Ojasalo and Ojasalo 2015, 310) and in this thesis the use of design thinking is tested as a tool to help with that transformation. The transition from producing products to producing services in the manufacturing industries should be separated from the transition from goods-dominant to service-dominant logic which is more about the perspective of the company towards value creation (Kowalkowski 2010, 288). I will concentrate on the latter.

2.2 Service design in innovation and FEI

The world is changing rapidly whether we want it or not. Companies and other organizations feel the pressure of developing new ways of helping customers with new or improved products and services. Big successful companies such as Google or Amazon lead the way for innovation by doing things in new ways. Sometimes innovation needs boldness, sometimes small changes are enough to keep companies alive.

When talking about FEI we need to understand what the word “innovation” stands for. Nonaka et al. describes that "Innovation is where the worlds of business and creativity meet to create new value. It really is as simple as that. Indeed, one definition of innovation is ‘the creation of new value’" (Nonaka et al. 2018, 7). The key word here is definitely “value” since many times people talk about innovations when they mean ideas. Simply, innovations are implemented ideas that create value.

According to service-dominant logic innovation is integration of resources, such as knowledge and skills (Lusch and Vargo 2014). This view is quite broad and comprehends both the
innovation activities and organizational attributes. The organizational attributes have been formed by using resources and thus using those further to make innovations is also integration of resources. Innovation-related skills are used when conducting innovation activities.

Often, innovation is divided to radical and incremental innovations. Booz, Allen and Hamilton have defined that incremental activities are for instance cost reductions, product line improvements or efforts of repositioning (Booz et al. 1982). It relies on a thorough understanding of the markets (Koen et al. 2014b, 34). Radical activities can be defined as additions or extensions to product lines, new product lines or totally new products (Booz et al. 1982). A thorough and understandable business plan is critical for radical innovations because if the concept is not formulated well, it can hinder the development fundamentally. Companies who understand both new and current markets are more likely to succeed in radical innovation. (Koen et al. 2014b, 31-32) Service design that is used in this thesis can help in formulating concepts and business plans and this is one way of how the FEI process of the case company may be improved by this thesis.

Innovation should be integrated across the whole company and design thinking can help with that (Lockwood 2007, 95). The remarks that innovation process should be self-regulating, evidence-based and should not have too much bureaucracy (Nonaka et al. 2018, 27) can be accomplished by using design thinking that includes strong teamwork based on evidence gained with customer understanding. Measuring the value of innovation is very important because it can change the attitudes towards innovation from creative and artistic to be more scientific (Lockwood 2007, 95).

The roots of the innovation division to two knowledge sources, market pull and technology push are from Dosi (Dosi 1982, 147-149). Dell’Era et al. adds the design push as an additional approach to get new innovations. Here, the drivers for innovation are the new product meanings and ability to understand and anticipate them. Each product has a value and meaning to the customers that can be communicated with them. (Dell’Era et al. 2010, 14)

Dell’Era et al. described radical design driven innovations so that they combine the new technologies with the understanding of innovative meanings. The illustration of this can be seen in Figure 2. Incremental design driven innovations can be created when acting only on the semantic dimension. (Dell’Era et al. 2010, 22) This kind of differences are important to understand when communicating about design and where and why to use it in companies.
Figure 2: By combining identification of innovative meanings of new products and research of new technologies companies can create radical design driven innovations. (Dell’Era et al. 2010, 22)

Innovation process may include three sections. It starts with the front-end of innovation process, continues with the new product development process and ends with commercialization. (Koen et al. 2014a 34). The Front-end part of innovation process is often presented as a funnel that starts from an idea or problem identification, proceeds with idea enrichment and ends with a concept description while being often very unstructured and nonlinear (Koen et al. 2001, 49, 2014b, 25). It is the most critical part of the innovation process considering strategy and decisions, judging which projects are to be implemented and which are not (Koen et al. 2014a, 34; Poskela and Martinsuo 2009, 672).

Calabretta and Gemser (2015) argue that there are three key challenges in FEI: innovation problem definition, uncertainty reduction by information management and stakeholder commitment. Design methods can help with these challenges. (Calabretta and Gemser 2015, 105) Also in the case company these are realized challenges. Traditionally in the case company the
innovation process starts from an idea and it is not thought much further what the problem behind the idea is and is it even a valid problem. The information flow between people related to innovations and ideas is not very effective and causes a lot of uncertainty during innovation projects. Sometimes poor stakeholder commitment in FEI is noticeable in the activity of decision makers in the idea management tool of the case company.

The decisions and choices made in the front-end phase are critical in a sense that they should be made having the best interests of the company and long-term strategic goals in mind (Piskela and Martinsuo 2009, 2). Only one third of the innovation performance comes from innovation activities and more than half are constructed from organizational attributes such as strategy, vision, culture and senior management involvement (Koen et al. 2014a, 40). These organizational attributes affect exactly the decision making and thus have a bigger impact on the company performance.

2.3 Design Thinking in innovation

The word design thinking was first used in 1987 when Peter Rowe used it in architecture design context (Liedtka 2015, 926). Later, and more related to business management, Innovation consulting company IDEO started to develop and use it (Kelley and Littman 2005). At that time people thought about design as a visual finishing step of a product development project. (Nonaka et al. 2018, 10) Nowadays design thinking is used in product and service development, business development and even strategy creation (Curedale 2013, 13).

In 2008 Tim Brown wrote an article about design thinking in Harvard Business Review. His description for design thinking is:

“it is a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity” (Brown 2008, 86).

It opens well the point of design thinking and its many-sidedness.

Based on design theory the design process is problem-centered, nonlinear and has a presence of uncertainty and choice (Liedtka 2015, 926). Design thinking uses the same theory base. Additionally, design thinking is about collaborative creativity that is qualitatively oriented. It is becoming a basic skillset in corporate world. An important factor differentiating design thinking from the other managerial ways of doing is the interest towards the problem. The process is driven by hypothesis and it relies on iteration, and learning through experimentation. (Liedtka 2015, 927; Nonaka et al. 2018, 10-11)
The power of design thinking is to large extent coming from collaborative approach. By developing innovations with customers in design thinking, it is possible to gain deeper knowledge about the customers and end-user needs, lower marketing costs since the testing is done with customers, decrease risk of innovation since the end result will fit the needs of the market better and increase trust with improved relationships (Nonaka et al. 2018, 120). The decreasing of innovation risk was one of the main arguments why the case company wanted to use design thinking but also the customer understanding is important and can be seen in the company strategy.

Design Thinking can make any company more human-centered and user-driven if it is used well. It helps in solving problems and creating new value from innovation. Thus, today, more and more companies are trusting design as their improvement in the field of innovation. (Brown 2008, 84) Bringing the tools and methods to the employees is not enough but the new way of doing and thinking must be aligned to the company culture. (Suciu and Baughn 2016, 787)

At first people need to understand why the change is needed, there needs to be a story or common vision. The employee commitment needs to be supported by empowered teams with capability and authority to make the change happen. (Kim and Mauborgne 2014) Design thinking practices could also be used to make the organizational change from traditional to design thinking ways of working but that is not the topic of this thesis.

2.4 Value from service design

Service design helps in innovation and improvement of existing services and experiences by multidisciplinary and holistic view (Moritz 2015, 7). In today’s world where people can buy goods and services from anywhere in the world, customer experiences become even more important. With service design all the layers around the basic item, such as delivery, can be made better and enjoyable for the customer. This leads for example to good reviews in social media and that way to more sales. (Stickdorn et al. 2018a, 1-9)

Service design is an approach to make meaningful innovations and when introducing it to an organization it is necessary to understand the value of embedding it to organization practices. Thomas Lockwood has described the measurable value of design. Purchase preferences can be changed when by using design the product meanings can be made clearer to the customer. Consequently the value of design could be measured with the attributes that affect sales. (Lockwood 2007, 92) After the pilot projects made for this thesis the case company will have examples of the value that can be achieved by using design thinking. The value may not be
measurable yet at that point but if the innovation projects are done well to the end, hope-
fully we will see good value.

In addition, service design can bring value by improving the development processes and time
to market. It can also create value by creating return on investment and savings, improving
usability, building brand image and organization’s reputation, enabling strategy for entering
new markets and helping to create intellectual property. Service design can also be an ena-
bler of product and service innovation. (Lockwood 2007, 91)

To be able to understand and use the concept of service design there are many kinds of pro-
cess pictures available. The processes are all somewhat similar to each other. Different meth-
ods enable us to apply service design in variable situations. The methods can be used and
mixed in different phases of the process. In the chapter 2.4.2 I will introduce the methods
that I used in different phases of the work.

2.4.1 Distinction between design thinking and service design

It is challenging to determine how design thinking and service design differ because the words
are mixing, and they are used in different ways by different researchers and managers. Po-
laine et al. explains that Design thinking is more about doing and service design is planning
(Polaine et al., 2013). Mark Stickdorn thinks that it doesn’t matter anymore what the differ-
ence is because people use them in many ways. If we work with any of these, we should
understand what we are doing. Consequently, he nowadays talks about service design thinking.

In my mind design thinking is part of service design but it is maybe more precise and made
more attractive for the business world by the management consultants. The case company
wants to use design thinking in their innovation work. Thus, I will use the word “design think-
ning” in my thesis when describing the new process to be used and tested in the pilot projects.
In my empirical research I will use a service design process to gather information, define a
new process and test it.

2.4.2 Service design and design thinking processes

In the service design field there are many different visualizations of the service design pro-
cess. The different models are all different and cannot be put in order of which one is best or
worse. Nevertheless, they help us understand the basics of service design. Each designer can
develop their own preferable model to work with. (Stickdorn et al. 2018a, 90) Each project
starts differently, and all methods and process pictures will not fit to every project. All of
them need to be thought separately and the processes applied according to the project (Polaine et al. 2013, 48)

According to Yu (Yu 2017, 28) they are all based on a double diamond model (4 D model) that is a general design process developed by UK Design Council (2005). The model is based on two simple diamonds that describe divergent and convergent stages of the process. (Tschimmel 2012, 9) The double diamond model is the one that is used in this thesis, so I will present that one in more detail. Figure 3 shows the basic double diamond model.

![Double Diamond Model](image)

**Figure 3**: Double diamond model. A modification of the original model developed by UK Design Council (2005).

The first divergent part of the double diamond process describes the discovery phase where the designers are searching for new opportunities, market trends and customer insights or some other information (Stickdorn et al. 2018a, 85-90). In this phase the definition of the problem, user need or opportunity and boundaries for the solution are starting to form. Both qualitative and quantitative research methods can be used. (Design Council and Technology Strategy Board n.d., 8)

In the second, Define, phase the information is processed and analysed, filtered and selected. The result is actionable tasks in a form of problem statements, that are formed from the selected opportunities, needs or problems. They are also aligned with the needs and business objectives of the organization. (Design Council and Technology Strategy Board n.d., 7)

The next stage, Develop, is about solution generation, development, iteration and testing. Through an iterative process the solution is defined, prototyped and tested with customers as many times as needed for it to be ready for implementation. (Design Council and Technology Strategy Board n.d., 7)
Strategy Board n.d., 9; Stigliani and Fayard, 2010) The idea is to try and learn to improve the ideas (Design Counsil and Technology Strategy Board n.d., 7).

Finally at the end of the process there is the delivery phase where the final concept is tested, produced and launched (Tschimmel 2012, 9-10). This is when the offering starts to address the defined needs from the discovery phase. This is also a good time to gather feedback from the offering and also the design process itself. (Design Counsil and Technology Strategy Board n.d., 9)

I chose to use the double diamond model because it is quite open and abstract. I could easily fit my research design to it and use it for making my own understanding about the process broader. For the case company design thinking process creation, I used the double diamond first to understand which parts of the process should be emphasized in the process, which parts were less obvious to the people working in the case company. According to these findings I drew a new process that was then tested in the pilot projects.

2.5 Combining traditional and new process models in innovation

As can be understood from the previous chapters, service design process is not an innovation process and cannot be used straight in its original form in the innovation process. The value from service design can be discovered only when the innovation process is linked to it. This way its role can be very ground-breaking and meaningful to the company. (Yu 2017, 37)

To make the innovation process and the design process in an organization work together, the design activities and methods must be described in a way that they fit with the innovation process. This way the new service design process may include also organizational activities in addition to the design activities. This kind of work is important to demonstrate and communicate service design as an approved and accepted approach and not only some separate activities. It would be important also to introduce these activities to the service implementation phase of projects. (Yu 2017, 35)

In this thesis I will concentrate on the front end of innovation process that is linked to a larger stage-gate process of product and service innovation. Also, the FEI process will probably be described with a stage-gate model, even if the nature of it is not linear. There is not much literature describing the combination of stage-gate model with design thinking even though design thinking itself has been studied a lot in different organizations. Design thinking can be used not only in the front-end but also in the development phase of a product or service. With design thinking, the product development phase and FEI activities may not have a clear starting and ending since the prototypes are already made and tested before the business case is made.
The world is changing, and the processes should take that into account. For example, social media, new digital technologies and other changes in the markets are important to consider. Alam (2014) suggests that a service development process model where phases are overlapping with each other, is informal and shorter than the traditional stage-gate model. (Alam 2014, 644) Cooper et al. (2015) has studied agile-stage-gate hybrid models to consider the rapidly changing world in the innovation process. There is not much literature of hybrid models with stage-gate and design thinking even though design thinking has been used and studied in manufacturing companies that probably have innovation processes that have been based on stage-gate model.

Leading manufacturing firms have started to combine iterative methods such as Agile method to their stage-gate processes of physical products. (Cooper 2016, 21) Iterative cycles and collaboration with external parties that are needed in today’s product development are not supported by the stage-gate process (Sommer et al. 2015, 34). Robert Cooper and Sommer et al. found that Agile and stage-gate hybrid models can be feasible and produce good results when used in traditional manufacturing of products (Cooper 2016, 28; Sommer et al. 2015, 43). Usually agile methods are used in the development and testing phases of the innovation process. (Cooper 2016, 28)

The traditional stage-gate model is fixed on the basis of the scope, (see Figure 4). The product development knows what is to be made but the budget and schedule can change along the way. In agile the budget and time can be fixed in the beginning, but the scope and product features are determined during the project based on customer insights, feedback and needs. Using these methods, that are new to product development, can create efficiency to the process considering the time and budget. This kind of processes are adaptive to planning, the delivery is evolutionary as they are iterative methods. They are also flexible towards change. (Cooper 2016, 22) Design thinking that is used in this thesis is similar to agile with these aspects.
Stage-gate process is about macroplanning and shows how the over-all steps in the process should go (Cooper 2016, 22). Each project manager can then decide how to organize and plan each project in detail (Sommer et al. 2015, 43). Agile is a microplanning and project management methodology.

In the case company the stage-gate model includes steps and decision points (gates) from idea gathering to launch of a product or service. It includes the different responsible parties from different functions of the company. The responsibilities are divided so that usually in one stage only one function is responsible for the actions, so even though the process is cross-functional the actions are not done together but one after another. The stage-gate model is like a guide for how to play (Cooper 2016, 22).

Stage-gate supports also in the decision making for what projects should be done and what should not. In each gate there is a decision made for the usable resources for the next stage. Projects can be compared and resources funnelled to the most promising projects. (Cooper 2016, 22) Despite the positive results in implementing these agile-stage-gate hybrids Cooper and Sommer (2018) found challenges in the implementation. Management skepticism should be addressed, finding resources to lead dedicated teams and making decent product definitions and development plans. (Cooper and Sommer 2018, 17)

The challenges in FEI and agile-stage-gate hybrids are human-centric. Management commitment and semantic issues are high in the list in the literature (Calabretta and Gemser, 2015; Cooper and Sommer, 2018). Opportunities and products and plans should be described better.
The management should be kept interested and informed. Design thinking combines the semantic and technological layers in innovation (Dell’Era et al., 2010) and it could help in solving the challenges.

2.6 Conclusions from the theory

The themes from the theory relate to each other (Figure 5). Innovation can be done both with goods or service-dominant logic. FEI is only a part of innovation process. Service design and design thinking can be used also in other issues than in innovation and FEI, but they are usually more based on service dominant logic than goods-dominant logic. Stage-gate is hard to place in this figure because I think that it does not argue towards S-D or G-D logics on its own. The determinative point is what a stage-gate model includes. The roots of stage-gate are in the 1950’s (Wikipedia, phase-gate process) when the manufacturing industries were strongly based on goods-dominant logic, so I placed it on that side.

Figure 5: How the theory aspects of the thesis relate to each other.

The bases for the change in the case company comes from service-dominant logic. The principles and mindset will guide the way of developing the case company’s front-end of innovation process. In this chapter I explored FEI literature and through that I went to design thinking and service design in product and service development. Figure 6 visualizes the theory framework and how it is related to the research part of the thesis.
Figure 6: The theory framework of the thesis. Service-dominant logic serves as a base for FEI development through design thinking and service design. Finally, that affects on the company FEI process.
3 Research and development process and methods

In this chapter I will describe the research and development process and explain the methods I have used in this thesis and why I chose to use them. After describing the process on a general level, I will explain the most important methods used in the pilot projects and the case study in more detail for sharing how they are generally used and why. Then I will tell why I used case study research and describe the actions and methods used in different process steps in more detail. Lastly, in the chapter 3.7 I will share the detailed description about the FEI project and the actions and methods that were used in it. I report this project separately to ease the understanding.

3.1 Research and development process

I used a modified service design process in the case study. Design Council’s double diamond model (2005) that I have applied in this case study divides the process into four steps: discover, define, develop and deliver. In Figure 7 I have drawn the process so that the Discover: gathering needs and Define: planning the new process are smaller than the other two process steps because the second diamond is emphasized in the case study research.

Figure 7: The research part of the thesis applied to the double diamond service design process. The first diamond is drawn smaller because the emphasis of this thesis is put to the second diamond.

In the discover phase, I looked for understanding of the current process to understand what kind of development projects design thinking could be used in and what actions are currently included in the normal way of working and what are not. I gained a lot of understanding of how the innovation process is currently working but I was not collecting actual research data. In the FEI project we gathered a lot of information in this phase related to the current FEI process.
The define phase, of the thesis process was to plan the design thinking process that could be used in the company. In FEI project we analysed the gathered data from the previous step and defined what kind of challenges there are in the current way of working. At this phase I was also considering how the design thinking process could fit to the other processes such as FEI and the rest of the product and service innovation process.

The defined design thinking process was tested in two pilot projects, during which I was observing the work while participating in the projects myself. I guided the projects according to the process to be able to use it in the intended way. It took many meetings to explain all the steps and value from them to the stakeholders. There were a lot of questions concerning the way of working and the reasons behind them. I will share more of them in the analysis chapter (Chapter 4).

After testing the process in the pilot projects, still in develop phase, I made 6 interviews for the project participants and other case company stakeholders to find out how the process prototype should be changed according to the case company needs. I also gathered feedback from all the workshops that I was facilitating to find out fresh thoughts after them. In this phase we also had a FEI project workshops for finding out what the FEI project should include to address the challenges of the current process.

The final phase of the thesis was to analyse the findings from the project outputs, observations and interviews. I made changes to the design thinking process according to the results and made a visualization of the new process description. The schedule for the thesis is shown in Table 2 which shows that the work for defining the process started already in 2017. All the information for the analysis was gained before the quarter 4 of 2018.

In deliver phase I also made the design thinking process fit with the total FEI process. A proper description of the process was made. It includes the process steps, roles, suggested methods and time schedule for each project where design thinking will be used. The description will not be presented in its full form in this thesis.

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Table 2: A schedule for the actions related to the thesis in the case company.
3.2 Service design methods

In diverse problems and projects there is a need to use different methods, or ways to work, to meet the targets. Visualization is seen as one of the main components of service design. (Segelström, 2013, 42.) Visualizations make complicated topics tangible and easier to talk about, they serve as boundary objects that help people from different parts of the organization to talk about complex things while understanding each other (Stickdorn et al. 2018a, 43).

A good example of a visual method used in this thesis is journey mapping.

There are three main motivations to visualize during a service design project according to Segelström: To communicate with the design team, to communicate insights outside your team and to remember the users and to stay inspired by them (Segelström 2013, 66). I have used for example a video and prototypes for communicating with the design team. Visualizations of customer’s processes and visual power point presentations were used to make people outside the design team to understand the gathered insights. Pictures of the customers and video material were used for remembering the users and staying inspired by them. One of the top reasons to use service design methods is also the empathy, deep understanding of the life, experiences and situation of the customers/users (Kouprie and Sleeswijk Visser 2009, 440).

3.2.1 Service design methods for gathering information

In the beginning of a service design process there is a need to understand people’s motivations and behaviour. The goal is to gather insight that will improve the outcome of the ongoing design project. (Polaine et al. 2013, 48) In research or discover phase there are different kinds of methods available to help with that. In later steps in service design process, the same research methods can be helpful as well. The methods can be quick desktop works or then for example user or customer interviews. (Stickdorn et al. 2018a, 97.) Many research methods in service design are borrowed from for example UX design, human-centered design or ethnography (Polaine et al. 2013, 48-50).

Preparatory research is done in the beginning of a design project. It can include web searches for finding out something more about the research questions on the customer’s point of view. The search can be for example about competitors, customer views, companies or key words. It can also have small workshops with any stakeholders to understand different perspectives you have to take into account in your research. The preparatory research is a good method for finding out the right questions for your total research. (Stickdorn et al., 2018b, 6.)

To prepare for the preparatory research one needs to define the research question. The research itself should be documented well so that the information can be found and viewed.
again later. The trustworthiness and how current the information is, should be evaluated during the research as well. A good summary can be used as hypothesis and assumptions for your research. (Stickdorn et al., 2018b, 7.)

Secondary research is about finding data that is gathered for some other purposes. The data can be qualitative or quantitative and it can be from internal or external sources. This kind of desktop research should always be the start of a design project. It ensures that the time is not used for something that is already done. The process for the secondary research goes similarly than the process of preparatory research. (Stickdorn et al. 2018b, 8)

In this thesis I looked for information related to customer centricity from the company materials and strategy to understand the importance of the projects to the company before doing any interviews. For FEI project the project team got familiar with the previous documentation related to the FEI process of the case company. Also, some unofficial desk research about FEI in general was made by searches in the Internet. In the pilot projects we did some information gathering online about the topics to know if other companies have considered the same topics.

3.2.2 Interviewing methods

A good way of gaining empathy towards users, customers or stakeholders, understanding their environment, needs, attitudes, experiences, processes, emotions and expectations is deep interviews (Stickdorn et al. 2018a, 122). When we discuss about interviews in service design the objective is learning something new, we are not focusing on shallow information (Portigal 2013, 3). From small amount of deep user interviews we get qualitative insights about what people say (Portigal 2013, 7-8). In my research I used interviews in addition to observations, so that I could understand both angles, what people say and what they do.

A light version for insight gathering could be to organize around five customer deep interviews of about 45 minutes and make a summary of the main insights. A proper time for deep interviews would be two to three hours. (Polaine et al. 2013, 48-52) In this thesis all interviews were 45 to 90 minutes long depending on how much the interviewee was talking and willing to tell us about the subject at hand.

Deep interviews are often conducted face to face because it is easier to create a cosy atmosphere and it is possible for the interviewer to interpret also the body language of the interviewee (Stickdorn et al. 2018a, 122). Also the interviewee’s own home or workplace would be beneficial for the interview, depending on the topic we are concentrating on (Polaine et al. 2013, 51).
Interviews are often semi-structured so there is no strict guide for how to conduct them. Usually there is a theme to guide the way. (Polaine et al. 2013, 50) One could ask other project members to join the interviews but they should not correct the interviewee’s wrong knowledge during the interview for not misleading the results (Polaine et al. 2013, 51).

Portigal suggests that two or three people go to the interviews together with the participant. What he teaches is important is that one person is the lead interviewer and others listen and participate actively in other ways, like body language. The questions should be open-ended so that they are not guiding the interviewee and so that he can appear as the expert. (Portigal 2013, 69)

The process for interviews starts with recruiting the interviewees. Secondly, you need to know what you will be asking about in the interview, so research needs to be done. It is better to be a little naïve and ask and not get stuck with false assumptions (Polaine et al. 2013, 54; Portigal 2013, 18). Even if you ask a stupid question, you can get notably deeper answer as well (Portigal 2013, 19).

During deep interviews we can use creative activities such as card sorting of any boundary objects like mind maps or pictures to get deeper into the subject. We will need to plan them too. (Stickdorn et al. 2018a, 122) After interviews it is important to analyse the gathered information systematically. What does the insight mean for the industry or strategically to the organization? (Polaine et al. 2013, 49)

Designers empathic abilities can improve by training and practical experience. Willingness of a team member is also determining the level of empathy and understanding of the customers. The willingness can be about emotional state, commitment to the project or personal interest to the users. (Kouprie and Sleeswijk Visser 2009, 139) Team members need to empathize by themselves but talking about the insights in a workshop helps them make connections that help the understanding. (Kouprie and Sleeswijk Visser 2009, 139)

I chose to use interviews as the main data source from the research part of the thesis because I wanted to be able to understand why people thought in a certain way and in an interview, I could ask that. Also, in both pilot projects interviews were the main source of new information when understanding customers worlds and needs. When we were interested in a larger topic, it was important to find the connections between the topic and the interviewees lives.

In FEI project we used a survey to gather information from the case company people. It was an effective way to find out a bit of the current situation of the FEI from a larger amount of people. In survey one cannot change the questions along the way, but the answers will be for the same questions. In semi structured interviews the target is to learn and understand from
the interviewees where as in the survey the target is to see a full view on the chosen questions.

3.2.3 Observation methods

Observation is a way of collecting data in qualitative or quantitative research. It is systematic way of following an interaction or phenomenon as it takes place. When the interaction in a group is the target of investigations, for example, observation is the best suited method to use. Observation is good when the studied individuals are unable to provide objective information or the study is in particular about behaviour. (Kumar 2014, 173)

There are two observation methods, participant observation and non-participant observation. In participant observation, the researcher collects information while (s)he interacts with people in their everyday contexts. One can investigate deep, rich and diverse experiences, behaviour, feelings, thoughts and meanings of people with this method. (Jorgensen 2015, 1) The researcher is acting like a group member and is being observed as well. In non-participant observation the researcher does not get involved in the activities of the group but is watching from the side. (Kumar 2014, 173–174).

In observation in qualitative research, narrative recording of data is often used. The researcher is making notes. A problem here is that the researcher may be biased and chooses what (s)he writes based on the bias. Video recordings may be used in observation as well. The positive aspect of this is that the researcher can see the video many times and ask also other researchers view it to get other interpretations of it. (Kumar 2014, 173-175)

We used participant observation in the pilot project 2 as we were helping a customer (a small company owner) in his work and getting to know his world for one day. This way we could have a real look on a customer’s life and learn more than by only interviewing him. I wore a video camera in my helmet and recorded the environment and conversations. I wanted to share the real atmosphere from the day with the other project participants and not only tell with my own words, that’s why I chose to use the camera. He agreed that the video can be shown to the project team members for thinking about new solutions for his kind of customers. Later, I edited the video to make a short and condensed sharing of the information for others to understand more from it too.

As I was participating the project team meetings and workshops of the pilot projects, I wrote down some observations about the participants’ understanding of the design thinking process and for example questions about the work. My note taking was not systematic. Anyway, it was very good to be part of these pilot projects to really understand what happened and how people reacted to different situations. This way I could realize how these projects affected their
other work load and so on. Even though this was not a systematic approach, I could call it participant observation.

3.2.4 Co-creative workshops

Co-design is used many times as a buzz word but can be beneficial when the team defines the goals for the service design project and align the co-creative activities, and the benefits from the co-design, to those goals. Co-design is defined to mean the co-creation during the design process. (Steen et al. 2011, 53) User workshops are sometimes better than focus groups because in focus groups the users mimic each other and tell the researcher what they want to hear. In workshops the facilitator can choose the methods that fit to the participants and the situation the best. (Polaine et al. 2013, 60)

In co-creative workshops we can combine expertise of service designers, developers and field experts but we can also ask customers and users to join. This way we have the point of views that we need, the technological and supplier view from the experts and developers and experiences and demand view from the customer. (Steen et al. 2011, 53). Service designers help in making for example complex services or experiences straight forward and easy to understand by drawings and models. (Design Council and Technology Strategy Board n.d., 3) The benefits from co-design can be manifold. Improving customer loyalty, improving innovation activities, reducing costs or improving the corporate culture are good examples of them. (Steen et al. 2011, 53)

Recruiting the workshop participants should be started early enough to get the time fit for everyone. Also, the venue and schedule should be planned well in advance. It is good to write an agenda for the facilitation, how to use the time for warm-ups and different activities. (Stickdorn et al. 2018b, 41). In the workshop the facilitator welcomes everyone and tells the purpose and agenda. It is good to also have an introduction of everyone. Other activities should be planned according to the topic and aim of the workshop. There should be some tangible outcomes from workshops so that the participants feel that they have been productive and there was use from the workshops. It is good to document the workshops well to be able to come back to what was done. (Stickdorn et al. 2018b, 39-41)

The FEI project was heavily based on co-creative workshops. We thought that it would be the best way to create a common process and get people to trust and use it afterwards. I will tell about the FEI workshops in more detail in the chapter 3.7 where I describe the FEI project step by step. In the pilot projects the most important co-creative workshops were the analysis and ideation workshops that were in the solution idea-phase of the process when we had interviewed and observed the customers and needed to find out the needs and problems to
ideate on. We wanted to arrange these workshops to involve more people and expertise and help the adoption of concepts in later development.

3.2.5 User journey mapping

User journey mapping can be used for example in co-creative workshop to visualize a user’s experience during the service or product use and the connections it has to the organization (Design Council and Technology Strategy Board n.d., 11). It is also easier for the customer’s to think about future needs and wishes if they look back in time and form a journey or timeline (Polaine et al. 2013, 63). Journey mapping helps different parts of organization to see the experience as it is, without silos (Polaine et al. 2013, 104).

Intangible experiences are made visible and easier to common understanding in the team by Journey maps. A journey map is always done with a focus of one main actor who can be a persona based on a group of customers, or employers. (Stickdorn et al. 2018a, 46) The journey map can help us understand the points where the service is working well and the ones where we need to do something to make it work. (Design Counsil and Technology Strategy Board n.d., 11.)

The experience is divided into stages, for example “need arises”, “information search”, purchase decision” and “usage”. Each of these stages includes several steps that represent any experiences that the actor has, like “waiting”. With stages a journey map is easier to understand and see the scale of it. (Stickdorn et al. 2018a, 46) In figure 9 there is an example of the journey map template where these stages and actions can be placed.

A journey map can include storyboards that visually show what is happening during each step in photos, sketches etc. They can increase our empathy towards the actor. Emotional journeys are also very common lane presented. There the customer’s satisfaction level in each step is evaluated usually on a scale from -2 to +2. It can easily reveal where the biggest problems of the service experience are. (Stickdorn et al. 2018a, 46)

Other lanes that a journey map can have are for example channels, means of communication during each step, stakeholders involved in each step, dramatic arcs that represent the main actor’s level of engagement in each step, or “what if” lane that is about worst case scenarios or problems that may occur in the journey. (Stickdorn et al. 2018a, 46)

Usually the process of journey mapping consists of preparing and printing out the data, choosing the user that will be on focus, definition the scale and scope of the map, writing the steps, iterating and finetuning and adding different lanes, such as emotional journey or stakeholders. (Stickdorn et al. 2018b, 54-58)
We used journey mapping in the FEI project to understand the current process what is happening when there is an idea and how it goes further to become a project. Using this tool, we could see where the problems are and how different the journeys are for different people. This helped us to concentrate to the right parts of the process when making it better. The used user journey map template can be seen in Figure 8.

![User Journey Map Template](image)

**Figure 8. A journey map template that was used in the FEI project.**

### 3.2.6 Ideation methods

Brainstorming and other ideation methods are used to bring up a large number of ideas in a short period of time. The best ideas are identified and taken further. The brainstorming method helps to overcome obstacles such as judgement and not concentrating on the topic. (Design Counsil and Technology Strategy Board n.d., 17) Brainstorming works so that the participants say ideas out loud and one person writes them down on a board so that everyone can see them. This is a fast way to find out what people are thinking about the topic. It is important to tell the participants to not criticize, focus on the number of ideas and to build on each other’s ideas. (Stickdorn et al. 2018b, 89)

If there is a need for more divergent ideas or there are people in the group that do not like to speak up, some other ideation methods can be better, like brainwriting. (Stickdorn et al. 2018b, 88). It is used so that participants write down ideas and hang them on the wall for others to see. They can hold the ideas until the end of the exercise or just pass them around to others to be able to build on each other’s ideas. (Stickdorn et al. 2018a, 180)

Idea workshop organizers may think that too many ideas are affecting negatively to execution (Nonaka et al. 2018, 22). I believe that with a clear and communicated structure in the convergent part of the process there will not be problems in the execution part. When there are more ideas in the ideation phase, there is an increased possibility to find a solution that is not obvious but may be radical or even disruptive.
We used both brainstorming and brainwriting to get more ideas. We started with brainwriting and continued with brainstorming when people could not think about new ideas alone anymore. Brainwriting may be hard because even though you tell people not to criticize, they will do it if they are used to it. They even want to criticize their own ideas. In some workshops we also inspired people by showing trends or other innovations from other industries to make connections and create more ideas.

3.2.7 Idea portfolio

To make the idea evaluation quick and easy we can use a slightly more analytical method, idea portfolio (Stickdorn et al. 2018a, 185). With this decision tool, like so many others too, the conversation during the usage of the tool is very important (Stickdorn et al. 2018b, 110). Idea portfolio is used by choosing two variables and ranking the ideas based on them on a portfolio or graph. (Stickdorn et al. 2018a, 185.) Two variables that work well are “impact to customer experience” and “feasibility” but also others, like “revenue potential” or “fit to brand” can be used (Stickdorn et al. 2018b, 109-110).

The portfolio is hung on the wall or left on the floor when one idea at a time the participants give marks from 0 to 10 to each variable (Stickdorn et al. 2018b, 109). When all ideas are on the graph, the most interesting ideas are chosen to go further with. They can be the most feasible with the highest impact or some that bring longer-term benefits from other areas of the graph. (Stickdorn et al. 2018a, 185)

We have used idea portfolio in pilot project ideation workshops to quickly evaluate and choose the best ideas. It is easy to place ideas to the graph on a large wall quickly and move on with the workshop and further development. It is important to use other methods for choosing the ideas to go forward because only based on the graph we may not find the one everyone is willing to continue with or is feasible or financially possible. After workshop it is also good to go back to all the ideas for not missing any good ones.

3.2.8 Concept value chart

Together with the second pilot project’s project manager we developed a new tool to help in concept understanding and validation. It was a modification of a tool from a book Blue ocean’s strategy. The book’s version is about validating the business model and ideas so that they are viable and less risky. A good process for a commercially viable blue ocean idea is to first think about the value of the solution to the customer. Is it exceptional? The buyer utility map (Figure 9) helps with defining this. There are stages of the customer buyer experience
and six issues that could be important to customer, such as productivity and environmental friendliness. To use the tool, one can think where in the table are the biggest blocks and if the offering effectively eliminates these blocks. (Kim and Mauborgne 2014, 118)

Figure 9: The buyer utility map is a tool that can be used for finding the blocks for the customer in the user experience cycle. (Kim and Mauborgne 2014, 118)

We used a similar table with our customer’s user journey at the top and different concept modules on the left. Then we filled in the table with attributes that told where the value for the customer is. For example, if we would have a product that saves the customer’s time when using it, we would write “time” to the box in the intersection of “product” and “use”. An arbitrary example of the tool in use can be seen in Figure 10.
Figure 10: Concept value chart was developed during pilot project 2 for understanding large concepts better from the customer’s point of view. In this example I have used an arbitrary example of data. Each column represents a step in customer’s experience and each row is a part of the concept to be developed.

We used the concept value chart to understand from the customer’s point of view what we are offering. We want to understand which parts of the normal customer experience we affect with the new ideas for a concept. With the original buyer utility map, we can find out if there are real problems in these areas. By comparing these two tables we can find out if the solution that we had thought would help solving them. Additionally, we can find the most important developments for our customers.

### 3.3 Case study research

As a research method I was using a single case study with two embedded units of analysis and a qualitative approach since I wanted to understand how design thinking could be used in the FEI process in a context of a manufacturing company. A case study is an empirical study that uses real-life context to investigate a current phenomenon in depth when the circumstances are relevant to the phenomenon (Yin 2009, 18). Since the outcomes of the thesis, design thinking and FEI process, cannot be used in a similar way in all other contexts, this is a case
study. The two units of analysis were the pilot projects where I tested the design thinking process. I chose to use the research design for two units of analysis since I thought about the case as a representative case in the manufacturing industry (Yin 2009, 61).

By answering to the “why” the insights gathered by a qualitative approach can be more easily acted on than the insights from quantitative research (Stickdorn et al. 2018a, 98). The aim of the analysis phase of the study, content analysis, is to understand the phenomena and present it in a conceptual form. Previous knowledge is used to operationalize the analysis, thus I am using a deductive approach in the content analysis (Elo and Kyngäs 2008, 107).

In the research part I chose to use interviews, observation and feedback gathering for gathering data and content analysis to analyse it. I think that they helped me to answer the research questions and to reach the development objectives. For FEI project the project team decided to use a survey and many co-creative workshops and analysis to form the final FEI process. The pilot projects were managed with design thinking methods and tools while testing the process. All the methods used in the case study research and the projects related to it are written to the Figure 11 under each process step. The pilot projects are divided into similar process steps as the research part for making the picture easier to read.

<table>
<thead>
<tr>
<th>Research</th>
<th>Discover</th>
<th>Define</th>
<th>Develop</th>
<th>Deliver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stakeholder discussions</td>
<td>Analysis of company needs process drawing</td>
<td>Feedback gathering interviews</td>
<td>Content analysis</td>
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<tr>
<td>FEI</td>
<td>Internal survey</td>
<td>Workshop</td>
<td>Workshop</td>
<td>Definition of FEI</td>
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<td></td>
<td>Workshops</td>
<td>Analysis with affinity diagram</td>
<td></td>
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<td></td>
<td>User Journey mapping</td>
<td>Drawing of FEI process</td>
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<tr>
<td>Pilot project 1</td>
<td>Design brief making</td>
<td>Pre-analysis</td>
<td>Ideation methods</td>
<td>Workshop</td>
</tr>
<tr>
<td></td>
<td>Hypothesis making</td>
<td>Analysis with affinity diagram</td>
<td>Evaluation with idea diagram</td>
<td>SWOT</td>
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<td></td>
<td>Customer interviews</td>
<td></td>
<td>Prototyping: adverts and pictures</td>
<td>Idea cards</td>
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<td>Customer interviews</td>
<td>Story boards</td>
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<tr>
<td>Pilot project 2</td>
<td>Design brief making</td>
<td>Analysis with affinity diagram</td>
<td>Ideation workshop</td>
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<td></td>
<td>Hypothesis making</td>
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Figure 11: The methods used in this thesis divided into service design process phases in the research part and the projects linked to the thesis.
3.4 Discover and Define: Gathering insight and needs and Planning the new process

Discover and define are the first two phases in the service design process used in this thesis. The double diamond process was described in the Figure 7 in the chapter 3.1. The discover phase is about diverging the knowledge whereas define phase is for converging. To diverge and gather more information I discussed with stakeholders and then to converge I made a prototype of the design thinking process based on the information gathered in the discovering phase.

After a few years of practical experience of how the case company works, 7 stakeholder discussions were held to understand the needs related to the design thinking process and the normal way of working in FEI currently in the case company. Design thinking was explained thoroughly to the stakeholders before the discussions. The people who I talked to were Offering Director, Innovation Director, Customer and Market Insight Director, Business and Portfolio Development Director, Marketing Director and 3 Portfolio Development managers. The discussions were not written down and are not part of the research material as such. The process picture was developed during the time of the discussions simultaneously while my understanding of the needs increased.

I found out that some parts of the process are not working as well as they should. For example, many times when working on new products, the customer does not have a proper role in the development at least in certain customer segments. The decisions are made based on assumptions of what the customers could want and numbers that someone has guessed based on earlier products.

With new kind of products and services, the evaluation of market attractiveness has been very hard and there has been disappointments earlier concerning the predictions and actualized sales. It could be hard to invest in some new kind of development because the evaluation is so hard. Thus, it is also mentioned in the company's strategy that there is a want to make new solutions based on customer insight.

The design thinking process prototype was made first according to design thinking literature and gathered insights from different stakeholders. Then FEI development was made alongside with the pilot projects, where the suitability and good practices of design thinking were tested in the case company context. The processes should be developed together for design thinking not to be a separate from all the other company processes.

The Innovation director of the case company and I thought that it was important to use company language when presenting design thinking. Therefore, I developed this new design thinking process picture (figure 12) with words that were familiar to the employees of the case company. During the time of the research the company strategy was renewed, and new words
were appearing there. The case company language changed so that for example the word “In-
sight” was understood better by people.

3.4.1 Design thinking process definition

Based on the stakeholder needs and theory available on mostly design thinking, a design 
thinking process was formed for the case company. It includes 5 steps that are describing the 
way of working so that it emphasizes the tasks and phases that differ from the normal way of 
working with FEI projects in the case company. It also aims to use a language that is under-
standable inside the company. Figure 12 shows the 5-step version of the process.

![Diagram of the design thinking process]

Figure 12: Design thinking process designed for the organization is the circled part of the sim-
plified launch process. This process was tested and redefined in the master’s thesis.

From the whole double diamond, the develop (ideation) phase was the most familiar to the 
people. In the company there has always been ideation and ideation workshops. In design 
thinking only the starting point may be different and require more work. The opportunity 
identification was felt slightly different than in normal way of working, since the work was 
considered to start from an idea and not so much from a topic or challenge. Observations 
showed that this kind of identification may take a long time (for example in pilot 1). These 
two reasons are why the first step of the process was chosen to be the opportunity identifica-
tion.

Based on the strategy and discussions with stakeholders, there is a need to gain customer un-
derstanding to be able to target good solutions. The current way of doing is to get insight 
from annual customer satisfaction surveys and from sales and customer service people who 
either do or do not tell others about their encounters with customers. It is also sometimes 
bound to the memory of the contact persons. The word “insight” was not much used in the 
company at the beginning of this process development, so I chose to use “customer needs un-
der chosen topic” as the second process step.
I also wanted to emphasize the prototyping aspect from design thinking in my process description. Prototyping can be explorative to help with ideation, evaluative to understand future experiences of customers or communicative to reduce misunderstandings and ignite discussion around the concepts (Stickdorn et al. 2018a, 212-213). In the case company I wanted to start with a value testing with a prototype to try if the future customer would gain value from the concept being developed, like Stickdorn et al. (2018a, 214) suggests. This way we do not use all our efforts to create something that looks and feels great but the value proposition is not solid (Stickdorn et al. 2018a, 214).

Low fidelity prototypes (that concentrates on value) are rarely done to test the customer interest in the case company. Nevertheless, for feasibility purposes the development of products sometimes has started before prioritization or evaluation of the ideas. Often in these cases, the product is ready before there is a decision of launch. The case company should be able to use the resources effectively and prioritize the most promising concepts in an effective way. Thus, rapid prototyping should be part of the FEI process but only in a sense of checking if they could be possible to implement.

The discussions with different stakeholders (described in chapter 3.4) showed how hard it is to prove the value of design thinking without seeing examples and results from using it. One interviewee (Business and Portfolio Director) needed a lot of explaining for why there needs to be validation of the prototypes at all in the process. “We have not needed it before”. After the pilot project 1, she understood the importance of the customer insight also at that point of the process.

In the case company there is a business case form that should be filled in when a new project for launching purposes is to be evaluated. This document includes the description of the desired concept, financial calculations and basic statements for why the concept should be developed and launched. The knowledge that something can be done has been usually somehow proved before the business case has been written. I wanted to combine this familiar viability aspect to feasibility and desirability that are naturally included in design thinking process. This will also bring more an iterative way of working to all of the three aspects.

After all these steps there will be a decision made about the investments for the development. This process merges with the development process and launch process that together with FEI form the innovation process. I wanted to show this connection, so I drew them to the same picture.

The design thinking process has an iterative nature so when presenting this process, I mentioned it and sometimes had arrows describing that. I still decided to draw a simple arrow with sections for process phases for making the process look clear and straightforward. I did not want to scare people with a very complicated picture.
All in all, the language chosen for this process picture was formed from the language that is used in the company. In service design the process phase names can be very simple such as those in the double diamond model (discover, define, develop and deliver). This kind of language would need even more training and communication for the process users and project participants to be understood well enough.

3.5 Develop: Testing in pilot projects

Develop is the third phase of the double diamond service design process that was used in this thesis (see figure 7). It is a divergent part of a process where the aim is to gather more information about the topic at hand. In this research it is about testing the prototype that was made in the previous define phase.

The design thinking process that was drawn earlier (Figure 12 in chapter 3.3.1) was tested by using it in two pilot projects. In each of these projects the project manager was a product portfolio manager. Team members were people working with the same product portfolio areas from different positions. The core team of these projects were about 3 to 5 people depending on the project phase and organizational changes. More people from the case company were included in the ideation workshops and in pilot 1 in interviews. These participants were from Finland, Sweden, Poland, Baltics and Russia since we wanted to learn the differences between the countries.

In the pilot 1 there was a consulting company helping me to bring the service design know-how to the project participants. They instructed us how to interview customers and facilitated the workshops. The work was done together with the consultants. The starting point for this project was to find out how customers feel about naturalness. We wanted to understand their needs regarding this trending topic. As target customers we had a certain group of professional customers that the case company has not been concentrated on too much in the past. We wanted to bring solutions (products or services or combinations of them) for this customer group.

In the other pilot (pilot 2) I was acting as a facilitator who managed the project in the design thinking point of view. The topic was about speed. We intended to understand what small customer companies thought about speed and the possibility of speeding up their work. First, we wanted to understand their work and how they used their time to find out if there are any possibilities to help the customers with this issue.

Unfortunately, both projects were put on hold before the whole plan was realized but nevertheless, I got results from both of them. The pilot project 1 was put on hold after a first
iteration on concept testing and the pilot project 2 was put on hold before the customer testing, both because of key people were leaving the company.

I have built the following chapters 3.5.1 and 3.5.2 in an order based on the design thinking process that was used in both of these projects. The sub headings separate each process phase from each other. These projects serve as the two units of analysis of a single case study and provide a lot of qualitative data for the research.

3.5.1 Pilot project 1

In the pilot project 1 we had a design consultant company helping us. They had 3 people involved in this project. From the case company side, we had 10 participants from different countries. They were all from the business area that related to the project, from mostly marketing and product management. The project manager was a portfolio manager and I was working as a design specialist helping in the organizing and communication in the project. The other participants were conducting the customer interviews and attending the workshops. The topic of the project was naturalness. The specific content of the pilot project is confidential, so I will only share the methods and process used in it.

Opportunity identification

The pilot project 1 started with choosing a subject for the project. The project manager asked the product and portfolio team in a meeting and the topic was selected among a few interesting topics that they had earlier defined. Together with the project manager we described what we want to do and find out in the project and wrote a design brief (the empty form is attached as Appendix 2). We explained who the customer is who we want to learn from and what are the starting hypothesis. We shared the brief with the consulting company that we chose to help us. The core team of the project together with the consultants planned the whole project.

With the team we revised and formed research questions and hypothesis to guide our way of working. Together we also made the interview protocol for the interviews. The protocol included questions and exercises that were done during the interviews. We chose to use interviews since we thought that it was a good way to talk to the customers and gain understanding of the topic and their opinions about the topic.
Customer needs under chosen topic

Interviews were arranged so that a service designer consultant was meeting a customer with one project team member. In the first interview, the consultant was interviewing and project participant from the case company was observing and writing notes. The second was done so that the roles were reversed. Then the participant could go to another country to help with other case company members in a similar manner than the service designer had done. This was a good way to learn interviewing for the case company participants.

There were 5 interviews in Finland, 5 in Russia, 2 in Sweden and 1 in Lithuania. In addition to questions we used feeling cards that were photos from very different objects or situations that may bring something to the interviewees minds (35 cards). Pictures were for example from family, nature, team work, old house, person doing yoga etc. Then we had Inspiration cards with different kind of products being used. The last exercise in an interview was inspiration word cards where we had gathered words related to our products, like ecological or economical. We asked the customers what was meaningful for them when they do their work? Using these extra materials in the interview allowed us to go deeper within the topic.

After each interview, the interviewers filled in person cards (Appendix 3) together with the co-interviewer. The cards included information about age, title, background, goals, clients, typical projects, attitudes, challenges and opportunities and experience on our topic that the interviewers identified during the interview. The person cards were filled as fast after the interviews as possible to gather the fresh insights and to remember and share the people who were interviewed.

All interviewers went through and wrote down their interviews and gathered insights, quotes and notes from the interviews. They were printed to post-it notes and used in the analysis and ideation workshop that was organized with 9 participants from different countries. To make the analysis faster and easier for the participants, the service design team of consultants (2 people) made a pre-analysis, they dealt the post-it notes under 6 categories concerning the content. They facilitated the analysis and ideation workshop and I was a participant. The agenda of the workshop was following:

08:30-08:45 Introduction
08:45-10:30 User insight analysis
10:30-11:00 Presentations and themes
11:00-11:15 Voting for themes
Lunch
12:00 - 12:20: Brainwriting (Group)
12:20 - 12:40: Picture prompts (Individual+pairs)
12:40 - 13:00 Brainstorm (All)
13:00 - 13:30 Clustering ideas
Break
13:45 - 14:30 Prototyping
14:30 - 15:00 Presentations

In the workshop people were divided into teams of four people. In the teams we did an affinity wall where we organized the pre-dealt post-its into smaller categories to make some sense of the data. Based on that work we identified challenges for our customers and 4 biggest or most interesting ones were selected to the ideation through voting. One of the selected ones was “need for facts” which was formed because the customer needs to convince their choices to others in their work and it is sometimes difficult if they don’t have believable facts available.

Solution idea

Ideation was done based on three selected themes. The facilitators decided to combine two of the chosen challenges to make the ideation clearer. There were three different kinds of rounds in ideation, first we used brainwriting in groups. In the second round the facilitators gave us inspiration from trends and other industries and we could write all the new ideas to post-its first individually and then in pairs. The last round of ideation was basic brainstorming with the whole group of people. The goal was to make as many ideas as possible and different methods were helping people to think about more ideas.

Rapid prototyping

After ideating, teams voted for the best ones and made fast concept development and prototyping of the ideas. They were made with Legos and paper. All the teams presented their prototypes and they were recorded to a video. The prototypes were co-designed further in a couple of team meetings and prototyped for validation by the design consultants. Altogether we had 4 concepts that we wanted to get further. They were validated with 2 customers and consumers per market (Finland, Sweden, Russia, Poland) to get fast validation and redefinition for the concepts before validating with larger amount of customers. Together with the consultants we made an interview protocol and data collection agreement. The new EU law about data security had entered into force at this point of the project.
Desirability check

The validation phase started with interviews, this time the case company people were conducting all of them. Soon after, the design consultants organized a two-day workshop for project participants from different countries. There were 2 consultants present and about 6 people from the case company. Since people had other important meetings during the two days, the people were not the same all the time. The agenda of the workshop was following:

Day 1
Starting 9.30
Monday morning = Analysing
  Creating an affinity diagram & swot -analyses in small teams
Monday afternoon = Ideating
  Creating user stories and concept ideas based on user insights and understanding
Ending 16.30
Day 2
Starting 9.00
Tuesday morning = Experimenting
  Voting the ideas, and building an experiment to concretize the desirability of selected ideas
Tuesday afternoon = Designing
  Refining ideas further, and making a final design
Ending 16.00

The workshop participants were divided into 2 teams. Each team could work with 1 prototype at a time. The participants who had been interviewing the customers about the prototypes went through the interview data by reading it out loud to their team. Other team members wrote down to post-its what the customer’s first impressions on the prototypes were, where they could use the concept and development ideas for the prototype from the customer. We also made a SWOT analysis based on the interviews in a similar way on post-its: strengths, weaknesses, opportunities and threats from the customer’s perspective. This way we could understand better how we should develop the concepts further.

All the concepts were talked through with the whole group to get a better view of also the other team’s insights. Then, one concept at a time we all wrote one idea (per person) for development for each of the concepts. The first day of the two-day workshop was at its end when we had all the development ideas on the wall. It was good to have all the development ideas on the wall so that they were treated as equals.
The second workshop day started with voting for the development ideas. Everybody could read the ideas quietly and mark their favourite ones with stickers to the wall. Based on the feedback and the favourite idea cards, storyboards were drawn and acted out from the customer’s perspective. We thought about the cast, dialogue and props. Acting and seeing others act made us understand who were involved in this story and why, what do they speak or think in the story and what kind of tools, devices or products are needed in the story.

The afternoon was about refining the ideas in the chosen concept and comparing it to the original prototypes. We concretized the concept features and value for the customers and created a minimum viable product as one team. As a result of the workshop we had a large white board describing a digital tool that would help our customers but could be feasible.

The next step will be to design an interactive prototype of the concept and then validate it with the target customers. Unfortunately, the project was postponed so the results will not be in this thesis. Nevertheless, I think that the information gathered from this project is enough for the process development perspective at this stage since also part of the validation was already conducted.

3.5.2 Pilot project 2

The second pilot project was organized with a small core team and larger workshop team. The core team worked on the interviews and organized workshops etc. It included me as service design lead, a project manager (product portfolio manager, different than the one in the pilot 1) and an insight manager. Topic of this pilot was speed. The specific content of the pilot project is confidential, so I will mainly share the methods and process used in it. We also had a steering group to guide our way. It consisted of customer insight and market intelligence director, business development director, marketing director and group portfolio development manager.

Opportunity identification

At the beginning of the second pilot project we had a concept idea. That in mind we leveraged the subject to be broader. We wanted to study the phenomena more closely. How does the subject affect our client’s worlds and how they feel about it? Is there something to be changed in their work considering our topic? During the design thinking process in pilot project 2, some competitor and product research was done to find out if competitors are doing anything related to the topic.
From our broader topic we made a design brief and decided the customer group that we were concentrating on. This time they were certain type of small companies. We wrote down research questions and hypothesis. We also interviewed 6 internal people in Finland and Sweden who had been in contact with this kind of customers a lot to understand better what we were going to talk about with them.

Customer needs under chosen topic

The insight manager and I made an interview field guide and interviewed seven customers in Finland. The project manager attended one interview as well. The number of interviews was a few less than what we originally planned but by the time we got to the last one we thought that the answers were starting to repeat themselves even though the interviewees were very different from each other.

The goal of the interviews was to understand their work, what was their user journey and their work process. In addition to questions we asked them to draw us their typical workday on a journey. We also asked them to tell us what they value when they buy products with the help of some attribute cards. We used these to find out their priorities and to find out if and how they would talk about the project topic when thinking about the priorities.

Each of the interviews were taking 45-65 minutes depending on how eager the interviewees were to talk. We went to see them in their own workplace if that was possible, but 3 of the interviewees wanted to come to the case company to meet us. We took turns with the insight manager on who was interviewing and who was writing notes. After every interview we went through the notes and wrote digital post-it notes from them. The notes were then printed and analysed with the project manager. We thought that it was easier to do the analysis with only 3 people who were attending the interviews and then share the most interesting parts of them to the workshop team. We used affinity diagram to make sense of the data because it had been proved to help fast in previous work.

In addition to the interviews I organized an observation day at the professional customer’s workplace. The customer was willing to let me and the insight manager help him in his work that day. We talked a lot during that day but got to really see how the work is like. I had a video camera attached to a helmet that I was wearing for 4 hours that day. Later, I edited a 4-minute video to gather the most interesting, new or important parts of the footage related to our topic.
Solution idea

The ideation workshop was planned by the project manager and me. I was facilitating the one-day event and the project manager and the insight manager who had been interviewing the customers, were attending the workshop as participants. Other participants were somehow related to the customer group at hand and were working with the area. They were customer service manager, product managers, product portfolio managers, R&D managers etc.

As facilitator I made sure that people understood why we were doing things like we did, explained what to do, divided people into teams and kept time during the workshop. We organized the workshop in an external location to be able to think more outside the box. We also agreed not to use computers or phones during the workshop times, only on breaks. That seemed to work well, and people were really engaged in the subject all day. The agenda of the workshop was following:

10 - 10.30 Welcome and presentation
10.30 - 12 Empathize workshop
12 - 12.45 Lunch
12.45 - 14 Ideation workshop
14 - 14.15 Break
14.15 - 15.15 Evaluation workshop
15.15 - 16 Summary and what happens next

I wanted to know how much we can base our ideation on insight when just a few people have been participating in the interviews. Sleeswijk Visser and Kouprie (2008) suggested that in ideation workshops the empathy is gained by first self-reflecting with the topic and then learning about selected quotes. After this they suggest that the workshop participants organize the information and compare it with their own thoughts. (Sleeswijk Visser and Kouprie 2008, 2) In the ideation workshop of the pilot project 2 a somewhat similar method was used.

The participants of the workshop were asked to think about how their own experiences could differ from the user’s experience and to write their assumptions on a paper according to their thinking, we called this an assumption dump. While going through the insights, they were asked to mark which of their assumptions were correct. The information from the customers was in forms of video and presentation. The participants of the workshop had been working with the customers for so long that it was hard to let go of the own viewpoints that they had developed over the years. In 4-5-people teams we went through the insights once again to recognize needs and pain points to the customer group. Then each team chose their favourite topic or problem from needs and pain points to continue with.
We used a warm-up when coming back from lunch. It was about going on a vacation with another participant. One had to propose vacation destinations and the other answered “No, but...”. On the second round the answer was changed to “Yes, and... “. This way we could change people’s attitudes from turning ideas down to building on each other’s ideas when moving from convergent to divergent phase of the process. (Stickdorn et al. 2018a, 418)

The first ideation round was a silent one. The participants put ideas on post-its to the wall for others to see them and to use them as inspiration. Each team had their own wall space. I emphasized that the amount of ideas is more important at this stage than the quality of them. We could have new ideas from each idea, not depending on the quality. The quiet work was chosen because then everyone had a chance to give ideas without them being turned down. Also, we wanted the working to focus on ideating and not to conversation.

On the second ideation round each team picked two random ideas from their wall and used them as inspiration to the next ideas. This time the teams could speak with each other. When planning for the workshop with the project manager and marketing director we decided to go with discussion at this point because we thought that also extroverts could feel good when being able to talk after the first round of silence.

Before the last ideation round, I as the facilitator, shared two trends for inspiration. All the ideas were then evaluated fast in an idea portfolio where the dimensions were easiness of implementation and benefit for the customer. Based on the whole evaluation conversation, the teams voted for the best ideas of their team and continued the work with the most voted ones to make concept and value propositions: How does the concept work, what is the value to end-user and us, and value proposition. Before feedback gathering all the teams presented their concepts.

For feedback gathering I used plank papers and asked the participants to write their thoughts before any feedback was exchanged in the group. This way I could get more genuine feedback from everyone without others’ opinions influencing too much. It seemed to work, since the feedback in paper was a lot more positive than the one that was got from the general discussion. A few loud and negative people can affect a lot to the atmosphere.

From the feedback we found out that it was surprising for the participants that the day didn’t consist talking about products, but the discussion drifted into services. This is probably because the insights that we talked about did not show any need for product improvements and in the customer journey there were many more points that we could be more helpful for them in the service side. As a facilitator I did not tell the participants what kind of ideas they should create or what to talk about.
Another interesting note from the feedback was that some people felt that we handled only old ideas. Again, the target was to generate as many ideas as possible. Maybe people were still not open and confident to bring up new ideas. If ideas have been discussed before, they are “safe” to say since they are already accepted in some way. Even though I did not think that the result was bad, this kind of ideation workshops need to be practiced more in this organization to be able to create also radical innovations. Another thought about this is that if we have hundreds of old good ideas that have not been implemented, we should do something about that too.

With the project manager we went through all the ideas after the workshop and made an affinity wall (similar solutions in same groups) to check that all ideas got attention and everything that belongs to the chosen concepts were added to the concepts. The project manager, a portfolio and business development manager and I went through the concepts and defined them a bit further and made visual representations of service modules included in the concepts. We also used the concept value chart to structure and understand the value of different modules in each point in the customer journey that was defined according to the interviews.

We had a plan to continue the project with making hypothesis for validation based on the concept value chart, but we had to stop the project. There were big organizational changes in the company and many of the people who attended the project changed roles. It was decided that the 2 concepts that we were going to validate with customers would move to other groups’ responsibilities and they would be handled along the other plans.

3.5.3 Qualitative interview for the project participants

The process is being made for people in the organization to use it and that is why it needs to be validated with the users. There were around 20 people involved in the pilot projects including all participants of the workshops. Six of them were interviewed after the ideation workshop in pilot project 2 and after the validation in pilot project 1. From the interviewees 3 had been attending in both projects and that was the reason for choosing them to be interviewed, they had also done interviews. The project managers were chosen because they had the most experience in the project. The last interviewee was also attending the customer interviews and was proposed by the project manager.

The interviews were based on a list of assumptions (Appendix 4) that were validated during qualitative interviews. The assumptions were based on observation and other thinking during the projects. Westcott et al. had identified a good set of questions to define the value of design in an organization (Westcott et al. 2013, 13). Some of these questions were used in the
process interview, but not all of them since this is just a beginning of the design journey for the company. Also design value scorecard from Westcott et al. was used when planning the questions for the interview. The list of questions can be seen in Appendix 5.

I used semi-structured interviews that lasted 60-90 minutes depending on the person. In a semi-structured interview some point of views have been fixed beforehand. There is a list of questions that are based on assumptions made by the interviewer. Nevertheless, the form and order of the questions may be changed depending on the conversation flow and the interviewer’s choice. In the interview, researcher’s assumptions are tested and questions are asked about the interviewees experiences on the situations. (Hirsjärvi and Hurme 2008, 47-48)

The project managers of the pilot projects had more to say than other project participants since they had been part of the process the whole way. It was agreed with the participants that the data will be used in the thesis. One of the interviews was in English and it was held in Skype. The rest were organized as face to face meetings and held in Finnish. All the interviews were recorded and saved. Later, I transcribed them word by word.

3.6 Deliver: Analysis and revision of the process definition

The deliver phase is the last convergent phase of this thesis. The aim of this phase is to make sense of all the gathered information and conclude to a final solution. I made content analysis to understand and conclude the available data. I made a few concluding pictures of the processes based on the results.

For qualitative analysis the result is always dependent on the researcher’s own thinking of the evidence and different interpretations about it. (Yin 2009, 127-128) I used content analysis research method that is replicable and used for making logical reasoning from research data. The outcome is categories explaining the studied phenomenon. (Elo and Kyngäs 2008, 109). The process starts by selecting the unit of analysis (Elo and Kyngäs 2008, 109; Yin 2009, 29). I was analyzing interview and observation data and the feedback from pilot project 2 and FEI project workshops.

I used the inductive content analysis; thus, next I organized my interview data. Organizing includes coding, categorizing and abstraction of the data. (Elo and Kyngäs 2008, 109) Categories are created from the coded data to understand better the phenomena that are present in the context. These categories can be then ordered into sub-categories and main categories. (Elo and Kyngäs 2008, 109)
I coded my transcribed interview and feedback notes in Excel (a part of it can be seen in Appendix 6). I used codes that were important from my hypothesis and thesis’ point of views:

- Idea workshop
- Process picture
- Process timeline
- Project timeline
- Facilitation
- Help
- Information from customers
- Design thinking vs. old method
- Hardest parts of the projects
- Level of design now
- Future
- Communication
- Learning
- Topic
- Countries
- Attitude towards interviewing
- Where to use
- Why to use

I colored the 6 interviews in different colors and moved quotes from each of them under the codes. Then I made summaries of the quotes under every code. I got 45 rows of these findings.

I created categories from my coded data. These categories could be then ordered into subcategories and main categories. I used main categories from literature (Koen et al. 2014a, 2014b) and matched my data with it creating my own framework. In the results section I will use this framework to organize my analysis results. Based on the data I also revised the design thinking process picture and made it fit to the FEI process.

3.7 Front-end of innovation process development

For understanding what should happen in the early phases of innovation and what kind of role design thinking should have, a project for defining the company’s FEI process was conducted. For making the reading of this thesis easier I will describe the FEI process separately since it was one project and should be understood as a whole. Thus, in the following chapters I will describe the actions and methods used in the FEI development project.

I made the plan for the project based on the double diamond model. In the first divergent phase we would find out how the current process was working and in the convergent phase we would conclude what should be developed and what are the well-working parts of the process. In the second diamond we would make new ideas for how to make the process functioning and finally make the description for a new FEI process. The project was agreed to have 3 workshops (or workshop sets) with the process users. Additionally, there was analysis and conclusions in between the workshops. To make all the project team and stakeholders understand the plan, I conducted a one-page project plan that is attached in figure 13.
FEI project

### Figure 13: A description of the FEI project plan based on user workshops and work done in between them. It was done to guide the project work and for communication purposes.

#### Mission:
To define the best process to create business cases out of ideas and opportunities based on customer understanding.

#### Vision:
Become a truly innovative company that stands out by making the end result and journey successful for the customer. Get innovations through the pipeline.

### Workshops 1:
**The current process**
5 (6) workshops for users from different functions.

**We know:**
- The current process description
- Hypothesis from core team workshop

**To find out:**
- What really happens
- How the process works and why and what are the gaps
- How do users feel about the different steps of the process

**Outcome:**
- User journey maps of how people experience the FEI

### Workshop 2:
**Overall process**
Interested people chosen to participate.

**We know:**
- What works in the current process and what doesn’t

**To find out and do:**
- What the process should include (elements)
- Relations between elements
- Ideas for the non-working part of the process
- Ideas for the overall process

**Outcome:**
- Process picture suggestions
- Subprocess suggestions in high level
- List of elements

### Workshop 3:
**Process details**
Decision-makers participating.

**We know:**
- The elements that should be included
- Overall process picture

**To find out and do:**
- Who is responsible for each step
- Subprocess descriptions
- KPIs
- Test how different ideas would go through the process

**Outcome:**
- Process description that needs only some polishing

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3.7.1 Innovation survey

Before the first workshops we conducted an innovation survey to find out where and how people get ideas and how they feel about the current process. The survey was sent to 46 people around the organization. The people were chosen with an experience of who would be interested in participating in the workshops from different parts from the organization. Some people informed us already at this point that they were too busy to take part in them. In the survey we asked four open questions:

1. Where do we get ideas or opportunities for new product and services that are directed to our customers?
2. Does the team you are working in bring up ideas and how often this happens?
3. How do you bring up ideas?
4. How important you find the development of front-end of innovation?

We got 22 answers for the survey which we thought was an ok result. The last question also guided us to choose (or not to choose) people in the workshop teams. The people who did not see value in it, were not invited to the workshops. I went through the survey results and gathered different versions of answers together under each question. Then I read them through question by question and made the following conclusions:

1. People get ideas from many different sources
2. Teams are not so often thought to bring up ideas
3. People feel that ideas are not often implemented
4. There are tens of different ways to start pushing an idea further
5. People feel that the development of FEI is important (average value was 8.77 on a scale of 1 to 10)

3.7.2 Workshop 1

Before the first workshop, the project team, including people from innovation, marketing, quality and project management, built the hypothesis of the current state of the front-end of innovation process. I facilitated a 2-hour workshop for the team where we thought about the stakeholders involved in the FEI process. I used a stakeholder map since I wanted the team not only to list stakeholders but also think about who are involved in what levels.
A stakeholder map illustrates all the different stakeholders, people or organizations that are involved in an experience. It also shows the existing relationships between stakeholders to find out unseen possibilities. (Stickdorn et al. 2018a, 59) The stakeholder map that we drew was for understanding all the stakeholders related to FEI. It ended up having the customer in the center because they are the reason, we are creating innovations. It included all different actors in the case company and in addition external partners, such as universities and competitors.

We also thought about different sources of ideas and how they go through the process to be developed as products and services. This was used as our hypothesis of the current stage of the process. The project team members are from different parts of the organization so the opinions differed slightly. This kind of discussion was important in the beginning of the project to get the team to speak the same language. After the meeting I wrote the findings to digital form.

In the first FEI workshop series there were 6 small 3,5-hour Skype workshops arranged with 3-8 people. We wanted to involve people from many different countries and parts of organization, also in operational positions, so the workshops were easier to arrange in Skype. We also had experience on organizing Skype workshops in the project team, so it felt like a good solution.

In each session people from similar parts of the organization shared a user journey. The journeys were based on their experiences of taking an idea towards implementation. We also asked about and recognized a large amount of idea sources that the process has. I planned the workshop with a colleague from innovations and facilitated them with her and another colleague from project management organization. The facilitator was welcoming people to the workshop, telling the survey results and explaining and guiding the way through each step of the workshop. In most of the workshops we had 2 people facilitating but there was one session that I facilitated alone. There was one project team member monitoring and writing notes in every session.

Each of the sessions had a specific set of people from the same department so that it was possible to work in teams to create a user journey. The people were from operational level from RDI, contact centers, marketing, sales and product management. Also, management level was taken aboard having a slightly different session for offering management team where they could tell how they saw the importance and future of the process. Mostly the groups were international, so the working language was English. One team was totally Finnish, so we changed the language to Finnish. The agenda for each of these sessions was following:
We let people write down (in Microsoft Planner) idea sources from where they get ideas, after which we went through the answers together and categorized them. As a result, we had a lot of idea sources in the system and we could divide them to these categories: customers, distributors, employees, schools, market and media. This was helping us to form a holistic view of the beginning of the process.

Then we divided the people into teams of 2-4 people and asked them to form a user journey map related to a real idea that was taken further in the process. Each team had their own Skype window. We agreed to try 2 different ways for the task: some teams were thinking about an idea journey, others an employee journey. The reason for using an idea journey was that it could be easier for the participants to think about whereas the employee journey was used to learn more about how people felt during their experience. When doing employee journey, the people didn’t have to guess what was happening for the idea, but they only told their side of the story.

The last task was to recognize pain points in their journey map (template presented in chapter 3.2.5 in Figure 8) and steps that work the best. This was done by adding symbols to the template. There were different symbols for good and bad feelings, challenges, parts that were well done, costly parts and time-consuming parts (Figure 14). In addition to the symbols, we asked the participants also tell us why they used the symbols they did. At the end of each workshop we gathered again to the same call and learned from others’ stories. The described idea journeys are confidential, so I cannot attach them to the thesis.
Sometimes people in this kind of company are not so familiar to talking about experiences and emotions, like they are about products and processes in a technical way. In service design though, we want to emphasize the human experience, emotions and needs so it is good to get practice of also these aspects. The results of these experimental ways of doing were good. When the facilitator explains the exercise well enough, people know what to do. Sometimes the online environment was causing some inactivity that required more leading questions from the facilitator. This was emphasized in groups where people were not so used to use digital tools or English as working language.

Based on the first workshops the current process was clarified more. The main learnings were that there were not clear steps or responsibilities for decision making but still ideas got through to be developed. Not many radical ideas were going through but mostly incremental ones that were easily guided to a person or team responsible for each development area. Additionally, business case could be done in different phases of the process in different customer segment related ideas and process users were not always updated during the process. Due to tight schedules of the project team, the analysis of the workshop results was done by talking about the user journeys and issues found in them while writing points down (Appendix 1).

3.7.3 Workshop 2

Before the second FEI workshop we sent a pre-task for the participants. We asked them to think about what the FEI process should include and consider. We did not ask them to write anything down or take anything concrete but only to think about the issue at hand so that they could be slightly prepared to think about that in the workshop.
The workshop was about developing parts of the process that were not working so well. The 16 participants of the workshop were from different functions and different levels of the organization. A colleague of mine (R&D manager) from the project team was facilitating the workshop. It was held in a large conference room with a lot of wall space. Before the workshop started, we had hung posters of different words for inspiration that had been gathered during the project that somehow was related to Innovations, for example culture, products, ideas etc. Also, the user journey maps from the first workshops were present. The agenda of the day was following:

9.30  Introduction
      Previous work summary
10-12  Individual ideation + working in small groups: think of what items, topics, processes etc. our new FEI should consist of
13-16.30  In new small groups: discussion of chosen topics from the morning session

At first, people were asked to write down on large papers what they thought was supposed to be included in the process. This was based on own thinking and the materials in the room and previous workshops. In Figure 15 is an example of a list made in this part of the workshop. Another example of a list of things that came to someone’s mind in this exercise (what should be included in FEI):

- Transparency & communication
- Ideas gathered from different sources
- Evaluation of ideas -&gt; decision on go/ no go
- Clear roles & responsibilities
- Understanding the customer needs
- Understanding the competitors’ actions
- Technology scouting
- Market trends
- Scoping the ideas
- SWOT-analysis
- Financial analysis
- Risks evaluation
- Innovation culture!
- Everybody knows how to put ideas forward in the process
- iteration
- ROI = Return on Innovation
There the “transparency & communication” and “innovation culture!” shows that there is a lot of work to be done after this process definition. Somebody had emphasised sharing of information by writing “+ sharing” after everything else, like “customer understanding + sharing”. Other cultural things like learning of failure and not being afraid of failure were widely present in the worksheets.

Everybody chose one topic from all the things mentioned in the worksheets and wrote more descriptively about it. The chosen topics were:

- Speed to failure - courage to act
- Innovation process FEI - visibility
- Culture that encourages innovation
- Scoping
- Knowledge sharing
- Future proof customer-centered solutions
- Structured systemized process
General FEI
Risk evaluation
Business model innovation
Boot camps to develop concepts
Validating the idea among customers
Include customers, suppliers and other interest groups in innovation work
Stakeholder analysis /identification
Encourage to innovate
IPR-searches - at the beginning of the process
Business case

From all the answers all the participants voted for 4 most important ones and developed those in teams. The selected themes were innovation culture, knowledge sharing, scoping and FEI in general.

An example of these development papers can be seen in Figures 16 and 17. After a while of developing one topic we switched places of the teams so that people could develop many topics. There was, for example a suggestion of having a role that would first filter ideas before they would go to responsible people. This was because the people evaluating ideas in the first workshop felt that they had to evaluate “stupid” ideas which took too much time from other work.

Figure 16: Scoping in FEI was one topic developed in the second workshop.
From the material gathered in the FEI project’s second workshop an overall picture of the company’s desired FEI process was drawn. First all project team members drew their own version of the process in their own way. The pictures were quite different from each other, but they were all based on the materials gathered from all the workshops. From all these 6 pictures, a more company-specific process picture with swim lanes was drawn. This process picture was revised in the third workshop with people from marketing, portfolio management, RDI, mostly on managerial level.

3.7.4 Workshop 3

The same colleague than in workshop 2, was acting as the main facilitator of the third workshop. I had the responsibility of a co-facilitator keeping time and checking that teams are working well. The rest of the project team were participating the workshop as participants since they had learned a lot about FEI during this project and thus had expertise in the topic. All in all, we had 17 participants and 2 facilitators in the workshop. The agenda of the workshop was following:

9.00 Coffee forewords
9.30 Finding positive things and things to improve
10.30 Break
10.50 Improving the process
11.30-12.30 lunch
12.30 Improving the process
14.00 Coffee break
14.30 Version 2.0
14.45 Idea walk-through
15.45 Ending words
16 End of the day

We started the workshop by presenting the FEI process picture, a prototype that we had drawn based on the second workshop. During the presentation and a while after it we asked the participants to write down positive thoughts about the presented process and then things that were not clear or should be developed further. The positive things were important to get the mindset positive and developing and not negative and shooting down improvement ideas.

After everyone had their own thoughts gathered to a paper, the participants were discussing them in pairs and choosing the 5 most important positive things and improvement topics. These were then gathered to a wall in post-its and shared with other participants. The participants voted for 3 of their favourite topics from the improvement topics. The project team chose and combined three most voted topics during a coffee break which were the basic topics for the rest of the day. The topics came out to be KPIs, de-siloing and roles and responsibilities. It was important to have small amount of topics to concentrate on for the workshop so that we could get some concrete suggestions and not only wide discussion.

The topics were given to three teams, of about 5 people in each, to be developed further. The teams had flip board papers and large pictures of the presented process to start with. After working for almost an hour, one (project) team member in each team stayed put and the rest of the team members moved to the second topic. The change was done again after 30 minutes so that all the participants (except the selected project team members) were able to give their input to each topic. At this point I suggested and together with the main facilitator we decided to change the teams for the last exercise because it seemed that in one team, the permissions to speak were not divided equally. The project team members who stayed with one topic the whole time, presented their topics to everyone so that we all understood what had been suggested.

The last task of the workshop before feedback gathering was to test the FEI process with real ideas. The people were divided into new teams and they thought about one specific idea (a real or made-up one) and made a 3-minute walk-through of it. We allowed the walk-through to be anything they wanted from presentation to a musical to include some creative doing. What we got, was two acts and one presentation with some moulding clay figures.
After the workshop, the project team gathered the information and formed a final version of the process picture. Also, a written description of the process was made. Some small changes were made to the process picture including addition of step for technology scouting tests in research and development and yearly ideation workshops for forced ideation.

The FEI project will continue after this definition part with the process implementation. Plans will be made for how to communicate about the changes, how to train people and how to improve the innovation culture across the company. Also a new idea system will be launched.
4 Analysis and results

The main research question of this thesis was

How can design thinking be used for gathering customer insight and defining solutions in front-end of innovation process in a manufacturing company?

I approached the main question by means of sub questions of how does design thinking work in the case company’s environment and how it can be integrated to the FEI process. The development target was to frame and test a design thinking process that could be used in making product and service innovations in the case company. I also explored how service-dominant logic could be applied in front-end of innovation to change the company’s mindset to a more customer-centric one.

I divided the analysis results in sections. First, I will share the analysis results of teams and collaboration and the activity elements that were part of the design thinking process. Then I will describe issues related to organizational elements. Based on these findings and results I will revise the design thinking process. These elements will explain how the design thinking process works in the case company environment that was part of a research question. After that I will consider the connection to FEI process and tell how the FEI project team integrated design thinking to it. The research questions and material that was available in the analysis is presented in the table 3.

From the analysis categories that were mentioned in the previous chapter, I formed a framework that I then divided into engine, activity elements and organizational elements parts. The same division was done in the Koen et al. articles (Koen et al., 2014a, 2014b). I used the codes as sub-categories and thought how they would be matched with the aspects that affect innovation from the literature.
<table>
<thead>
<tr>
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<tr>
<td>Research</td>
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<td>How can design thinking be used for gathering customer insight and defining solutions in innovation process? How can service-dominant logic be applied in front-end of innovation to change the company’s mindset to a more customer-centric one.</td>
</tr>
<tr>
<td>FEI project</td>
<td>Survey results, Workshop 1: User journeys, Workshop 2: lists of what should be included in FEI, Discussed topic descriptions, Workshop 3: Further developed and validated process picture, Feedback from workshops</td>
<td>Individual analysis question by question, Discussion-based analysis with the project core team, Individual process pictures based on individual analysis by core team members, Content analysis</td>
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<tr>
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<td>Affinity diagram</td>
<td>How can design thinking be used for gathering customer insight and defining solutions in innovation process? Solutions for a specific customer group</td>
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<td>Interview data, insights, Observation video, Feedback from the ideation workshop, Prototypes, concept descriptions, Concept value chart</td>
<td>Affinity diagram, Content analysis</td>
<td>How can design thinking be used for gathering customer insight and defining solutions in innovation process? Solutions for a specific customer group</td>
</tr>
</tbody>
</table>

Table 3: The research data that was available from each part of the thesis work, how I analysed it and how it was related to the research questions and development objectives.
4.1 Teams and collaboration

It was concluded in a research that 24% of innovation success is related to teams and collaboration. Effective teams and team leadership are important parts of it. (Koen et al., 2014b) I used Koen’s frameworks to structure my analysis and wrote this chapter based on this structure. My framework drawn from the analysis categories is attached as figures 18, 19 and 20.

Figure 18: Framework for engine of innovation and the aspects that affect it. Result of content analysis.

When thinking about the effective teams, one of the most important aspects that come to mind when thinking about these pilot projects is time. The people who participated these projects were from different parts of the organization, but they still had some relation to the topics of the projects. Many were busy with their normal jobs, so these projects were thought as extra work for them. Like one interviewee said (a participant of pilot project 1):

“I think I’ve been wishing that we had a lot more time to do this because really a lot of things are happening during spring”.

The project manager and always a couple of other people were the most active ones. My role as a design lead was also requiring an active participation since the way of working needed constant explanation for not to be forgotten and slipped back to old ways. For example, after the ideation part, I had to explain why the validation is an important part of the process and should be done. Or in the beginning of pilot project 2 I had to explain why we had to interview customers and not only the internal people who had met customers.

In the future it is important to get people involved in the design thinking work by interviewing and participating the interviews. That ensures that as many people as possible learn straight from the customers and we may get more customer centric ideas and innovations. That still has to be practiced. In pilot project 2 a participant said:

“In a way everything didn’t go by the book. So that we have these needs and then we make ideas for them, but we made ideas that didn’t really relate to the
original subjects or the needs. The concepts that we now have, should we test them now and see if there are true needs for them?”

4.2 Activity elements

Koen et al. had divided the activity elements related to the aspects affecting innovation into five parts that together explain 29% of the innovation outcome (Koen et al., 2014a, 2014b). In my context opportunity identification and idea generation and enrichment were the most suitable ones. I matched other topics from the research under these categories. The framework can be seen in Figure 19.

As literature and our work in FEI project show that radical and incremental ideas should have different processes, I have divided idea generation and enrichment to those two sections. In FEI it was decided that incremental ideas are handled without a need for feasibility study (and without design thinking), I added the design thinking activities, interview, idea workshop and validation to be related to the radical box. This way there may be radical design driven innovations that combine the new technologies with the understanding of innovative meanings.

Feasibility studies are used for making decisions of whether to invest in a project or not. They can take a long time and the environment and evaluated costs may change during the time. (Yun and Caldas 2009, 73) A general feasibility study usually inquires technical feasibility (Yun and Caldas 2009, 74) but in the case company the word is used for describing the process of gathering the data about a potential project to a business case document.

Figure 19: Framework for activity elements formed from the categories from the content analysis.
4.2.1 Opportunity identification

In my codes I had “topic” which is leading straight to opportunity identification. From the interviews it was found that design thinking should be used when there is no clear thinking of how to move forward with something, when the subject is vague and there is no knowledge of the customer perspective on the subject. Most of the interviewed people thought that design thinking should be used when something new is to be done but two people had an opinion that it could be used in almost every project, not only product and service development projects.

The broad topic was considered a good thing in the pilot projects. In the pilot project 2 the topic was first narrower and as we broadened it for the interviews, it was giving us more valuable information than it would have with the original topic. Topics for new design thinking projects can be got from for example customer and market trends. A pilot 1 participant said:

“\textit{I think it is easier to start with a broad topic and then tighten it up in the meantime. Because otherwise you go to a customer and ask them, and they are not interested in that one and you really close the door and there is nothing more to discuss. But if you are open a bit broadly then everything is open}.”

4.2.2 Interviews

From the Interviews I found out that there was new information gained from the customers, so the people felt that the customer interviews were worth doing. A participant of pilot 1 said:

\begin{quote}
\textit{The broad topic opened up the discussion with the customers. They were very eager to tell about their work and their viewpoints. One interviewee commented that it was because “We were not selling anything but trying to find solutions for them”}\end{quote}

The project participants understood the phenomena of naturality and how the customers understood it when talking straight with them.

To understand the insight from the customers, it is important to be part of the analysis. The people who were doing the affinity walls (analysis) were more convinced that we got new information and not just verification for our old thinking. Regardless, all the interviewees said that we got new information. Most of the information was still confirmation for our assumptions which was also considered as good information since then people were sure that something is like they thought.
I think that communication has a big role here too. If the hypothesis is thought about together at the beginning and at the end, the new information will be proven with them in an effective way. In the second pilot we could have checked the hypothesis in the ideation workshop and reflected them to the results before starting to ideate. Instead, we only had each people’s own assumptions as individual work, so it was on their own responsibility how well they did it.

Some people were questioning if the need is proven for the concepts ideated in the pilot project 2. It remains to be seen how they will be moved forward and how they will be validated. The validation of the concepts would bring the needed statement of whether the concepts are needed and appreciated by the customers or not.

4.2.3 Idea workshop

The idea workshop participants gave us good feedback from both workshops. The most surprising feedback was that they did not expect the conversation of the workshop to be so much about services instead of products. I think that we succeeded to spread a little bit of service-dominant logic to the participants who have long been thinking in a goods-dominant logic. They were thinking about the customer and what would help the customer the most, not only about what we can do best, which is products.

Some participants told that they were relaxed because they did not have to know what happens next in a workshop and some were stressed because of the same issue. People are different and, in a project, we need to balance so that everyone would feel ok. I think that for this there could be a format or order for how to do ideation workshops but still have it under responsibility of one or two people to decide the details.

In the research interview I got confirmation for my observation that ideas are turned down very easily in the case company. The culture is not formed so that it would support the ideation. One person even told that she would have liked to turn them down even more. I’m not surprised that another person said that there were not so many new ideas. This kind of ideation should be practiced more to get the most out of it in the future. The culture needs to change.

I asked in the research interview if we could have had the same ideas without talking to the customers. Some of the interviewees said that maybe we could have the same ideas but at least we now know that it is a good one. Others had an opinion that without the inspiration from the interviews and the video in pilot project 2 we would not have got all the ideas that we now got. The customer’s point of view helps to make new ideas.
A pilot project 2 participant told me in the interview:

“The basic hypothesis was that the customers are interested in speeding up their process. The result was yes and no. And internally we did not necessarily understand this. If we did what we first thought, it wouldn’t be a hit. We can’t just assume.”

This shows that people tend to believe more strongly in their own assumptions if the evidence is not very strong for different direction. This is also why there needs to be a strong lead who is able to keep the logic and structure in a right path all the way.

If I take the conversation further from the workshop, the ideas from the workshop were developed to be more customer centric because of the knowledge gained from the customers and the customer point of view that we had gained. For example, when the concept value chart was used, we had to make sure that we understood all the potential value of our concepts for the customer. That way we could also separate the ideas that were not so valuable for the customer from the ones that were.

4.3 Organizational elements

Also in the organizational elements I used the Koen et al. division: vision, strategy, resources, culture and senior management involvement. They explain 53 % of the innovation outcome. (Koen et al., 2014a, 2014b) When talking about vision, we should communicate about the plan and vision of using design thinking in the case company. People would understand why we do it and what kind of position it should have in the company practices in the future. Also measuring and KPIs should be thought about, organized and communicated to the employees. The framework of the organizational elements can be seen in Figure 20.
In the company strategy or innovation strategy there should be clear targets and roadmaps for radical and incremental innovation (Koen et al. 2014a, 40). From the customer viewpoints we can get both incremental and radical ideas but if people don’t believe that there is a point in suggesting radical ideas, the process is not used at its most effective form. From the interviews and workshops, I got a feeling that people want to focus on the core business and more to incremental ideas because people were so careful with their ideas and did not dare to suggest anything too radical. It can also be that people are not used to ideate out of the box, which is then coming out as tame and mostly incremental ideas. The guidance for the ideas is needed from the strategy.

When the goals are communicated and guided with strategy, there should be also resources available for these innovation activities. Cooper and Sommer (2018) reported that finding resources to lead dedicated teams was a challenge in implementing agile-stage-gate models. (Cooper and Sommer 2018, 17) It became clear also in this research that this kind of projects need a facilitator (design lead) to guide the team in a proper way. The tools and methods can be used by anyone but the true value from all of this comes when the people understand what and why they are doing each step. This requires good communication during the projects.

There is a habit that the case company trusts more consultants for this kind of roles which is a pity if the knowhow can be found internally.
In the pilot projects, all participants did not feel that they were involved in the beginning when a few people defined the hypothesis and interview protocol. These could be done together with the team if possible, to ensure that everybody feels that they belong to the project team. When we talk about these more abstract projects where people need to understand phenomena etc. in addition to concrete issues, it is extremely important to keep them updated of what is being decided and what will happen next. Otherwise they will not understand the process or the value of it.

The culture must approve the time used in innovation activities. It is not a separate thing, but it belongs to normal work. Communication from management should support this as well. Senior management should be involved in the FEI process mostly in the decision making but also by supporting the culture and assuring the needed resources.

Traditionally product and service design activities are conducted by different staff separately. Thus, there are often difficulties in increasing transparency and information sharing between these activities. A suggestion from Kowalkowski is to work in cross-functional teams to integrate product and service teams. (Kowalkowski 2010, 289) In this thesis it became clear that there has to be a combined team who thinks about the whole value and experience of the customer and the ideas come from them. It is not clear in the beginning of a design thinking process what the end result will be.

If we have a rough idea of what we want to do, like we did in the pilot project 2 but we don't know what kind of solution would benefit the customer the most, we have to step back a bit and think what is the customer value that the idea will generate. What is the customer value that we want to study more closely? We have to define which customers we want to focus on and in which countries. The basic insight gathering study can be done in just a few countries where the idea could potentially be used. The validation of an idea can be made in as many countries as needed to find out if in those countries the customer's processes are similar than in the ones where the insights were gathered. If not, we can iterate the concept planning so that it will fit also to those countries' customer needs. It is of course possible to offer different solutions in different countries.

4.4 Design thinking process revision

In the research interview I asked the pilot project participants what better names for the process steps could be. I only asked about the first three steps because the projects were supposed to continue and then I could have asked about the last two steps (the answers are gathered in Table 4). Nevertheless, there were a lot of organizational changes and the projects were not finished as planned. The pilot project 1 was postponed after a short validation
round and pilot 2 was discontinued but the ideated concepts continued in some other projects by different people. The Pilot 1 continued just after the thesis was written.

<table>
<thead>
<tr>
<th>Opportunity identification (idea, challenge, problem)</th>
<th>Customer needs under chosen topic</th>
<th>Solution idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea recognition, problem, situation</td>
<td>What does this mean for the customer?</td>
<td>How will we answer the customer’s problem?</td>
</tr>
<tr>
<td>customer insight</td>
<td></td>
<td>solution development</td>
</tr>
<tr>
<td>scope</td>
<td>Interviews (it is clear that we form insights from the data)</td>
<td>idea workshop</td>
</tr>
<tr>
<td>idea, challenge, problem</td>
<td>customer needs, insight</td>
<td>solution ideas</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
<td>workshop</td>
</tr>
<tr>
<td></td>
<td>generating ideas</td>
<td></td>
</tr>
<tr>
<td>idea, scope</td>
<td></td>
<td>ideation workshop</td>
</tr>
</tbody>
</table>

Table 4: Suggestions for the first three process step names from research interviewees.

The participants had many good ideas of changing the phase names. I agree that there are a lot of words and it could be simpler. Based on the interviews people felt that the hypothesis and scoping were an important part of the process. The project manager of the pilot project 2 said that (without the scoping and hypothesis)

“We would have gone to that that with a small group we would have thought that yes, this is what we will do but not asked the customer or anybody. Traditionally it goes like that here”

Scoping and hypothesis keep the doing on a right track and remind of the original thoughts. Like I originally thought, there is a prominent difference between the old way of doing and what should be done in design thinking. In the old way, the results would be already there in the beginning. This was an issue that we had to fight against especially in the pilot project 1, that we really listen to the customers and not go with gut feelings. Therefore, we should emphasize scoping and broader topic in the process picture, thus the name of the phase could be topic and scope (see Figure 21).
Customer needs under chosen topic phase includes qualitative research methods, like the interviews and observation. When talking with the participants, they all remembered the interviews but not so much the observation. I would not want to use methods as process step names because there are many possible methods that can be used depending on the project. Therefore, customer insight and needs would be a good name for this step.

The third step, solution idea, was maybe the hardest to understand by the participants from the original naming. In practice the name could be idea workshop or ideation workshop but again, workshop is a method that can be used in this step to create ideas based on the insights from the last step. As a result, from this step, we should have one or a few good ideas that are thought a bit further than just a raw idea. Thus, we could name this process step as solution development. Solution is a word that may include products, services or a combination of this. It may be also about communication with the customer.

The last two steps were not totally validated because only the pilot project 1 had these steps. Nevertheless, I decided to leave the complicated words out and used only prototyping and validation. This way the process includes and emphasizes the core of design thinking. When this design thinking process is integrated to the feasibility study in the FEI process, there will be also the viability aspect well included in the description.

With these new words I drew a process picture for design thinking for the case company (Figure 21). I chose a circular visualization for representing the steps because it was proved especially in the pilot project 1 that the process is iterative, like it is said in literature. When the first round of prototyping and validation is done, there needs to be another scope definition when probably new insight is needed from the customers. Based on these the solution can be developed further and so on. At some point the decision has to be made that the development will be continued according to some other process preferably the product and service innovation process.
The research interviews showed that it is difficult to understand the value of the design thinking process when everything has been going “ok” with the old way. The way for understanding is simply by being involved in a project that uses the design thinking process and learning by doing. During the pilot projects there was a pressure from the management to get something to be launched. It is important for them to understand that this process may not necessarily bring new launchable product or service, but the value comes from learning and doing the right think also from the customer’s perspective. If they are not interested, we should not launch. Of course, by iterating the process, we can get something to be launched but the schedule must be understood too.

The design thinking process picture can be used in feasibility studies as a communication tool. The to-do list and schedule can be made by using the picture to understand the way of working. The FEI process description that was the outcome of the FEI project will be used to guide the activities related to front-end of innovation, where the ideas should come and how they should be handled.

The schedule of the feasibility study should be made tight enough so that the project team does not start building ideas based on their own assumptions in the insight gathering phase. In the pilot project 1 the scheduled time for the insight gathering part was about half a year. The long time enabled us to find also internal information related to the topic a lot more than what we could have gathered in a shorter time.

The insight gathering tasks were divided so that not the whole project team was participating the interviews because of time constraints in other projects. Still, about a half a year they talked and thought about the topic. They already made a lot of ideas and strengthened their
assumptions based on their old ways of thinking. I noticed this in the workshop of the pilot project 2 where people would talk a lot about their own view about the topic. At this point we should concentrate to listen to the customers and not get stuck with first ideas that come to our minds. If there are good ideas during the insight gathering phase, we should not throw them away but write them down to remember. The most important thing is still to not to get stuck with some idea that is not necessarily the answer for the customer’s needs or problems.

The pilot project participants were almost all thinking that we had a ok or tight schedule. They thought that there are no resources or abilities to make things faster. Still there were not many days when things were really happening. I think that if this is just planned early enough, the whole process could be done in four months or less (now the pilots took 4-6 months for the first half of the process). This of course requires the cultural acceptance and resources.

4.5 Connection to FEI

The official overall picture of the case company’s FEI process was drawn together with the project team (Figure 22). The form of the figure was chosen to be a triangle to illustrate the number of ideas. In the beginning there are a lot of ideas and in each phase, ideas are getting archived and only the best ones get to the point where business case is made, and project is started to implement the idea. Everything starts with strategy and innovation strategy. The process is divided into three phases, discovering, scoping and concepting and preparation of business case. The project team thought that it was also important to show the connection to the product and service innovation process, where FEI is the preparation phase.
To connect design thinking to FEI I drew my version of the process picture after the workshop 2 of FEI project. While reading all the materials, I added key words to a A6 paper to form a concise picture of all the mentioned issues. Then I added some arrows and thought how it can all be joined together. As a result, I drew a picture on quite general level, see Figure 23. It shows that company culture and strategy is giving guidelines for the whole process. Continuous work with customers and insight gathering, own employees, market and environment research, foresight methods and collaboration with external partners are helping to create ideas. They also enrich the ideation and concept creation during the “radical loop” of the process, that create radical design driven innovations.
Ideas are formed in many ways and by different people. Some ideas go straight to relevant teams such as product portfolio teams (incremental ones) and some more radical ones come to a suggested innovation management team (or so-called gate keeper). The team makes sense of the gathered ideas and groups them in relevant bundles that could lead to a concept. The innovation management team then finds an owner to the idea and (s)he or the relevant team decides whether the idea needs to go to the radical loop or through the incremental shortcut straight to the business case creation without further investigation. Design thinking comes into the game in the radical loop that includes also other activities to define the concept and find out information needed in the business case.

When we combine new technologies and understanding of innovative meanings, we can create radical design driven innovation. Incremental design driven innovations are made only on the semantic dimension. (Dell’Era et al. 2010, 22) In the FEI project it was decided to use design thinking in the radical ideas (radical loop) but in those feasibility studies, when the semantic level is researched well, it will provide also incremental ideas that can be implemented for the benefit of the customers. This is the design push approach to innovation (Dell’Era et al. 2010, 14).

The radical loop includes activities similar to the idea gathering. Customer insight gathering, market and environment research and futures thinking help in concepting the concept to be able to create a business case. Customers, employees or partners can be all included in the radical loop working. In addition to that, prototyping and validation with customers should be done in case of radical ideas. Design thinking is used in the radical loop. When using it, there
will be new ideas based on the insights and needs from this process. All new ideas that are not going further with that project should be included in the idea funnel and be evaluated.

Based on the FEI project team’s pictures and my overall picture (Figure 23) a proper process picture with swim lanes was drawn. It is so detailed and includes sensitive information that I will not attach it to this thesis. The additions from the third FEI workshop were technology scouting and yearly ideation workshops. The ideas from these workshops and technology scouting do not have to go through the gatekeeper.

When there is a radical idea or topic that needs a feasibility study, the process will go like presented in figure 24. After the gatekeeper gets the idea, s(he) filters and categorizes it to be sent to a responsible team or person to be evaluated. If the evaluation is favourable for the idea, the concepting can start. This is when design thinking process is used. When there is enough information from the design thinking process, there is a check for desirability, feasibility and viability for being able to know if the business case is needed. Business case is written and approved by the Offering Management Team of the case company. If an idea is incremental, it does not have to go through the concepting phase and the business case can be made after prioritization.

Figure 24: A process description for an idea where feasibility study and design thinking are needed.
5 Conclusions and discussion

In this thesis I studied how design thinking fits to a front-end of innovation process. FEI process is usually visualized as a funnel where ideas are finding their way towards implementation, and only few can get through. The process is often unstructured and fuzzy. (Koen et al. 2001, 49, 2014b, 25) Design thinking can give more structure to this evaluation work as it can be used as a process to find insights to be able to develop the idea further. Nevertheless, it is not a linear process that would be easy to visualize as such (Liedtka 2015, 927; Nonaka et al. 2018, 10-11). Based on the data gathered during this thesis, a non-linear visualization of FEI where design thinking is integrated in, was drawn.

A design thinking process for the case company was drawn and tested in two pilot projects. After that the process was reframed according to the test and qualitative interview results. By using design thinking in the FEI phase of innovation, it was easier for the project participants to think about the customer value as dependent on the customers themselves and not just something the company gives. The idea is to co-create value with the customers.

Service-dominant logic was applied also in the research part of the thesis. The value of a process comes from using the process and not when creating it. The user of the process is a co-creator of value and needs to have enough understanding and skills for using it right. Therefore, it is important to have a facilitator for these projects also in the future. The case company mindset is currently more goods-dominant but slowly the discussion has been changing towards more service-dominant mode. The use of design thinking and focus on customer helps in this change.

In addition to service-dominant logic the thesis was based on literature of service design, design thinking and front-end of innovation. A service design double diamond model by Design Council was used firstly to think about the design thinking process and secondly as the research process for this thesis. Also, the FEI process was conducted based on the double diamond model.

The process started with finding out the case company needs for design thinking process. Based on them, a design thinking process was drawn. The process was used and tested in two pilot projects. Six participants of these projects were interviewed to find out what they think about design thinking and how it fits to the case company. Based on the interviews, also the process picture was reframed.

During the pilot projects, a FEI project was executed targeting to reframe the front-end of innovation process of the case company. Three workshops were organized first to understand how the current process is working, then to think about how the new process should be and then to test the new process. Between workshops the project team was analysing results and
drawing process pictures. At the end, there was a process description where design thinking was integrated in.

5.1 Discussion of the main findings

In the chapter 2 the theoretical background was presented and explained how it relates to this thesis. A visualisation of that can be seen (again) in Figure 25. Based on the principles of service-dominant logic I brought design thinking to the Front-end of innovation process of the case company. I did not find much literature on how design thinking has been integrated to stage-gate innovation processes or any hybrid model descriptions and this is why I got interested in agile-stage-gate hybrids that were studied more.

![Diagram](image_url)

Figure 25: The theory framework of the thesis. Service-dominant logic serves as a base for FEI development through design thinking and service design. Finally, that affects on the company FEI process.

The design thinking process is not a linear process (Liedtka 2015, 927) and cannot be linearly attached to the FEI process. Even if we could show the path of one idea or topic linearly, when talking about the whole process, we should show the iterative nature in the visualization. The new ideas created based on the insight gained in design thinking project but not developed further should be added to the beginning of the FEI process. Of course, archiving ideas at any stage is possible. When utilizing the design push like this (Dell’Era et al. 2010, 22), we can take advantage of the incremental ideas gained in the radical projects where it was decided to use design thinking.
Service-dominant logic applied in process development offers a new perspective on how the value of the process is produced in the use of the process. As S-D logic’s 3rd premise, “Value is always uniquely and phenomenologically determined by the beneficiary” (Vargo and Lusch, 2004), Employee experience has its share on the experienced value even though the financial results are still what usually determines the value of innovation process in the case company. The employee acts as a co-creator of value so it is important that (s)he knows what should be done and how. Therefore, the terminology is important in process descriptions. The design thinking process was visualized in company language. It was noticed, that the company language changes over time when for example strategy changes.

The perspectives of employees should be considered when developing processes alongside those of the company and other stakeholders. This requires an approach that consciously takes the employee experience into consideration in the development. In this thesis this approach was taken in the design thinking and FEI process development. Employees use the FEI process when wanting to make progress in the area of innovation. The value is created when the employee experience is good, and idea goes further efficiently, and also the later stages of innovation process can be used.

Alam (2014) and Cooper et al. (2015) suggest using new models in processes to stay relevant in the ever-changing markets. After using design thinking to the fuzzy FEI that was described as a stage-gate model, it was clear that there are benefits of using it. Problem definition is one of the three key challenges in FEI (Calabretta and Gemser 2015, 105) and using design thinking tools and methods, we could make it easier in the pilot projects. Product definitions and development plans were a challenge in agile-stage-gate hybrid implementation (Cooper and Sommer 2018, 17). Design thinking is tackling the semantic level of innovation and with the tools and methods the plans and products are easier to describe.

Other key challenge in implementation of agile-stage-gate hybrids was to find resources to lead dedicated teams. (Cooper and Sommer 2018, 17) and this came to be true also in this case research. There needs to be a facilitator who takes responsibility of the process and logic used in the projects where design thinking is used.

A key challenge in both FEI and agile-stage-gate implementation was management commitment (Calabretta and Gemser 2015, 105; Cooper and Sommer 2018, 17). That was a challenge during this thesis as well and integrating design thinking into FEI did not bring solutions to that. Also, the design thinking-stage-gate hybrid built in the thesis needs commitment from the management to use the time, employees and money needed in these projects.
Introducing new design thinking tools and methods to the employees is not enough because the new way of doing and thinking must be aligned to the company culture. (Suciu and Baughn 2016, 787) This challenge came into realization during the pilot projects when the process steps and customer point of view had to be repeated and repeated to get the people do things in a new way. But I noticed that a few of the active people in the pilots started to change their own thinking during the process towards S-D logic. Towards the end, they were justifying the design thinking to others. It takes time for design thinking to be part of the case company culture but when it is pursuit systematically, it can be achieved.

5.2 Reflection on the used methods

Case study quality can be evaluated with the concepts of trustworthiness, credibility, confirmability and dependability of data (U. S. Government Accountability Office, 1990). Tests regarding construct validity, internal and external validity and reliability can be done to evaluate the quality (Yin 2009, 40–41) In this case study I had a single case design with two embedded units of analysis in the same context. The credibility of the study could have been better if I had used multiple cases. Considering the circumstances that I was doing this thesis for one company only, it was not possible to use a multiple case design in the research. Nevertheless, I had multiple sources of evidence and data that were used in the research.

I wanted to make the change in the case company. This may cause a bias for seeing positive changes more than there is or interpreting data in a favourable way. I was also taking part in all of the three projects, so I was contributing to them a lot and maybe I could not see things objectively all the time. Two projects were chosen to be the pilot projects related to the thesis. The results could have been slightly different with some other projects. Having two units of analysis and getting similar results in them with different set of people gives more construct validity to this study.

We used co-creative workshops in all the projects to understand people, to utilize the knowledge and to share the process and methods inside the case organization. Also, we wanted to improve the corporate culture and make it more collaborative and non-siloed. This work must be continued in other projects to make a difference. All in all, people liked the workshops and contacts with customers. Also, we got valuable information and insights from the employees during the workshops for the pilot projects, FEI development and this thesis research.

Interviews was a good choice for gathering information from the pilot project participants in addition to general observation during the projects. There was more specific information about how people experienced the different steps of the process and how they thought it
could be better. I think that the people were honest and did not lie about how they felt or thought since there were also negative comments.

Observation was another method used in the pilot projects and research part. When people know that somebody is observing them, they change their behaviour (Kumar 2014, 173-175). This might have happened in the pilot project observation but still I believe that we got a lot of relevant information from the field, even surprising information. It was also very good that we were helping the customer in his work and not just watching. It made him trust us more and to be more open towards us. When I made the video about the day, I might have interpreted something differently and included parts than somebody else would not have. Regardless, as I did not interpret the data totally by myself but used raw video data to show in the workshop for others to analyse it as well, the interpretation bias was not so strong.

Considering the observation made for the research part of the thesis, I could have defined in advance what I would have liked to observe in the pilot and FEI projects and have a list where I could have made notes every time after interactions with the project team. I would have got a lot more data and while not writing it down, I have probably forgotten some of the gained information. Also, as I was not all the time aware of my task of observation, I may have missed some pieces of information related to my research.

5.3 Usability and transferability of the methods and results

Single case studies have poor statistical generalizability according to critics but analytical generalizability can be good (Yin 2009, 43). There is research literature of design thinking in companies as innovation activities but not so much about how the design thinking process has been integrated to the innovation or FEI process. For knowing on a general level if the combined process suggested in this thesis would work, it should be tested in other companies as well. The whole process should be also tested in the case company to know if the defined FEI process works as a whole, so far we know that the feasibility studies with design thinking work.

The used methods and processes can be used in other contexts as well. For example, the FEI project process where the process was enhanced by understanding the user needs and pain points would be a well-suited process for other kind of process development projects as well. The design thinking process could be used in other companies as well, but the language should be checked so that the users understand it better. Of course, if there is a design facilitator, who will take care of the process and translate it to company language, all the users don’t have to even use the process picture.
The frameworks that I used in my analysis could be used in other organizations as well to evaluate the different aspects affecting to innovation. The frameworks can be used as a starting point for investigation and development process. As I did not take all aspects into my framework from the study by Koen et al. I would suggest adding them also to the framework when using it as a starting point for an organizational research.

The tool that was developed for pilot project 2 to help with understanding the value of the concepts, concept value chart (explained in chapter 3.2.8), can be used in other similar situations. It could be used to evaluate an idea before and after customer insight gathering. The interview questions and hypothesis can be made using the chart for structuring a fuzzy concept idea in a systematic and customer-centric way.

The results from this thesis are from one case company but my assumption is that the results can be still used in other traditional manufacturing-based companies as well. This thesis assumes that design thinking is the best methodology to use in FEI process. Other methodologies have not been evaluated. Also, a combination of methods could be possible such as design thinking and agile together in feasibility studies.

For evaluating reliability, one should think if the study could be done again with the same results. The description of the study and used methods should be well written to be able to do the same things again. (Yin 2009, 45) I believe that I have succeeded to narrate the way of working quite well in this thesis report so that it could be possible to do it again.

5.4 Contribution and further research

This thesis is an exploratory research of how stage-gate and design thinking can be used together in a FEI process. Not much previous research could be found on this topic even though design thinking has been researched a lot in recent years. The hybrid of design thinking and stage-gate in FEI could be tested in a similar way than the agile-stage-gate hybrids have been tested in multiple companies.

For the case company this work has been a starting point of a change from goods to service-dominant logic. Some workshop participants were disappointed after an ideation workshop that we had talked only about services and not about products. This shows that the focus was really on what the customers would need the most and what we could offer them to help them. The case company has great products and this time the biggest problems were not related to them. By practicing this design thinking mindset and customer view in feasibility studies, the case company can gradually become more service-dominant by the culture.
The implementation planning for the reframed FEI process has been started. The design thinking process will be used with the radical ideas and some projects are already ongoing. By planning a vision and a roadmap for the use of design thinking in the company and following the execution there might be better results from using it. In the future it can be used also in other kinds of projects like internal service development, process development and incremental innovation.
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<table>
<thead>
<tr>
<th>FEI results from the survey and the workshops</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ownership of ideas is forgotten during the process</td>
<td>The idea ownership should be traceable during the process, idea sh</td>
</tr>
<tr>
<td>Ideas are handled often only in meetings → slow</td>
<td>Responsibilities for idea evaluations should be clear and effective</td>
</tr>
<tr>
<td>Ideas come from different sources and people do get them</td>
<td>Embrace all ideas that we have</td>
</tr>
<tr>
<td>People do not know what an idea is</td>
<td>Educate people about the process and the targets related to it</td>
</tr>
<tr>
<td>No ideas in the current ideation tool</td>
<td>Establish a culture building process while implementing the proce</td>
</tr>
<tr>
<td>Evaluators are not active</td>
<td>Make process easier for evaluators and decision makers</td>
</tr>
<tr>
<td>Idea recording is challenging, the threshold is high</td>
<td>Lower threshold for idea recording</td>
</tr>
<tr>
<td>Decision making is challenging</td>
<td>Make process easier for evaluators and decision makers</td>
</tr>
<tr>
<td>No visibility to idea handling</td>
<td>Make process visible</td>
</tr>
<tr>
<td>Meetings and workshops are working well</td>
<td>Take advantage of workshops</td>
</tr>
<tr>
<td>General ideas generate more meetings than precise ones</td>
<td>Make the process for more general ideas clearer</td>
</tr>
<tr>
<td>Starting the implementation takes a long time</td>
<td>Think about the time schedule of FEI</td>
</tr>
<tr>
<td>Criteria for making decisions are not clear</td>
<td>Base decision making on strategy and innovation strategy</td>
</tr>
<tr>
<td>Different customer segments have different decision making processes</td>
<td>Combine different processes into one</td>
</tr>
<tr>
<td>People don’t understand the connection of the work to the innovation process, even though they do it</td>
<td>Educate people about the process and the targets related to it</td>
</tr>
<tr>
<td>Process is not connected to everyday work</td>
<td>Connect innovation to the culture</td>
</tr>
<tr>
<td>Innovation strategy is not existing</td>
<td>Make sure there will be one and people know where to find it</td>
</tr>
<tr>
<td>Teams are not so often thought to bring up ideas</td>
<td>Improve culture and attach ideation to working teams, organize wi</td>
</tr>
<tr>
<td>People feel that ideas are not often implemented</td>
<td>Reasons for implementing or not implementing should be clear</td>
</tr>
<tr>
<td>There are tens of different ways to start pushing an idea further</td>
<td>New FEI process that is used for all ideas</td>
</tr>
</tbody>
</table>
Appendix 2: Questions in the design brief used in both pilot projects.

<table>
<thead>
<tr>
<th><strong>Project description</strong></th>
<th>What is the project about? What do we want to do?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intent scope</strong></td>
<td>What are we focusing on?</td>
</tr>
<tr>
<td><strong>Research questions</strong></td>
<td>What are the main things we would like to know?</td>
</tr>
<tr>
<td><strong>Target users</strong></td>
<td>Who are we targeting the possible outcomes of this project? Who is our customer?</td>
</tr>
<tr>
<td><strong>Research plan</strong></td>
<td>What kind of methods will we use in the research?</td>
</tr>
<tr>
<td><strong>Expected outcomes</strong></td>
<td>What are we expecting to get out of this project?</td>
</tr>
<tr>
<td><strong>Success metrics</strong></td>
<td>How do we know if we have succeeded in this project or not?</td>
</tr>
<tr>
<td><strong>Project planning</strong></td>
<td>What is the rough schedule and plan for what to do and when? Who is involved?</td>
</tr>
</tbody>
</table>
Appendix 3: Person card template used in the pilot project 1.

ID:

- AGE:
- TITLE:
- BACKGROUND:
- SPECIALTY / GOALS:
- CLIENTS:
- TYPICAL PROJECT:

"... quote ...

Attitudes towards the topic at hand: Challenges & Opportunities with the topic at hand: Key influencers in decision making:
Appendix 4: Assumptions for the research interview at the end of pilot projects.

1. The project steps are thought to be understandable and in good order and good phase names.
2. The process should be faster than 6 months per half process.
3. There is a need for a facilitator, who will take care that the projects are done customer centrically.
4. There was new information from the customers.
5. The concepts were better than what we would have done otherwise.
6. The hardest part was to understand why we do things like we do and to explain that to others.

The company is on the first level in the design value scorecard and affects on the development and delivery and organization levels. Wants to grow with this. 

Research interview questions
Appendix 5: Questions for the research interviews for project participants after ideation phase of design thinking process.

The target for this interview is to validate the process and the process picture. The master’s thesis topic is about integrating design thinking into the front-end of innovation process.

Opportunity identification (idea, challenge, problem) -phase
How was it decided that this topic was the one that we want to take forward?
How did the topic find it final form?
Was the topic and plan clear when the study was started?
How did it feel to make hypothesis?
Were the hypothesis useful?
Would you do something differently in this phase?

Customer needs under chosen topic -phase
Were you convinced that we would get more information from the customers by asking?
Was it good to have many interviews in different countries at the same time?
How did you feel when you had to interview?
How did the customers feel about us asking them questions?
Did we get a lot of new information from them?
Were there differences between countries in the gained information?

Solution idea -phase
How was the idea workshop?
How did people from different countries deal with the ideation workshop?
Do you think that there should be a pattern for an ideation workshop or should it be always thought separately according to the situation?

Overall (half) process
Draw your moods in the process picture. How did you feel during the project first part?
Is the process picture understandable and clear (in company language)?
Do you understand the meaning of each phase with these words? Do you have change suggestions?
Are the phases in right order?
How did you feel starting this project in a new way of working?
What kind of schedule did you have? How should it be?
Could we make it faster?
How did the consultation company deal with their work? Were they useful?
What kind of help is needed in the future when this kind of process is used?
Would it be good if we had an internal resource (or some resources) that would take care of the design part of the pre-study projects?
In what kind of projects would this kind of process be useful?
Was there something useless? Was something missing?
Were the concepts different from what they could have been without this process?
What was the hardest part of the project? Why?

Business-related questions
Look at the design value scorecard and think aloud where we are and where would we want to be.
What are strategy and priorities at the moment that relates to design?
How could the progress be monitored?
How does this process fit to them? What is design’s role in delivering the results?
How does design create value?
What could be tracked?
## DESIGN VALUE SCORECARD

<table>
<thead>
<tr>
<th>Level of Design Org Maturity</th>
<th>Attributes</th>
<th>DEVELOPMENT AND DELIVERY</th>
<th>ORGANIZATION</th>
<th>STRATEGY</th>
<th>STRATEGY and Business Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Optimized</td>
<td>Processes Proactively, Continuously Improved</td>
<td></td>
<td></td>
<td></td>
<td>Vertically, group will be more productive, improve quality, reduce risk and waste</td>
</tr>
<tr>
<td>4 Managed</td>
<td>Processes Modified/Varied Based on Feedback</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Defined</td>
<td>Processes Standardized</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Repeatable</td>
<td>Basic Project Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Initial/Ad Hoc</td>
<td>Heroic Efforts</td>
<td></td>
<td></td>
<td></td>
<td>Horizontally, group will have broader influence and impact</td>
</tr>
</tbody>
</table>

**Aesthetics**

**Functionality**

**Connector**

**Integrator**
Appendix 6: Content analysis working in Excel. Different colors represent different interviewees and the answers have been divided under codes.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process steps, names</td>
<td>Process timeline</td>
<td>Project timeline</td>
<td>Facilitator, help</td>
<td>Information from customer concepts, DT vs. old method</td>
<td>Hardest parts of the study</td>
<td>Notes</td>
</tr>
<tr>
<td>Yes, I think so.</td>
<td>&quot;And do you think that I think I've been well but it might also be...&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, they are really under...</td>
<td>En tiada mitten jos olisi oso. Joten vii on tekaa. Sometimes I think it. They really opened up and I think that's really difficult.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joo kun vaatias ja nimi</td>
<td>Muuk taimi holmi</td>
<td>&quot;Yeah, and then this thing they've been, because normally if you have...&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No idea tunnitaminen.</td>
<td>Voinkin sii semmo...</td>
<td>&quot;I think somehow the... you mean before. Yeah, I think I think if you...&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Se tarkempi määrittelevi ko</td>
<td>Help post</td>
<td>&quot;Maybe it could be like... it was not that...&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joe tietäminen kun ses on</td>
<td>Lohjattu organisation</td>
<td>Pähkinä kun jokin te. We have a lot of le...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ona on äärimmäinen. Sii on sitte</td>
<td>Perkk oli olos voimistumisen joki</td>
<td>&quot;Yeah I think so. I was thinking...&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toi on ihana hyvä</td>
<td>Noppeaampaa kun 3 kpl ihäri on ollut...</td>
<td>&quot;I think that it is value because it's not direct question that you...&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer needs under c</td>
<td></td>
<td>Koko projektin puolelta hyödyttävät tekijät</td>
<td>&quot;Oh, ago. Small need. I...&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

< All | findings | Workshop | Where why | Attitudes | Countries | Topic scope | learning | communication >