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Unleashing the creativity of non-professionals

Co-design as a method of innovation

Marthe Svendsen

Master of Science in Entrepreneurship
Submission date: June 2018
Supervisor: Lise Aaboen, IØT
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Abstract

This thesis explores co-design as a methodology for innovation processes involving non-professionals. Co-design as a method of innovation is increasing in popularity and becoming more widespread (Sanders and Stappers, 2016, Steen et al., 2011).

In order to include everyday people in innovation processes by the use of co-design, knowledge on the experience of participation is necessary. However, there is a gap in the theoretical field of co-design concerning the experience of participants.

The purpose of the thesis is therefore to explore co-design processes. To fulfill this purpose, three research questions has been developed: 1. How is a co-design process performed? 2. How is a co-design process experienced? 3. Which factors affect a co-design process?

The empirical material consists of ten interviews and nine hours of observation. In response to the purpose of the thesis, the author has compared two different innovation processes, which have been analyzed by a co-design framework. Process one was conducted by a multidisciplinary team at a Norwegian university, and process two were conducted by a multidisciplinary team at a college in the Netherlands. The methodological approach has been qualitative and exploratory, and two separate within-case analyses has been conducted, as well as a cross-case analysis.

The analysis reveals important similarities between the two processes. In both processes the teams are struggling with performing abduction, as well as identifying a real problem or user need in the research phase of the process. The teams also need much closer facilitation in the phases of analysis, concepting and prototyping. Another important finding is that participants want restrictions on the process, but not on the final solution. The thesis reveals that factors that influence the co-design process has shown to be mainly three; the facilitators, the design of the presented challenges and the client, which again influence the motivation of the participants.

The thesis lastly presents an updated process model of co-design based on the findings from the empirical data review.

Sammendrag

Denne masteroppgaven utforsker co-design som en metode for innovasjonsprosesser som involverer ikke-profesjonelle. Co-design som metode for innovasjon øker i popularitet og blir stadig mer utbredt (Sanders and Stappers, 2016, Steen et al., 2011).

For å inkludere disse menneskene i innovasjonsprosesser ved bruk av co-design, er kunnskap om deltagernes erfaring nødvendig. Det mangler imidlertid forskning på deltagernes opplevelse av å delta i en co-design prosess.

Formålet med oppgaven er derfor å utforske co-design prosesser. For å få til dette har forfatteren utformet tre forskningsspørsmål: 1. Hvordan blir en co-design prosess utført? 2. Hvordan blir en co-design prosess opplevd? 3. Hvilke faktorer påvirker en co-design prosess?

Det empiriske materialet består av ti intervjuer og ni timers observasjon. For å svare på formålet med oppgaven har forfatteren sammenlignet to forskjellige innovasjonsprosesser, som har blitt analysert med et co-design rammeverk. Prosess en ble utført av et tverrfaglig team ved et norsk universitet, og prosess to ble utført av et tverrfaglig team ved en høyskole i Nederland. Oppgavens metodologiske tilnærming er kvalitativ og utforskende, hvor både en intern analyse av hvert case har blitt utført, samt en sammenligningsanalyse av begge casene.

Analysen avslører viktige likheter mellom de to prosessene. I begge prosessene sliter lagene med å gjennomføre abduction, samt identifisere et reelt problem eller brukerbehov i prosessens undersøkelsesfase. Gruppene trenger også mye nærmere fasilitering i analyse-, konsept- og prototypefasen enn fasilitatorene tilrettela for. Et annet viktig funn er at deltakerne ønsker restriksjoner på prosessen, men ikke på den endelige løsningen. Oppgaven viser at faktorer som påvirker co-designprosessen har vist seg å være hovedsakelig tre; fasilitatorene, utformingen av problemstillingene og klienten, som igjen påvirker deltagerens motivasjon.

Oppgaven presenterer til slutt en oppdatert prosessmodell for co-design basert på funnene fra den empirisk data gjennomgangen.

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Introduction

This chapter will explain why the topic of the thesis is important, and clarify the link between innovation and co-design, why co-design is increasingly popular, look at the need for co-design research as well as present the purpose of the thesis. Finally, the structure of the entire thesis will be explained.

The creativity of non-professional creatives as a resource

There is a rising trend for everyday people to want to participate in activities that enable them to experience and express their own creativity (Sanders and Stappers, 2016). Everyday people not only want to participate in creative experiences on a private basis, but also want to express their creativity in dialogue with the companies they are customers of (Prahalad and Ramaswamy, 2004). However, despite the fact that everyday people want to participate in creative experiences, and the fact that consumers themselves are a major source of product innovation for companies (ibid), everyday people remain an untapped resource for most companies (Von Hippel et al., 2011).

Design is a broad field, defined as the plans and processes required to create something new (Giacomin, 2014). Co-design, defined as "the creativity of designers and people not trained in design working together in the design development process" (Sanders & Stappers, 2014, 8), is a way for organizations to tap into the resource of everyday people. Co-design is based on the belief that all people are creative and can contribute to design if given the appropriate setting and tools (Vaajakallio and Mattelmäki, 2014). The people formerly known as end-users are being acknowledged as experts of their own experience (Sanders and Stappers, 2016) and seen as crucial to include in the design process when developing new products and services. Not only to the testing of prototypes and for feedback of services, but already at the early front end of the design development process, which can lead to positive, long-range consequences (Sanders and Stappers, 2008).

Co-design as a method of service innovation is increasing in popularity and becoming more widespread (Sanders and Stappers, 2016, Steen et al., 2011), and especially public services are starting to see the advantage of using co-design as a way to create new services.

Innovation and Design: two sides of the same coin

Short, time-limited innovation processes have experienced great popularity in recent years (Nguyen, 2016), with a focus on quick validation process, typically lasting for a week instead of as several months, as it traditionally were (Jacko, 2007). These processes were popularized by Google Venture (Knapp, 2016) introducing their own "Design sprint" process to produce viable solutions within five days (Sari and Tedjasaputra, 2017). The process is based on methodology from Design Thinking, which is simply described as *how designers go about thinking and doing things* (Brown and Katz, 2009) (Kimbell and Street, 2009).

Design thinking methodology has gained foothold within the innovation and start-up environment the recent years (Nguyen, 2016). Design and innovation processes can therefore be said to have come closer to each other, which explains why the terms *innovation sprints* and *design sprints* are often used as synonyms (E.g. p. 92 and 93 in Ma & Morris, 2017). With this as a background, the author argue that there are many similarities between design- and innovation processes, which makes it reasonable to see them as two highly overlapping fields.

The benefits of co-design in the public sector

Co-design, is seen as a way for public services to respond to the increased pressure from contemporary societal challenges (Bradwell and Marr, 2008) (Yang and Sung, 2016) (Donetto et al., 2015) (Ødegård, 2015), such as the increase of elderly, the cost reduction in public welfare services and the increased pressure to deliver more integrated and seamless health care services.

Co-design is also seen as a way to combat the disengagement and disillusion from citizens to the public services (Bradwell and Marr, 2008). Co-design can transform citizens from a traditional role of passivity and dependence on *the paternalism of professionals* to become more empowered and active persons (Cribb and Gewirtz, 2012*)*. The process of co-design is valuable for the legitimacy of the public sector (Voorberg et al., 2014, Vaajakallio and Mattelmäki, 2014), and is therefore often seen as a goal in itself (ibid) . This corresponds with citizens of several countries` statutory rights of user participation, where the person receiving a service is entitled to participate in the planning, implementation and evaluation of the service (Kjellevold, 2015). Furthermore, co-design can create a new discursive space that breaks down

sociocultural, professional and personal hinders to communication, both between citizens and different levels of service staff, and with designers that facilitate the workshops. (Iedema et al., 2010).

The benefits of co-design in the private sector

Also in the private sector is co-design seen as a method to include the end-users in the innovation process. As earlier mentioned, everyday people remain an untapped resource for most companies (Von Hippel et al., 2011). If organizations include and encourage their end-users to actively be a part of their innovation processes, they will have a large group of creative people that can serve as an unexpected source of free innovation ideas and prototypes (ibid.). This way of interacting and bringing the consumer into the creative processes of a company and thereby allowing them to better understand their customers' needs and co-create unique experiences with the customer, can be a new source of competitive advantage (Prahalad and Ramaswamy, 2004, Von Hippel et al., 2011). In addition, the more a customer gets involved in the service provision, the more likely this service is of evoking co-ownership which in turn will results in increased customer loyalty and long-term engagement (Schneider et al., 2012).

A need for research on the experience of participation in co-design

Service design and co-design are growing in popularity and are becoming more widespread (Steen et al., 2011), but there is still a lack of research on the experience of the participants of a co-design process. This makes it challenging to know how to involve non-professionals into the process of co-design in an appropriate way, leaving it up to every single organizer to decide herself.

Knowledge on how to better adjust the co-design process to fit the needs of the participants is of great importance, as an enjoyable creative experience is an important factor in supporting people in the generation of creative contributions (Prahalad and Ramaswamy, 2004, Füller et al., 2011, Von Hippel et al., 2011). Furthermore, a failure to create a positive experience for the participants of a creative activity will therefore reflect the poor quality of the creative contributions or the quality of ideas (Füller et al., 2011).

Design tools and processes have also been criticized to be "made by designers, and for designers" (Rygh, 2017), meaning that participants without creative training doesn't always understand how to perform the different parts of a process. It appears as a paradox that co-design as a discipline has a great focus on user centeredness, but there is still a lack of research on the users of a co-design process.

One of the most important principles of co-design are said to be the belief that all people are creative and can contribute to design, given they have *the right setting and tools* (Vaajakallio and Mattelmäki, 2014, Sanders and Stappers, 2008). There is a accumulating body of literature on co-design tools, but still little research on *the setting*.

Some relevant questions then emerges; how is the process of co-design performed by the participants? How is the setting of co-design perceived by the participants? Which factors affect the setting?

Purpose

The purpose of the thesis is therefore to explore co-design processes. This thesis aims to fill this gap in the current literature; the lack of research on the experience of participants in a co-design process.

To enable this, the purpose has been clarified by formulating three research questions.

RQ1: how is a co-design process performed?

By performed, the author emphasizes the activities performed by the groups. To find out how a co-design process is performed, the author focused on what can be observed; what the participants say and what the participants do. The performance is something that happens mainly in interaction between the participants and is therefore fully observable. To investigate how a co-design process is performed is an important step important in order to answer the purpose of the thesis, as co-design processes are activity-based, and therefore consist largely of what the participants say and do.

The next research question is the following:

RQ 2: how is a co-design process experienced?

By experienced, the author refers to how participants experience the process at a personal level. This research question focuses on individual experiences, which relates to the participants' thoughts and feelings. There is also an evaluative aspect related to this research question, linked to the fulfilled and unfulfilled needs of the participants along the process. Exploring how participants experience a co-design process is important in order to respond to the purpose of the thesis. This is because the participants' experience of the process affects how it is performed, as well as the motivation of the participants.

The last research question is the following:

RQ3: which factors affect a co-design process?

The author chooses to have a broad definition of factors, including all of the people, activities, situations and other variables that could affect the process. It will focus on external factors, i.e. those outside the team members themselves. This research question will be answered by means of an exploratory research design, and the significant factors will therefore arise from the data material. This research question responds to the purpose of the thesis because it is important to look at co-design processes as part of a larger context, thus considering how this context affects the process.

These three research questions together support the purpose of the thesis, which is to explore co-design processes.

Chosen context

To achieve this, the author will compare two different innovation processes; one with co-design as methodology, and one innovation process not following any particular methodology. Thus, a structured process and an unstructured process can be compared.

By comparing these two processes, the thesis can reveal interesting differences between these two processes and the participants' experience of them. One of the innovation processes was organized as a part of a collaboration between a Norwegian university and a local hospital, while the other was directed by a college in the Netherlands.

The reason why these two processes were chosen for comparison were their similar outlines. Both processes were set up as innovation challenges where interested could sign up and then get a team for working. They both also had a timeframe of two weeks. In addition, they were both built around challenges that the registered teams would work on to find a solution. As the arrangements were aimed at students and non-professionals in innovation, both were based on the assumption that non-professionals can contribute to innovation, and therefore fits well with the context of co-design. By non-professionals the author refers to people without a background or training in any type of innovation work.

A qualitative approach and a multiple-case study design is chosen to answer purpose of the thesis. By the case studies the thesis aims to give insight on the topic of how co-design processes are performed and experienced by the participants, and which factors affect the co-design process.

Contribution

The author aims to contribute literature to the academic field of co-design, by how a co-design process is performed and experienced, as well as investigating which factors affect a co-design process. To find out, it is important to look at the participants' experience of the process. By analyzing two innovation processes with a co-design framework, the author wants to increase knowledge about the different phases of a co-design process, and how they are perceived.

The author will also propose a co-design process model that shows how a co-design process can be structured, as well as which factors affect the process. In this way, future co-design processes can be better adapted to the needs of the participants, as well as knowing which external factors needs to be taken into consideration when planning and performing a co-design process. Thus, the author wishes to contribute to the literary field of co-design, but the aim of the thesis is also to offer practical implications for the practitioners of co-design.

Structure of the thesis

In the next chapter the thesis will present all relevant literature from the field of co-design. Based on the literature on process models, a co-design process model will be presented. Following, the methodological choices and research design will be presented. After, the empirical data review will be presented, with data from two different innovation processes. Then comes the analysis chapter where a within-case analysis is performed for each process, as well as a cross case analysis that analyses similarities and differences between the processes. In addition, the analysis looks at the factors that have affected the processes. Based on this, an updated co-design process model is presented that takes into account the findings from the analysis. Following is the conclusion of the thesis. The thesis finishes with a chapter which discuss the findings and the research's contribution, implications, limitations as well as suggestions for further research.

This chapter has presented reasons why the chosen topic is important, clarified the link between innovation and co-design, explained why co-design is increasingly popular, considered the need for co-design research as well as presented the purpose of the thesis. The next chapter will present the theory necessary to understand co-design and the theory used to analyze the empirical data.

Theory

This chapter gives an overview of the literature on co-design. Before the chapter starts explaining co-design, it is important to give a brief and general understanding of what design is. The introduction to design will act as the context for understanding co-design. Co-design is largely based on general design principles, and several types of design literature is therefore used in the theory chapter.

The theory chapter start by focusing on design and how the design field differs from the field of science. The chapter will then look at co-design and the background of this emerged field. Furthermore, the author will explain how co-design differs from other fields of design, and then present different definitions of co-design. The author will thereafter look at what the literature says about existing co-design principles. The theory chapter will then consider what the literature says about different phases of a co-design process and the related activities. An overview of the phase division of various design and co-design processes will then be presented, and the chapter will be ended with proposing an integrative co-design process model. The whole theoretical section on co-design will serve as the framework for analyzing the empirical data.

Design

The word design has been defined in a broad range of ways. From the abstract conception of a thing to the actual plans and processes required to achieve the specific thing (Giacomin, 2014). The word is also used in a broader sense to describe the driving force of creativity (ibid).

The field of design has actively been trying to promote a distinction between design and more traditional disciplines of science (Cross, 2001). A distinction is made in particular between the scientific method and the design method (ibid). This is because scientific method deploys problem-solving behavior as means to find out the nature of what exists, whereas design method is a tendency of inventing things, which do not yet exist (Gregory, 1966). Design is concerned with envisioning and realizing alternative situations, and therefore deals with both facts and values (Steen, 2013). In the field of design a broad acceptance exists of combining

thinking and feeling as means of solving problems and inventing solutions as opposed to traditional science (ibid).

Co-design

Changes the field of design – the arise of co-design

The field of design has undergone some major changes the last years, which has led to the whole design process also changing as a result (Sanders and Stappers, 2016). The large front end of design (often referred to as *fuzzy front end*) has been growing and gaining greater importance (ibid). This is the part of the design process where inspiration and exploration takes place, and where most aspects of design are still very open.

Another important change is that designers are being increasingly asked to join and lead teams that are faced with very large challenges, often consisting of *wicked problems* (Rittel and Webber, 1973). Such problems are often to be found in health care, public health and socio demographic challenges. This demand has led to the new and emerging design disciplines responding by being bigger and more ambitious than the traditional disciplines, which has mostly dealt with products and the aesthetics of products (Sanders and Stappers, 2016). The new design disciplines require the collaboration of people with different backgrounds, including both designers and non-designers. The shift is going from a user-centered (but still designer- and researcher-driven) design process to one based on collective creativity (ibid).

Co-design is a design field that has emerged as a result of the new, societal challenges and demands. Co-design has grown in importance in the past years, and so has the range of methods and tools related to this field of design (Sanders et al., 2014). The field of co-design is expected to increase and also mature rapidly in the coming years (Sanders and Stappers, 2016). Another general change in the field of design is an increase lately, in the practice of co-design at all stages of the design process (Sanders and Simons, 2009).

How it differs from other fields of design

Co-design did not emerge from a single direction, but borrows and builds upon several directions within design (Sanders and Stappers, 2016). *Participatory design, positive deviance*

and *lead user design, action research, context mapping, rapid and participatory rural appraisal, experience design* and *service design* are mentioned by Sanders & Stappers (2016) to be some of the fields of design that has influenced co-design. This paper will not clarify the relationship between co-design and all the mentioned disciplines, but rather look at the similarities it has with some of the most prominent ones; service design and participatory design.

First, a general distinction will be made on the design field: the user-centered approach and the participatory approach (Sanders and Stappers, 2008). The user-centered approach looks at the user as a subject that needs to be studied to give inspiration to the designer who develops a solution for the user. The participatory approach looks at the user as a partner, and tries to include the end user as much as possible in the design process.

Participatory design

Participatory design is a design practice that involves different non-designers in various co-design activities throughout the entire design process (Sanders et al., 2010). One of the main characteristics of participatory design is the use of physical artifacts as tools for thinking (Sanders and Stappers, 2016). The main tools in participatory design have originally been inspired by approaches from drama, such as scenario games, design games and prototyping techniques (Sanders et al., 2010).

Service design

Service design is described as a collaborative process of researching, envisaging and then designing experiences that happen over time and multiple touch points (King and Mager, 2009). Service design is known for contributing to the field of design with visualizations that reveal the complex interdependencies that must be considered when designing service systems (Sanders et al., 2014). Service design has adopted many of the tools, techniques and methods from participatory design and from generative design research (Sanders and Stappers, 2016) It is a holistic method, that advocates intensive user participation or co-designing (Sanders et al., 2014). Service design advocates co-design, and co-design builds a great deal on principles from service design (Sanders et al., 2014).

Participatory approach can be seen as a collective term, which includes both co-design, generative design, and service design. By addressing the definitions of the different disciplines within participating design, one sees that the fields are strongly overlapping and the differences

less than the similarities. The disciplines seem to borrow, share and get inspired by each other, and in several articles the names of the disciplines are being used as synonyms. The literature review will therefore use literature that both refers to participatory design, service design, generative design and co-design.

Definitions of co-design

The most cited definition of co-design is given by Sanders and Stappers (2014). They differentiate between co-creation and co-design by defining co-creation as *any act of collective creativity that is shared by two or more people* (L. Sanders and Stappers, 2014, 25). Co-design is being defined as *collective creativity as it is applied across the whole span of a design development process* (ibid). In a broader sense, they refer to co-design as *the creativity of designers and people not trained in design working together in the design development process* (ibid).

Kleinsmann and Valkenburg (Kleinsmann and Valkenburg, 2008) has a somewhat different perspective, defining co-design as *the process in which actors from different disciplines share their knowledge about both the design process and the design content…in order to create shared understanding on both aspects…and to achieve the larger common objective: the new product to be designed*" (Kleinsmann and Valkenburg, 2008, 369). This definition requires that participants initially have a conscious relationship to the design process, which distinguishes it from Sanders & Stappers definition (2014).

Steen (2013) states that co-design can be as a process of collaborative design thinking. He further explains it as *a process of joint inquiry and imagination in which diverse people jointly explore and define a problem and jointly develop and evaluate solutions* **(**Steen 2013, 27). This definition embodies the design principle of abduction, and focuses on the importance of insight arising jointly, as a premise to call a creative process co-design.

The paper will relate to the definition that sees co-design as as *a process of joint inquiry and imagination in which diverse people jointly explore and define a problem and jointly develop and evaluate solutions.*This is because the definition is open enough to accommodate different forms of co-design, while it is specific by focusing on the participants' previous background as well as the main activities of co-design.

Principles of co-design

In this section the reader will get an overview of the co-design principles that exist in the reviewed literature. The author has chosen to systematize the co-design principles in two main categories, namely team and mindset. In the category of teams, the principles concern group composition and group dynamics. In the category of mindset, the principles regarding which way of thinking is encouraged to perform in co-design.

The team

Multidisciplinary

One of the most important principles of co-design is the belief that all people are creative and can contribute to design, given they have the right setting and tools (Vaajakallio and Mattelmäki, 2014, Sanders and Stappers, 2008). This is a fundamental starting point because it also holds the importance of not only having designers in a co-design team but also end users, ethnographers and other stakeholders.

As a result of this principle, co-design requires multidisciplinary team work, in which people from different backgrounds share and combine ideas and knowledge (Steen, 2013, Tan, 2015, Giacomin, 2015). It rests on the argumentation that diversity is a key driver to innovation. On a team where all team members share the same background,the outcome will more often be of a predictable kind (Sanders and Simons, 2009).

Jointly explore

The aspect of team work is rather important in a co-design process, in which the process is built for joint inquiry, by the team jointly exploring, discussing and defining a problem, and thereafter jointly explore, develop and evaluate possible solutions (Steen, 2013). Teams are encouraged to work in a constant joint process.

Reflect

Co-design should also be organized to helps co-design participants become more aware of their thoughts and feelings, and their own roles and interests in the design process (Steen, 2013). This is to ensure an effective team that manages internal interpersonal challenges when conflicts arise. By mapping the interests of the team members, it will also be easier to

customize a motivating design process. A co-design team is therefore encouraged to implement reflection as a part of their process (ibid).

The mindset

Abduction

Steen (2013) creates a distinction between induction, deduction and abduction. While as induction and deduction are scientific ways of reasoning, abduction is the preferred way of reasoning within design and co-design. The different logics correlates to different problems the two distinct disciplines try to solve. Whereas science and engineering deals with defined problems, design involves working with open problem solving. In problem solving related to abduction the design team only know the wanted end value, but not how to get there. The challenge then becomes to figure out both the "working principle" and the solution. In addition, the team needs to constantly try to reveal what the problem actually is (Steen, 2013).

Divergence and convergence

In a design process, there is a need for both divergent and convergent thinking, which are two fundamentally different modes of thinking (Tan, 2015). When divergent thinking is performed, multiplicity, possibility, difference and originality is generated. The general scope is widened, and a broad range of solutions and information are being explored by the design team. A quantity of possible ideas is created in a design process, as a result of divergent thinking (ibid).

After a period of divergent thinking, convergent thinking is needed. Convergence deals with relating, associating, combining and synthesizing (ibid). The scope is narrowed and the best alternative is identified. In a ideation process the ideas are refined and narrowed down into the best idea, as a results of convergent thinking (BritishDesignCouncil, 2005). One of the most important aspects of convergent thinking is that it leads to a single best answer; answers are either right or wrong, which leaves no room for ambiguity (Tan, 2015).

Both convergence and divergence are important aspects of creative processes, according to Tan (2015). Divergent-convergent models has gained broad acceptance within the practicing field of design, and was structuralized and made popular by the British Design Council in 2005. According to the British Design Council, a change in divergent and convergent thinking

happens twice in a design process (BritishDesignCouncil, 2005). First to explore and define the problem definition, and then to explore and define the solution (ibid). The transition between divergence and convergence is visualized by the British Design Council as a double diamond, as illustrated.

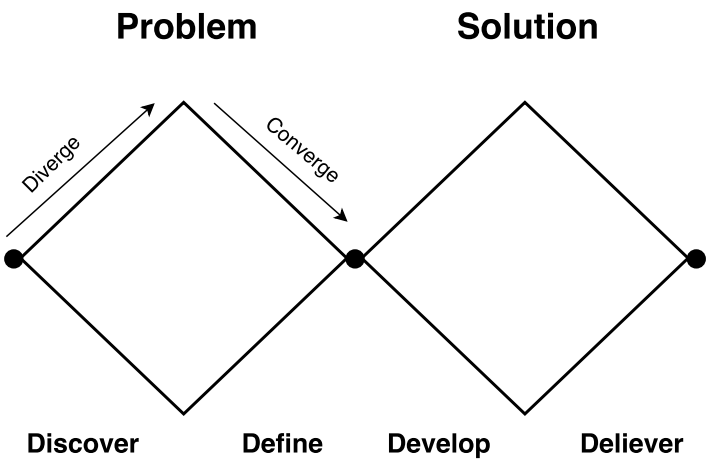

Figure 1 The double diamond

Empathizing

Empathizing is also an important co-design principle. Empathy is the ability to get inside another person's feelings and worldview (Wiggins and McTighe, 2005), so in a co-design context it refers to trying to see the world from the perspective of the end user.
The aim is to not only understand what the other persons thinks, *but feel as the other feels, and see and the other see* (Wiggins and McTighe, 2005, 98).

Empathy is a form of insight encouraged in co-design because it involves getting beyond the seemingly distant worlds of other people, to find what is meaningful for them (ibid). This is to better understand the end users' true needs, when developing solutions. A co-design team therefore needs to decide which activities to take part in, in order to experience the world as the targeted end user group.

Activity-based

There has been a general shift in the description of creative processes the last fifty years (Howard et al., 2008). One of the early and most recognized creative process models by Wallas (1926), suggests that ideas has a nature of sudden emergence (Howard et al., 2008).

Models that describe creativity and idea generation as a mystical, inherent quality, is today seen as somewhat outdated (ibid).

More recent descriptions of creative processes try to explain creativity as a conscious effort of idea generation, based on activity based stages (ibid). In co-design, creativity is believed to emerge by performing activities, and not by mere cognitive processes (Van der Lugt and Stappers, 2006, Steen, 2013).

Iterative

A core aspect of design is that it is an iterative process. A design process is an iterative process because it makes feedback from the people a critical part of how a solution will evolve (Tan, 2015, Giacomin, 2014). An idea can be advanced by building, testing and iterating, and thus enable a bigger extent of certainty that the idea is the right solution to the problem (ibid). In the context of a design process an iterative approach means that it might be necessary to take a step back at times or even start from scratch (Schneider et al., 2012).

Include end users

Another important principle of co-design is to acknowledge that the end users one is designing for, are actually the experts of their own experience, needs and dreams, and that it therefore becomes essential to include these in the design process to find good solutions to the problems (Sanders and Stappers, 2016, Tan, 2015, Giacomin, 2014).

The roles in a co-design process are therefore different than in a traditional design process. In a traditional design process, a researcher will analyze the user of a service in order to deliver a report to the designer, who has the task of creating the product, service or system. In co-design there is a focus on inclusion of end users in the design process.

End users as equal participants

A way of including end users in a co-design process, is to enable them to participate as equal partners. End-users play an essential and active role in co-design, and many co-designers advocate a full inclusion of end users, both in knowledge development, ideation and concept development. They further argue that end-users, researchers, designers and other stakeholders should work equally into the process and contribute in a straight line to the result. This leads to a transformation of common power relationships between participants, which is an important principle of co-design (Donetto et al., 2015).

Figure 2 Traditional design and co-design

Overview of design- and co-design process models

The co-design process and other design processes are often divided into different process phases. Based on an exhaustive literature review on design- and co-design processes the author will now give an overview of the different phases, and the activities related to the different phases.

In this section, the author will present a summary table of design and co-design process models, and the phases they are divided into. The table shows where the processes overlap and what the different process models have in common. Based on this, a co-design process model is proposed, with a set of overall categories that can be said to represent all phases of a complete co-design process.

The following table is an overview of the process models that were analyzed to create the co-design process model with the six phases.

Sanders & Stappers (2013)		Pre-design	Discovery	Design	Making	Marketing	Aftersales
Pugh (1991)		Market	Specification	Concept design	Detail design	Manufacture	Sell
Kankainen (2003)	Design brief	User research		Concept ideas	Low-fi prototypes / High-fi prototypes		
Tan (2015)	Planning	Context of use	Requirements	Design	Evaluation		
Howard et. al. (2008)	Establishing a need	Analyzing of task		Conceptual design	Embodiment design / Detail design	Implementation	
British design council (2005)		Discover	Define	Develop	Deliver		
Google Venture Sprint (2016)	Make a map & choose a target			Sketch competing solutions / Decide on the best	Build a prototype / Test with customers		
Cross (2000)		Exploration		Generation	Evaluation	Communication	
Andreasen & Hein (1987)	Recognition of need	Investigation of need	Product principle	Product design	Product preparation	Product execution	
Integrative model	**Preparation**	**Research**	**Analysis**	**Concepting**	**Prototyping**	**Implementation**	

Figure 3 Summary table of design and co-design process models

The co-design process model

The integrative co-design model suggests a division of the co-design process into six phases, namely preparation, research, analysis, concepting, prototyping and implementation.

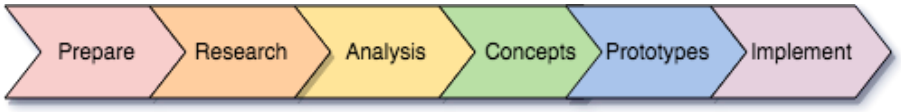

Figure 4 The integrative co-design model

The author will now explain the background of the integrative co-design process model.

Only five of the nine process models have a separate phase for all activities happening before the research phase – what the author chose to call the preparation phase. Furthermore, most

process models agree that there is a research phase and that it is about exploring the user and its needs. In the analysis phase, the process models somewhat disagree more, where some of the process models focus on defining specific product principles or specifications (Pugh, 1991, Tan, 2015, Andreasen and Hein), while the rest of the process models to a lesser extent define what the analysis should be, more than focusing on general user needs. The concept phase and the prototype phase are something all process models agree to be existing phases, and they define the content in these phases alike - simply to create concepts and to make prototypes. The last phase of the co-design process is the phase in which the theoretical field disagrees the most. While some of the theorists (Kankainen, 2003, Tan, 2015) doesn't include a phase after prototyping at all, others focus on content of commercialization in the finishing phase (Sanders and Stappers, 2013, Pugh, 1991).

The author came to the final six phases by conferencing the practitioners of co-design regarding the two phases of greatest disagreement in the literary field; namely the preparation- and implementation phase. Practitioners of co-design confirmed that activities such as receiving a design brief are common in co-design and occur before the actual working begins, thus implying that a preparation phase reflects how a co-design process is carried out. In addition, the majority of the asked designers also stated that clients in most cases require some form of implementation, a minimum of presenting findings but often also actively planning how the client can implement and realize the new solutions themselves.

The paper will now present the six different phases, and the activities that are typically conducted in those phases, based on co-design literature. The co-design process model is created, because the overview will later serve as a framework with which the author will analyze the gathered empirical data. It is important to mention that all activities do not have to be performed in order to conduct a specific phase, but as the activities are designed to reach the goal of the various phases, at least some of them should be performed in order to conduct a co-design process.

Together with the co-design principles, and the coming section of co-design phases and the related activities, this forms a co-design framework that will be used to analyze the empirical data.

Co-design phases and the related activities

Phase 1: Preparation

The first phase is a clustering of all the activities happening before the co-design team starts approaching the given challenge. This phase concerns preparing everything that needs to be ready before the team can start working. The preparation phase concerns activities related to interaction with the co-design team's client. Based on the related activities, the goal of the preparation phase is to develop a clear understand of the design brief presented by the client, ensure the understanding is in line with the client`s perception and develop a plan for the further process.

The following section will explain some of the commonly conducted activities performed in the preparation phase of co-design.

Related activities

Design brief

A design process is based on the existence of a problem that needs a solution. Designers often get the problem presented by an external, the client or the company management. Such a presentation of a problem is called a design brief (Cross, 2001). A design brief can vary widely in form and content, but often involves setting a goal, some constraints within which the goal must the achieved, and some criteria for recognizing if the solution is successful or not. There is no specific way of proceeding from the problem statement to a solution statement, except by practicing means of designing. A design brief does not specify what the solution will be. The client setting the problem does not know herself what the answer might be, but she will recognize it when she sees it (ibid).

Reformulation of design brief

After the presentation of the design brief, the team should try to reformulate it using their own words (Cross, 2001). Since design problems are often wicked problems they can be hard to define, and any problem formulation may embody inconsistencies (Cross, 2001). The starting point is often a specific situation which is experienced as problematic, but what precisely is problematic is not yet known (Steen, 2013). Since proposing a solution is a means of understanding the problem, it is crucial that the design team has understood the client's perception of the problem, and her criteria for a solution (Steen, 2013, Cross, 2001). Due to

this, a design team will reformulate the design brief and send it back to the client for final confirmation. This is to avoid misunderstandings and to ensure that the team works within the limits it is given. The design team should develop the initial design brief into a clear statement of client requirements.

In addition to avoiding misunderstandings with the client, a reformulated design brief also functions as a provisional problem definition for internal use in the team, which can later be restated and refined in an iterative process (Steen, 2013). The formulation of the problem is important, as the way the problem is conceived decides which solutions are followed and which are dismissed (ibid).

Project brief

The team should also develop a project brief, to gain an overview of the project and decide what should be done, how deadlines are set and what resources are required (Wong and Khong, 2011). Clarifying internal resources, logistics, finance and team effort is should also be a part of the project brief. In addition, a discussion and clarification of the chosen methods and tools should be proceeded (ibid).

The phase of preparation can be said to be finished when the co-design team has a clear understanding of the design brief, and a further plan for how to approach the given challenge.

Fase 2: Research

The co-design team starts conducting research as a first step in working towards a final solution. Within the field of co-design, research refers to any activity of collection of data for better understanding of a topic (Norman and Verganti, 2014). In this phase, the design team should take active steps towards improving the initial problem definition, by collecting data and carrying out research (Cross, 2001). By conducting research the intention is to ensure that the problem is fully understood without overlooking ant important elements, and thus identifying the real problem. According to Cross, this is a crucial phase of design because if not performed properly, one ends up solving the wrong problem. Or as he states, "*There are plenty of examples of excellent solutions to the wrong problem!"* (Cross, 2001, 34).
The most important goal of the research phase is to identify the target user and user needs (Wong and Khong, 2011). The target user is the specific group of people that shares a problem, or whom the final solution is intended for (ibid).

Much of the job of the design team is working on discovering the problem from the perspective of the customer, and articulating it in an accordingly manner (Sanders and Stappers, 2016). This is important because the client might be convinced that they have a true perception of the problem, which isn't always the case (ibid).

The following section will explain some of the commonly conducted activities performed in the research phase of co-design.

Related activities

Ethnographic methods

Ethnographic methods such as observation, interviews and participatory observation are largely used when conducting research in co-design (Steen, 2011). However, these methods will not be discussed as the author expects the reader to already have knowledge on these methods.

Day-in-the-life

By conducting a *day-in-the-life*, a member of the team gathers research material linked to a particular type of user, in order to create a descriptive walkthrough of their daily activities (Schneider et al., 2012). The data can be presented as a visual graphic or by using video to produce a rich description. The purpose of this technique is to provide an overview of a typical day of a user group, including what the customer is thinking and doing outside of the interaction with the existing solution. It is commonly used because it contextualizes a user's product/service/experience interaction, and therefor allows for a great deal of background information pertaining to their thoughts and feelings when interacting with the existing solution (ibid).

Cultural probes

Probes are materials designed to provoke or elicit a response from the target user, such as a postcard without a message (Sanders et al., 2014). Cultural probes are information gathering packages. Based on the principle of user-participation via self-documentation, the probes are usually given to research participants for a prolonged period of time, during which they can produce richly engaging material for design inspiration (Schneider et al., 2012). The probes invite people to express their experiences, feelings and attitudes in forms that provide inspiration for designers (ibid).

This technique is used to gain the most intimate insights, and allows for the gathering of the insights without the researchers being present. This can allow for more open and honest reflections and data from the user group (Schneider et al., 2012).

Generative toolkit

Sanders & Stappers (2016) makes a distinction between different levels of knowledge to explain the importance of generative toolkits. A designer can reveal different levels of knowledge in a user; explicit, observable, tacit and latent (Sanders and Stappers, 2016). To reveal the levels of latent knowledge, a designer needs to use certain tools to gather data from the user. An example of latent knowledge is a person's needs and values, which are abstract qualities and something people are not used to discussing directly (ibid). By supporting users in expressing themselves through means of making, a designer can help them express their needs and values. Toolkits for expression are developed by the design team to support the user in a pre-determined activity, such as recalling memories, making interpretations and connections and envisioning possible futures (ibid). A toolkit usually consists of photos, words, symbolic shapes, 3D shapes, Legos, and other kinds of material that can enable a user to express her thoughts, feelings and visions (ibid).

Why is it important to enable participants to make things? Sanders explains this by saying *the things that dreams are made of is often difficult to express in words but may be imaginable as pictures in your head* (Sanders, 2000, 2). A common misconception about making things during co-design is that the object being created is a forerunner of the future product. This is rarely correct according to Sanders and Stappers, which says that *what is being created is also a vehicle for observation, reflection, interpretation, discussion and expression* (Sanders and Stappers, 2016, 66).

There is no certain way of knowing when the research phase has been completed, and research and analysis are often overlapping phases, as they depend upon each other.

Fase 3: Analysis

After a period of gathering data and information about the user group and the problem, the data must be categorized, to enable the design team to look for a broader meaning (Sanders and Stappers, 2016). In this phase creative synthesis will happen, which is when convergent thinking and divergent thinking is integrated (Tan, 2015). A creative synthesis aims at identifying and making sense of all the possibilities from the research phase, to figure out which ones are the most potential (BritishDesignCouncil, 2005). Sanders & Stappers (2016) points out that analysis is an intuitive process, where the design team should start looking for patterns in their research data. Grouping data on intuition and feeling is therefore encouraged (Tassoul and Buijs, 2007). When analyzing, the team should look for both the bigger picture, but also new views and insights on the topic (Sanders and Stappers, 2016). The goal of the analysis phase is therefore to gather all the data from the research to look for patterns which again leads to insights.

Related activities

Analysis wall

Following co-design principles, the data should be visualized to better engage and inspire the design team. Performing an analysis on a wall is the best way to analyze "messy" data that is collected during a design research phase (Sanders and Stappers, 2016). By putting it up on a wall, all team members can participate in the analysis and identification of important insights (ibid).

Stakeholder map

A stakeholder map is a visual or physical representation of the various groups involved with the specific situation the co-design team is designing for (Schneider et al., 2012). It gives an overview of all the stakeholder groups, and identifies their roles, responsibilities, and motivation in relation to the situation the team is designing for. A stakeholder map also reveals how the stakeholder groups are related to each other and how they interact (ibid).

By representing the users, staff, customers, partner organizations and other stakeholders, the interplay between these groups can be analyzed and further addressed when proposing a solution. The stakeholder map is also used to analyze the current context of use, and will help to ensure that the needs of all those involved are taken into account when creating a solution (Tan, 2015, Schneider et al., 2012).

Personas

Personas are fictional profiles, often developed to represent a particular group based on their shared interests (Schneider et al., 2012). Personas may include information about characteristics, interests, cultural beliefs, gender and life style (Tan, 2015). The presentation of personas often include name, pictures and quotes, to enable the design team to imagine how the persona would act and react (Schneider et al., 2012). The creation of personas is done by clustering research insights into common-interest groupings, and then developing the groups into a workable character (ibid).

Personas are used as a means of representing users and their needs to the design team (Tan, 2015), and thus become a way to engage with user groups. Personas are particularly valuable when it is difficult to include user representatives in the design team (ibid). The technique is also used because personas can provide a range of different perspectives on a product/service/experience, and therefore allows the team to define and engage different interest-groups within their target market (Schneider et al., 2012). An effective persona shifts focus away from abstract demographics, and towards the needs of real people (ibid).

User journey map

A user journey map is a visualization of the experiences a person has when interacting with a product or service (Hanington and Martin, 2012). It tells a story about an individual's actions, thoughts, feelings and perceptions – including the positive, negative and neutral moments when interacting with a product or service over time (ibid). The user journey map should be based on information from direct contact with the end user of the product or service.

The user journey map helps teams to pinpoint specific moments that elicit strong emotional reactions by the users, and therefore are also ripe for redesign and improvement. It allows a team to carefully evaluate and improve each moment of a product or service experience. A

user journey map helps teams develop a shared understanding and vision about ways to more effectively augment existing user behavior (ibid).

The analysis phase is completed when the team feels it has generated some valuable insights of the target user which can serve as the basis for generating solutions that will fit the user's needs.

Fase 4: Concepting

After analyzing the data gathered from the research phase, the design team start to develop concepts based on the analysis. A concept is therefore a larger idea that responds to several of the insights, and thus making it more holistic than an smaller idea (Sanders and Stappers, 2016). In the conceptual phase of a design process the statement of the problem identified in the analysis is used to generate solutions (Cross, 2001, Sanders and Stappers, 2016). It has been identified as a core part of designing, and the phase which has the greatest bearing of the design outputs (Howard et al., 2008, Sanders and Stappers, 2016). This stage is also important because the cost of an additional iteration during conceptualization is marginal compared to the cost of failure with the concept after launch (Schneider et al., 2012).

The concept phase is dual and takes advantage of both divergent and convergent thinking. Firstly, the design team will engage in divergent thinking by trying to generate as many ideas as possible (Tan, 2015). The team should then proceed by indulging in convergent thinking through reducing, synthesizing and trying to see the connection between several of the generated concepts (Wong and Khong, 2011).

Concepts should be visualized during the concept phase, because it enables everyone on the team to see what is going on and therefore easier work together (Cross, 2001). Sketching and visualization also makes it easier to imagine how users would interact with the product/service/experience, which is why designers explore ideas while sketching (Tan, 2015).

The design approach is to move quickly towards a potential solution or set of potential solutions, and then use that as means of further defining and understanding the problem, by involving end users (Cross, 2001). Early solution concepts are often less than satisfactory, and

a design team should therefore be open for discarding concepts to search for better ones if needed (ibid).

The goal of the concept phase is to end up with one or several relevant concepts that fit the insights from the research, as well as other constraints that may be present (Sanders and Stappers, 2016).

Related activities

Brainstorming

Brainstorming is a popular method when creating concepts in a co-design process. It brings together the design team to inspire each other in a creative, joint idea generation (Tan, 2015). It helps a team to generate a quantity of ideas, and at the same time promotes a shared way of understanding the context the team is designing for (ibid). Brainstorming is performed by freeing the mind of team members to accept any idea that is suggested, and thus allowing for a greater creativity (ibid). To enable this, some rules need to be set. No criticism should be allowed during a brainstorm session, and seemingly crazy ideas are welcome (Cross, 2001). While the generation of a large quantity of ideas are promoted in the beginning of a brainstorm session, it should end with the intention to combine and reduce ideas (ibid).

Analogies

The use of analogies is also used to provide new concepts in a co-design process (Tan, 2015, Cross, 2001). Biological analogies are often seeked, as the biological solution to a similar problem can provide great inspiration to a design team. Besides biological analogies, personal analogies, symbolic analogies and fantasy analogies can also provide designers with inspiration (Cross, 2001).

Scenario

Scenarios are hypothetical stories, created with enough details to meaningfully explore a particular aspect of a product/service/experience offering (Schneider et al., 2012). Scenarios can be presented using plain text, storyboards or videos. Research data is used to construct a situation around which the scenario can be based. Problematic areas of a current product/service/experience offering might be developed into scenarios to brainstorm solutions (ibid). Such perception ideally involves “moral imagination” where team members imagine or rehearse a current and problematic situation, using both their thoughts and feelings (Steen,

2013). This will increase the likelihood of the team generating new solutions and concepts, and allows the team to address questions such as “how does this problematic situation feel? How can we generate solutions for this problem? How is this solution better than the existing solution? (ibid).

Mock-up

Mock-ups are easy and quick simulations of a potential solution (Tan, 2015). It is interpreted by the author as the very first lo-fi prototype a design team creates. All design ideas go through iterative development, and a mock-up is a first step in the iterative cycle of finding an appropriate solution to a problem. By the use of mock-ups, changes to the design may be made rapidly in response to feedback from users. This helps to avoid the costly and time consuming process of correcting design faults in later stages of development of the solution. Mock-ups are often simple paper versions of a potential solution. The paper mock-ups can be used for internal testing within the team, or to involve users in providing feedback (ibid).

Fase 5: Prototypes

Prototyping is the tangible creation of artefacts at various levels of resolution, for developing and testing ideas within the design team and with clients and potential users (Hanington and Martin, 2012). Prototype is a word that is used interchangeable with the word model in a co-design context (Sanders et al., 2014).

Prototyping of a solution is done to experiment and explore ideas, and the goal of the phase is to learn by making, to evaluate ideas, to identify problems, to decrease development costs, to establish functional criteria and to sell the idea to the client (Cross, 2001). Another goal of prototyping is to refine ideas (BritishDesignCouncil, 2005), through testing with end users and iterations on the product or service. Testing of prototypes are also means for learning more about the user group and their true needs, and can therefore result in inspiration for complete new concepts (Sanders and Stappers, 2016).

Related activities

Low fidelity- and high fidelity prototypes

Prototyping is similar to creating a mock-up and what separates the two is the higher degree of time and effort put into the prototype (Tan, 2015). There is a distinction between low-fidelity prototypes and high-fidelity prototypes, and the co-design team should provide both

(Wong and Khong, 2011). Fidelity refers to the resolved finish of the prototype (Hanington and Martin, 2012).

A low fidelity prototype is typically made in materials such as plasticine, clay, wood, paper clay and/or foam to make quick, tangible prototypes (Cross, 2001), when the final solution is a product. Low-fidelity prototypes can also appear as concept sketches, story boards or sketch models (Hanington and Martin, 2012). After creating the prototype, it will go through a process of rapid testing and adjustment. This cycle guarantees that user needs are met and that the product is understandable and usable (Norman and Verganti, 2014) .

After sufficient testing of the low fidelity prototype, a high-fidelity prototype will be made, which is a working prototype (Wong and Khong, 2011).The high-fidelity prototype goes through the same iterative process of building, testing and evaluating. The evaluation of a prototype can be done by considering the objectives from the design brief (Cross, 2001).

Wizard-of-oz

Wizard-of-oz prototyping has become a widespread technique for testing prototypes, and normally relates to testing of digital systems or services. This type of prototyping allows a user to interact with a computer system that is operated by a hidden developer (Tan, 2015). The hidden developed processes the inputs from the user and responds to it with simulated system output. This enables the team to test different system proposals without spending a lot of time on preparation for creating a prototype (ibid).

Fase 6: Implementation

The phase and its goals

There is little agreement about what the final phase of a design process involves, which the author believes has to do with the fact that design processes vary in both extent and intent. According to Sanders & Stappers (2016), the main activities in this phase concerns marketing and after sales, which involves both production, manufacturing, sales, distribution, roll-out, product use and after sales. Pugh argues similarly that the final phase of a design process relates to manufacture and sales (Pugh, 1991). Both of these process models focus on the commercialization of the solution as the goal of this phase.

Cross (2001) has another point of view, where he argues that the final phase of the design process concerns communicating the findings to the client. The communication involves both verbal communication of the process, findings and presentation of solution, as well as delivering physical deliverables, which can consist of prototypes and a written report.
The activities in the implementation phase of a design process can therefore be said to vary depending on the scope and intent of the process.

Summary of chapter

In this chapter, the author has given an overview of the literature field of co-design. This has been done both by looking at how the field arose, how it differs from other fields within design, what different definitions of co-design exist as well as an overview of all the co-design principles from the field of literature. In addition, the author has introduced well-known process models in design and co-design to create an overall framework – a co-design process model. The co-design process model consists of six different phases; preparation, research, analysis, concepting, prototyping and implementation. Each phase has its associated activities.

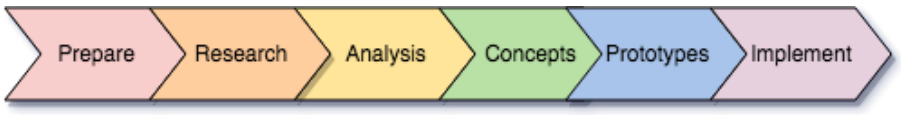

Figure 5 The co-design process model

The co-design process model has been created to be used as part of a framework for analyzing the data that has been collected, in other words, having a scope. This enables the author to say something reasonable about the data, in a co-design context. The variables identified as important for the framework are therefore; co-design principles, the various co-design phases and the associated activities of the different phases. Thus, these sections from the theory chapter together serves as a co-design framework for analyzing the empirical data. The next chapter will describe the research design of the thesis, as well as reflect upon the validity of the chosen methods.

Method

In this chapter, the paper will address framework conditions and methodological approaches, which, together with the theory, are used to elucidate the purpose of the thesis. The chapter starts with an explanation of the chosen research design, and why a qualitative approach is chosen and a multiple case study framework. Following, the method of data acquisition and analysis is explained, and lastly a detailed reflection on the methods and their validity will be discussed.

Research design

This master thesis has compared two different innovation processes, which has influenced the choice of research design. A qualitative approach were chosen as research design, with a multiple-case study design. As the method of data acquisition, observation and semi-structured interviews were chosen, as they would best fit to answer the purpose of the thesis.

Different methods were selected to best answer the three research questions. To answer research question 1: *how is a co-design process performed*, Observation was chosen as method for gathering empirical data on process one. To gather data on process two semi-structured interviews were chosen, as observation was not possible, since the process had already been finished. To answer research question *2: how is a co-design process experienced,* Semi-structured interviews were the chosen method. To best answer research question 3: *which factors influence a co-design process,* observation and semi-structured interviews were chosen as suitable methods. The reason for the mentioned choices of methods will be explained in the section on data acquisition.

Explorative research issue

Due to the purpose of the thesis, the research design will be *exploring*, in which it attempts to explore co-design processes, with a focus on the experience of the participants. The investigation is thus exploratory, and the knowledge that is intended is descriptive.

Due to the nature of the exploratory research questions, the master's thesis also aim at contributing to the already existing theory of co-design, as a result of the analysis of the data.

Qualitative approach

A qualitative approach is chosen because it works well to study social phenomena and is based on the belief that one must understand how people interpret their social reality to get a real understanding of social phenomena (Jacobsen, 2005, Flick, 2015), which fits the research questions, which are to understand how a co-design process is performed and experienced, as well as which factors influence a co-design process.

A qualitative research design is also chosen because it has a high conceptual validity (Jacobsen, 2005), giving the author a thorough understanding. In addition, those who are being investigated will help define what this understanding means - it can therefore be said to be more of a democratic approach than using a quantitative method, which fits well with the values of co-design.

Multiple case study

A case study approach is chosen because the purpose of the thesis aims at understanding the experience of something, for which Yin suggests a case study method would be the most suitable (Yin, 2009). A case study should not be limited to the case in isolation, but should examine the likely interaction between the case and its context (Yin, 2013, Jacobsen, 2005). A case study approach is also chosen because the topic of the thesis and the aim of it, fits well with the description of case studies as "*an empirical inquiry about a contemporary phenomenon (e.g., a "case"), set within its real-world context—especially when the boundaries between phenomenon and context are not clearly evident"* (Yin, 2009, 18).

Two different processes were chosen as study objects for the multiple case study. Innovation processes one was performed by a team participating in a two week event, organized as a part of a collaboration between a Norwegian university and a local hospital. Innovation process two was performed by a team participating in a two week summer course, directed by a college in the Netherlands.

The context of innovation process one was an event that was a student initiative, which aimed at creating closer cooperation between medicine students and the university's innovation environment. The challenge lasted for two weeks, and the participants were voluntarily enrolled first year students of medicine and technology. The workshop consisted of 20 students, working

in smaller working groups of 4-5. The innovation challenge concerned medical technology. The context of innovation process two was a summer course, designed and organized by a design coach from a college in the Netherlands. The participants were voluntary enrolled students and former students from all over the world. The summer course had a total of five participants, which together formed a team. The innovation challenge concerned technology of opening doors.

Data acquisition

By conducting observation during the two different innovation workshops and semi-structured interviews of participants, the thesis will try to explore co-design processes, by focusing on how a co-design process is performed, experienced and which factors affect the process.

The data acquisition process for this thesis was conducted from February 2018 to April 2018.

Theoretical sampling

The purpose of the research has partly been to develop theory, and not to solely test already existing theory, and so theoretical sampling is appropriate, instead of random or stratified sampling (Yin, 2009). Theoretical sampling means that cases are selected because they are particularly suitable or illuminating and extending relationships and logic among constructs.

The reason why the two different innovation processes were chosen is based on context with the unique setting of students without specific training in creative methods, which would be working together on a two weeks innovation process. Co-design is intended to be performed in interdisciplinary teams, something these two processes allowed for.

The informants of process one was a randomly selected group from the event, where a total of six teams participated. The group was selected on the basis of the simple criterion that it was closest in physical proximity to the researcher during the situation of observation. Three of the four participants in the group were later interviewed. The fourth person was not interviewed, as he did not want to attend an interview. In addition, the organizer of the event was interviewed, as well as one of the facilitators. The facilitator was chosen randomly as he was the one remaining after the event, thus available for making an interview.

The informants from process two were the only enrolled group, and thus a natural choice. Three of the five participants were then interviewed. The reason why not all five were interviewed was that one of the last two did not respond to the request of being interviewed, while the other is the author herself. In addition, the organizer was interviewed, as well as one of the facilitators. The reason that one facilitator was chosen was because he was the one who responded to the request of being interviewed.

Method 1: observation

Observation as a method for data acquisition were chosen for several reasons. Due to the holistic focus of the research, observation is a natural way of gathering data, as it allows observing behavior in a context. It makes it possible to see how group dynamics also affect the co-design process. Observation is also chosen as a method as this allows for a more direct access to practices and processes (Flick, 2015). Observation also make it possible to record interesting events that were not taken into account when data acquisition was planned. Another reason why observation was chosen as a method is that it provides a good opportunity to explore topics that can be investigated further during the semi-structured interviews (Ritchie et al., 2013). In the presentation of the empirical data review, the observations will also be used to put the interviews in context and provide a rich depiction.

The observation of the process was conducted on the opening day of the event, lasting for a total of eight hours. The author chose one of the participating teams – simply the one that was closest by. The author participated herself in innovation process two, and therefore chose not to gather data through observation, but rather by interviews of the other participants. This made it easier to ensure validity in the results. The observation guide was made based on the framework of co-design, focusing on co-design principles, and also the activities related to the different phases of the c-design process. In addition, the author focused on the expressed experience of the participants. What the participants said, did and how they expressed themselves by facial expressions, body language and tone of voice was also documented.

Method 2: semi-structured interviews

Semi-structured interviews were chosen as a method as it would complement the observation. This is because it allows for going into the depths of certain events that took place during observation (Jacobsen, 2005), thus revealing the variations and nuances in the different interpretations of the participants of the innovation processes. Through the interviews the perception of which factors influenced the innovation process, emerged. The reason why semi-structured interview with individuals were chosen over, for example, focus group interview is due to the fact that participants modify their answers to a bigger extent during focus group interviews, as the informants adjust their answers to what can be considered socially acceptable (Dykema et al., 1997).

An interview guide was prepared, which was designed around the main topic of the experience of participation, and which factors were perceived to influence the process. The facilitation was one of the prepared topics. The author had prepared a short interview guide, on purpose, to focus on interesting topics the participants talked about, and give follow-up questions on those, rather than leading the conversation too much. The interviews were conducted with tape recorder and note pad. This was chosen because only noting would lead to incomplete notes, as the author also had the responsibility to lead the conversation throughout the interview. The interviews of the participants of process one took place in the second week of the process. One of the participants were also interviewed after the process was over to get data from the whole timespan of the innovation process.

The informants of innovation process one were all selected from the same team, to get the opportunity to get different points of views of the same group process. Three of the four participants were chosen for semi-structured interviews. In addition, the organizer, and three of the facilitators of the process were interviewed, to gain a broad understanding of the process. The interviews lasted between 1-1.5 hours. The interviews were conducted in the environment where the innovation process took place the first day, due to contextual effects (Jacobsen, 2005). Staying in the room where the workshop is conducted is known to help provide the informant with physical cues which in turn will help them to provide a more thorough and real-life depiction (ibid.).

The interviews of the participants of innovation process two were conducted through skype.

Three of the five participants were interviewed, and the interviews lasted for 1-1.5 hours. In addition to the three participants, the organizer which also was the lead coach, plus another coach were interviewed. The interviews took place six months after the actual innovation process had taken place.

Data analysis

Both the use of observation and semi-structured interviews as data collection method led to large amounts of raw material, which in turn was necessary to analyze. The purpose of the analysis is to reduce the complexity and extent of the data, and to simplify and structure the data to create an overview (Jacobsen, 2005). The process of data analysis has been divided into 4 stages: transcription, coding, within-case analysis and cross-case analysis.

Transcription

Taking detailed notes during the observations is also of importance, to ensure that all information is being documented. Transcription removes contextual data such as body language and other physical and non-verbal cues, which makes it important to take notes additionally to the tape recorder, to lower the risk of losing important indirect aspects and of misinterpreting the data.

Coding

Coding was conducted to create categories out of the data. This implies reducing the data from the observations and interviews to a set of themes or categories. There are two types of coding structures; those that are stated by actors: *in vivo codes*, and those which the researchers construct from the material*: in vitro coding* (Corbin and Strauss, 1990). The coding of this thesis relied on both, as the data is acquired through both observation and interviews, and therefore one is based more on the researcher's understanding, while the other is based on the informants' understanding.

The co-design framework was used to analyze the data. The variables of focus were the co-design principles mentioned in the theory chapter, as well as the six different phases and the related activities. These variables were used as categories for coding. In addition, new categories arose because of unexpected information from both observation and the interviews.

The coding continued until theoretical saturation was achieved – meaning when additional analysis no longer contributes to discovering anything new about a category (Corbin and Strauss, 1990).

Within-case analysis and cross-case pattern search

The data was analyzed in two ways; by within-case analysis and cross-case pattern search (Eisenhardt and Graebner, 2007). The within-case analysis involved treating each case as a stand-alone entity. This allows the unique patterns of each case to emerge, before the researcher starts to generalize patterns across cases (ibid). Cross-case pattern search between cases was conducted by selecting categories and then looking for within-group similarities. Intergroup-differences was also investigated.

Reflections

Author`s preunderstanding

The authors foreknowledge of the academic field of co-design was limited before starting on this paper, besides participating in a two-week summer course in co-design. This implies having to start with a wide scope to learn everything from scratch, which again has lowered the chance of taking theoretical shortcuts and to jump to hurried conclusions based on assumptions. Although this has led to a long process of conducting the extensive literature review due to lack of prior knowledge, it has also forced the author to go through a wide range of articles from various sub disciplines within the field of design.

However, something that has influenced the authors preunderstanding is the basic belief that all people have the potential to be creative, given the right social environment. This is related to the authors background from social anthropology and social psychology, with a focus on the impact of the social environment. This has contributed to shaping the topic of thesis, which again might affect which kind of literature has been searched for.

Validity of observation

In order to ensure validity in the observation results, the author had a constant focus on concrete reproduction of the situations and to produce detailed descriptions. The purpose of the thesis

helped shape the observation guide, but the author also tried being open and to include as much data as possible, even events that were not immediately considered relevant. The observation notes also made a distinction between observation and subjective perceptions. Examples of subjective perceptions was how the author as a researcher experienced being present and observing. For example the authors subjective interpretation of the connection between the process and affecting factors. Such a division was made to later understand and criticize own interpretations of what was said and done during the observation study.

Validity of semi-structured interviews

To ensure validity in the interview results, several precautions were made. The author used several and highly knowledgeable informants to ensure that the informants view the situation from various perspectives (Eisenhardt and Graebner, 2007), which increased the validity. The research will also aimed at ensuring conceptual validity by letting the informants speak in their own words, to strive to understand them on their own premises and thereby provide a thick description (Geertz, 1994, Eisenhardt and Graebner, 2007). At the time of the interview, the informants had already seen the author before, which can increase the validity of the data. This is because repeated contact with the informant will help build a trust that will make it easier for the informant to open up (Adler and Adler, 1987). This is especially relevant in innovation process two, where the author was a participant herself, and thereby already had a trusting relationship with the informants. By interviewing more participants from the same team, more information sources from the same situation was also obtained. Since the data from the different sources correlated, the validity of the results are increased.

Overall, observation and semi-structured interview as data collection methods provided a real-time look and retrospective look at the two innovation processes, which enhance the validity of the findings given that both sources say the same (Eisenhardt and Graebner, 2007). Triangulation is a solid alternative to traditional criteria like reliability and validity when it comes to qualitative research (Rothbauer, 2008). In the social science, triangulation means to view a research issue from at least two vantage points (Flick, 2015), which this thesis has fulfilled, by both using observation and semi-structured interviews as methods of gathering empirical data. In addition, the data collection has been conducted by interviewing several participants from the same group, thus ensuring several points of views confirming or disconfirming given statements. Both participants, organizers and facilitators has also been

interviewed to ensure triangulation by comparing several points of views, coming from different roles within the process.

Validity of analysis

There is a general requirement for an analysis: "*The categories should be based on data. They should emerge from the documents, observations and interviews we have available* " (Jacobsen, 2005, 193), which was in constant focus during the analysis. The categories should be taken from the actors, or at least should be easy comprehensible to them (Corbin and Strauss, 1990). At the same time, it is a requirement that the categories should be conceptually reasonable. That is, they should be able to make sense to people other than those who participate in the survey and the researcher (ibid). The author ensured this by looking at previous literature, and checking in with supervisors.

Research ethics

Researching people is making a form of intervention in their lives, and more ethical dilemmas can arise because of the establishment of a relationship between researcher and research object. It is important to plan on how to conduct ethical research and how to maintain the informants' right to informed consent, entitlement to privacy and to be rephrased correctly (Jacobsen, 2005). These rights were taken care of by ensuring that the informants were volunteering for the research. The author informed the participants on the scope of research, how the data would be used, in addition to stating that it would be okay for them to withdraw at any time during the research. The informants were also anonymized in the research, to maintain their right to privacy.

In this chapter, the thesis has explained the methodological approach, which, together with the theory, have been used in this thesis to respond to the research questions. The chapter started with an explanation of the chosen research design, and why a qualitative approach is chosen and a multiple case study framework. Following, the method of data acquisition, and analysis were explained, and lastly a detailed reflection on the methods and their validity were discussed. The next chapter will present the empirical data findings.

Findings

This chapter will present the data collected to answer the purpose of the thesis. The data will be presented according to the two different processes; Process one and Process two. The processes will be chronologically presented, and both depictions and quotes will be used to present the data.

Process one: the unstructured process

The background of the two-week innovation process was an event by a local student initiative, by which a newly established student organization held its first event. There was an open enrollment for all medical and technology students, but the organization mainly attempted to recruit students who were early in the course of their studies.

Preparing the event

The organizer says that the purpose of the event was a bit unclear. He states it like this;

> *"What we wanted the students to get out of the event? Hmm ... That`s a very good question, because I do not think we had a clear plan of what we would achieve ... Maybe that the students would get engaged ... We also wanted them to come up with good ideas they could further work on after the arrangement was over "*
>
> – organizer of the event of process one

The organizer says that the path of designing the event and finding relevant challenges arose as a result of receiving tips from acquaintances in the university environment. Finally, the organizers spoke with the head of a technology research project, which was a collaboration between the university and the local hospital. The leader was very interested in bringing students to work on the research topics of the organization, and therefore ended up preparing six different challenges for the students.

When talking about the preparation of the event, the organizer also mentions time shortage along the way in the planning process: *"Compared to the ambitions we had of providing*

information and planning in advance, we ended up having less time for it than we wanted. We did not have a clear plan ".

The innovation event had a total of 24 enrolled students, of whom 18 showed up to the event. The organizers had promised a mid-sized cash prize to the winning team, to be spent on improving the idea. Two days ahead of the event, the organizers sent a short email to all enrolled students with information about the time of attendance and what equipment would be necessary to bring.

Uncertainty about the supervisor role

On the morning of the opening day of the event, all the process facilitators meet early to receive a brief briefing about the organizer's expectations on how they should facilitate. The six process facilitators are students of an innovation education at the university. They gather around the organizer while he tells them; *"The role of a facilitator concerns pushing the students. You push them. Like – come on, guys!".*

After the organizer leaves the facilitators, they get access to a sheet containing the six different challenges to be presented, which trigger an intense discussion. It appears as there are some uncertainty regarding the facilitator role and how they can contribute to this specific event. One of the facilitators says to another; *"Hmm ... If this is not a business case, how can we then contribute?".* Another facilitator later says that he experienced his own skillset as irrelevant for the challenges. That his knowledge was related to business and commercialization of an idea, which was omitted from the issues. The organizer says that he encouraged the facilitators to have a motivational role since they didn't know how to contribute themselves.

The discussion among the facilitators continues until the students arrive. The students are informed of the team division and thereby gather with their teams. Briefly after, the official opening of the event begins, where the organizers have a brief introduction of the student organization that are arranging.

The client presents his perspective

The head of the research project contributing with the challenges starts a presentation on his research organization. He talks for one hour about trends in the field of medical technology, and also of how his research team works towards finding innovative solutions. Among other things, he mentions that they often get inspiration from other industries, such as the airline industry, to create solutions for medical technology. The leader also speaks about one of the technologies that will later be presented as one of the challenges, and comes with a suggestion for how technology may be used in the future.

Finally, a student involved in a healthcare startup gives a short brief on her team's journey and how they found the solution to the problem they wanted to solve. She points out the importance of involving the users in developing the solution, right from the start.

Presenting the challenges

Then the head of the research project presents the six different challenges for the students. The wording of the challenges is displayed on a large screen while the leader reads them out loud.

After all six challenges has been presented, the group being observed start to discuss. The group members are positive to the fact that the issues are based on real cases, and not only fictional or designed for the event. At the same time, all four members in the group express that they think the challenges are difficult to understand and that they "*are far above their level"*. Or as one of the group members says: *"I do not understand the challenge. What's the problem? What needs to be solved?"*

Incomprehensible challenges

Later during interview, all three interviewed students say that they think the challenges were difficult. That they were experienced as difficult both because they were technically demanding and also due to the way it was formulated. The group spends a lot of time looking up different words from the challenges, on their computers. One of the team members later states during the interview: *"I think they were formulated a bit difficult... We spent a very long time understanding what it said, I think we actually spent all day".*

In addition, the group seems uncertain about the expectations of the organizers and what is required of the solutions they will present. The organizer asks for a moment of attention from the groups, and gives a short brief on what he believes the groups should do now; If they have decided on a problem, they should try to figure out what the problem really is. He further says that they should figure out what they need to know to understand the problem, and then seek out the experts at the university and the hospital who can provide them the answers. He also states that many experts from the university and hospital are prepared for the students to call.

The students return to work, and the group continues to discuss. One team member stays quiet in the group discussion, saying much less than the others. One of the group members later says that she experienced varying involvement among the group members - that the project seemed very important to someone in the group, and not so much to others. The group member who did not talk much during the group discussion later confirms this during interview; "*On the first day of the event, I remember thinking; am I really motivated for this?"*.

Engaged problem owners

Attending the event are also six different experts from the research organization who have developed the challenges. After lunch, the leader of the research organization as well as the experts begin to visit all student groups, which the students in the given group experience as highly positive. One of the students proclaims during interview that the experts and their dedication reassured her, because it made her feel that the event was taken seriously, and that organizers and experts really believed that the students could contribute. The organizer later explains during interview that the choice to bring experts from the research organization was planned. He says that other hackathons he has been attending has been struggling with the fact that there no one owns the problems presented. Furthermore, he says that since the assignments were given by members of the research organization, it was also most reasonable that these were available to answer questions.

At the same time as the experts walk around and visit the groups, some of the process facilitators have sought out the teams they have been given. Most of the facilitators withdraws quickly, and start talking together once again. The participants seem to not understand the role

of the process facilitators. They also evaluate them as somewhat passive. As one of the group members says during interview;

> *"The process facilitators... They were not very present, I must say… One of them sat down with us for a little while… I don't know how they were trying to contribute, maybe by keeping the conversation going or something? But I really don't know."*
> – group member of process one

Where is the problem in the challenge?

After discussing for one hour, group one decides what challenge they want to work on. One of the team member later says during interview, that they chose the challenge they did because it was the one that generated the most ideas and sparked the most discussion. She further says that the entire group agreed on the decision.

Not everyone in the team seems to be as happy with the decision. Another team member says during interview that the group chose the problem because two of the team members wanted to, because the challenge was based on their academic background. She further says that she did not understand any of the challenges, and therefore she was neutral in which to choose. After the group has chosen a challenge, a new aspect of the challenge seemed to confuse them; it seemed to be linked to an already existing technical solution. The group finds it strange that it is mentioned in the challenge that "Scan-X" should be used as a solution. One of the group members explains it like this during interview;

> *"I probably expected the challenges to be a bit simpler, or easier to understand, at least. And not so connected to solutions that already existed. I thought we would be presented a problem, so that we could try to propose a completely new solution. "*
> - group member of process one

The process facilitators are also discussing the presented challenges. They are critical towards the challenges, and proclaims that the issues should have been formulated in a manner that presented a problem for the students, and then asked how the students would solve the problem. Not to present a solution and ask how it can be done even better. One of the

facilitators says that when the challenges are designed the way they are, then the event is no longer about innovation.

Sharing ideas of potential solutions

The group spends the next half hour to share a computer and search for the specific vein that the challenge concerns. The medical students try to explain to the rest of the group what the function of the vein is.

One team member suddenly suggests that the group should try to brainstorm. To start the brainstorming, she takes up a blank sheet and asks; *"Do you have any ideas?".* After a little hesitation, one of the group members begin to draw a solution on the sheet. As she draws, she imagines the solution to work. Another team member begins to comment on the drawing and ask questions about her visualized solution. The two of them discuss her solution for a little while before they dismiss it as technically impossible. Another group member also begins to think of a solution while speaking hypothetically about how it would work. Team member "X" stops him quickly by saying that one of the imaginary technical component is impossible to create in real life. The other agrees and they throw away the paper with the idea.
She explains in retrospect why she designed the solution:

> *"I drew the solution for myself at first. Just to better imagine it. Then another team member started to comment on it, and after that I tried to explain my ideas using that drawing. It made it a little easier to explain to them how I thought. Also, the shortages of a solution are easier to discover when you draw a solution. You can start improving it directly* - group member of process one

Another team member draws a prop to then play a scenario to show how a surgeon would behave in a given situation.

Desire to participate in surgery

The developer of the technology related to the chosen challenge of the team, is also present as a professional expert during the event. After the group receives advice from other of the

experts to talk with the developer, one of the team members goes to invite him over for a talk. The group spends a long time talking with the developer.

In addition to talking to the developer of the technology, the group also gets advised to attempt to participate in an surgery to understand more of how surgeons work - the end users of the technology. They receive the contact details of the surgeon they should contact, and then call to hear if they can participate in observation of a surgery. After getting a confirmation from the surgeon, the group continue to interview him about his work situation and current situation in the surgery room, as well as what solutions exist today on the market.

All of the group members said later in the interview that they wanted to participate in surgery both to better understand the problem of surgeons and also to get inspiration for new solutions. One of the team members later explains it like this; *"It's hard to understand a problem that you are not familiar with, yourself. I'm not a surgeon. I do not know how it feels to be a surgeon and how the problem feels for the surgeon "*.

After the phone call with the surgeon, one team member says she must be leaving soon. The group therefore begins to discuss the plan on moving towards the presentation they will be having in two weeks. They discuss what they need to figure out, who they need to talk to figure out this, and when the team should meet. Several of the team members seem uncertain about what they should really prioritize in the coming two weeks. The organizer of the event later says during interview; *"We did not define the process much for the students, or how they can proceed an innovation process. I think we should have done more if we had the time "*.

Meeting with the inventor

The team members doesn't meet until three days later, when they have agreed to meet the developer of the "ScanX" technology. During the meeting, they get to try the technology to see how it works. The group learns more about the technology, and also which problem the scientist behind the technology thinks it solves. During an interview in this period, one group member says that the group at this time had decided to focus on *"Scan-X*" and present this as the final solution during the presentation. She says they also discussed whether they should research other solutions or not. Several of the team members states during interviews that they think the experts who were part of the innovation process-network seemed very competent.

One of the participants also says that it was the experts who helped the team find the solution. He states it like this; *"... and we got some ideas and some response to our questions and the experts helped us find a solution. Without them we wouldn't have found a solution "*.

Two days later, the group meets to attend observation of a surgery. The surgery is cancelled, leaving the team members disappointed. They said they were hoping to get a new perspective on what the problem of the surgeon really was. The team members begin to discuss how they should move forward towards the presentation. It seems they are still having issues on understand what the problem of the chosen challenge really is.

Where is the facilitation?

During the process, the group experiences that there is little support from the facilitators and organizers of the innovation process. The group members says that they did not get any guidance on how the process could be carried out. One of the team member describes it like this; *"We did not get any guidance on how we would work towards a solution. It was somehow like this; the next two weeks, you can work as you please. And that was it"*.

After the surgery was canceled, the group began to contact various experts who would be potential end users of the technology they are focusing on. The group presents the "Scan-X" technology to these experts and receives feedback from them. The technology is presented by merely talking about it, as the group believes something else is not possible. They state that since a subcomponent of the technology still does not exist, the technology can not be demonstrated.

> *"When we presented our solutions to the experts, we tried to explain them as thoroughly as we could ... So we didn't have the means to demonstrate it. We did not have anything specific and concrete to show them, but we could ask them; what if you had such a solution...* – group member of process one

The group contacts both radiologist, a surgeon and an expert on image diagnostics to tell them about the technology, and hear if they think it would be a good solution to use. Of the image diagnostic expert, the group gets a CT image to use to use with the technology, as a way of demonstrating the potential use of the technology at the presentation.

The challenge really has no specific problem

At this point, the group feels that they still have not understood what problem the technology is trying to solve. The difference now is that they no longer experience that they do not have enough skills to understand the problem, but rather that they have learned enough about the area to realize that there is no concrete problem that technology solves. One of the team members gives a comment during interview that illustrates the groups perception; *"So what we basically found out in the end, was that there was really no concrete problem that the technology was solving".*

Nevertheless, the group decides to continue meeting the developer of the technology, as they feel they "*must present something*". It is now three days left for the final presentation, and the group meets the developer of "Scan-X" once again. This time they learn to put together CT images with the technology. This is to use it on the presentation as a demonstration. They also make the presentation together with the developer, and agree upon which aspects to present.

Disagreements while preparing the presentation

The following day, the group makes a compulsory two-page document to be submitted to the organizers of the innovation challenge. This is the first time there is a disagreement in the group, one team member later says during interview. The disagreement concerns the document and how it should be written.

> *"So the document we were going to write... At this point everyone was very tired when we were to write it, so it became a bit of a messy structure because we did not get any idea of how that structure should be ... Then I got a bit frustrated and said: maybe we can write this in a slightly more clear way? Because there were some team members who actually thought that what we had written was really good, that it was good enough. That was the only disagreement we had. Otherwise we have agreed all along "*- group member of process one

Besides this instance, several of the members state that the group agreed throughout the whole process. One group member says during interview that she did not really think this was any positive for the final result, but that at least the general mood in the group was good. Another

one says it like this; *"If there is some disagreement then, then something is at least happening. Then you as a group can see things from different angles. If everyone agrees, it's a bit like everyone only shares the same perspective ... ".*

Another participant says that the dialogue in the group was good, but that she felt she took up more space than the others, and dominated the group at times. However, she says that she is not sure how the others have perceived this because it never became a topic for discussion.

The final presentation

On Saturday, the group presents in front of a jury and all the other teams of the innovation event. They present the technology together with the CT images, as well as the supposed problem that technology solves. The group does not win the competition and is also not happy with their own presentation. One of the group members believes they would have performed much better if they had received more guidance on how to go through an innovation process. She explains it like this;

"I think that the presentation and our final solution could have been done better if we had received guidance along the way. Something like; the first thing you should do in an innovation process is this and the next is that" – group member of process one

In addition, several of the members state that they have not prioritized to work a lot on the challenge throughout these two weeks, and that the motivation for the different team members seemed to have varied a lot.

Process two: the structured process

Process two was part of a two week summer course in co-design, designed by a college in the Netherlands. This section will present the data in a chronological order.

The organizer's preparations

The organizer states that the purpose of the course was to give students an introduction to a co-design process, and teach them how to set up similar processes for themselves later. He further says that the summer course is a great opportunity for him to offer a client a group of students who can work in a creative manner for those two weeks. The organizer says that the benefit of bringing together students and a case from a client is that students can bring the client a whole new perspective, as they come from the outside and are not affected by the client's corporate culture. He explains it like this;

> *"Students are not limited by the system, and I mean the company system. In most companies you will see that there are rules and regulations, there are existing patterns, there are constructs, there`s power and power play happening, so in a company it is quite difficult to innovate. We often see that students can offer a new and fresh perspective, not bound to any construct in the company. Because they dont know the people in the company"*- organizer of the event of process two

Designing the process after the client's needs

In order to find an appropriate client and challenge, the organizer says that he considered several. He sent an email to all his contacts in the design community to hear if someone had a suitable case for his course. The organizer further says that he chose that one particular client because he was the first to respond and that he had a very concrete design brief. This made it easy for the organizer to implement the case without much extra work. He states it like this;

> *"… they came with a very concrete example...I chose them because they were the first, and the best prepared of the teams….So they had a very clear design brief, that was quite easy for me to apply"* – Organizer and lead coach of process two

The organizer also says that the course is arranged according to the client's needs and the specific problem to be solved, but that he also adapts the programs according to his own mood.

Building team culture is uncomfortable but important

The course started with the course participants meeting and introducing themselves to each other. The participants consisted of a team of five people, all from each different country in Europe, the Middle East and South America. The first day consisted of the team being introduced to various exercises to get to know each other. One example of the exercises the participants go through is that team members need to share something that affected them on a personal level last week, and how it affected them. One of the team members starts to cry as she tells the group about a shooting episode in her hometown last week.

The organizer later explains during interview that the exercises were meant to build team culture in order to get the members to trust each other and therefore work more efficiently. The participants describe the exercises as uncomfortable, but all of them also states that they have realized how important the exercises were for the team's development and further process. Promoting team efficiency and honesty is mentioned by the group members as the purpose of the exercises. One of the team members says it like this;

> *"I was a little shocked the first day… The exercises made me very uncomfortable, but they helped a lot, for us as a group… Because we only had two weeks and we had to work hard, so we had to make that bonding happen superfast"*
> – group member of process two

Getting introduced to feedback sessions

After the team culture exercises, the team gets a theory introduction on how to give and receive feedback. After that, the team has a reflective session where they give each other honest feedback, based on first impressions. The facilitators says that they believe that it is the fear of doing mistakes that holds students back from innovating. They further explains that they believe this can be counteracted if the team feel confident about each other, which is achieved through feedback sessions.

Meeting the client

The next day, the team gets a two-hour introduction to user-centered design and co-design. After the theoretical review, the group travels to Rotterdam to meet the client and receive the design brief. At the client's office, the team is presented to the challenge the client wants them to work on, as well as the company`s values and way of working. In addition to talking about what the client wants the group to focus on, he also spends a lot of time talking about their existing technology "I-BELL" and how they want to enter a new market with this technology. He proclaims that in order to enter this new market, they need to understand the end users and their true needs.

The challenge is too abstract and vague

When later asking the participants about their opinion on the presented challenge, they point out two aspects. One is that most think the challenge in general was too vague and abstract. Understanding people's relationship to two values; hospitality and access appeared as being overly open to several of the team members.

The second aspect was that the participants find the challenge too closely related to the client's already existing product. They explain the problem by saying that it was difficult to free themselves from this product when they first had been presented to it. One of the team members explains it like this; *"In regards to the challenge we were presented, I think It was difficult to come up with a lot of different ideas around the actual idea that the client already had as a business, but for a new market"*.

The main facilitator which is also the organizer explains the choice of challenge as a way for him to present real cases for the students, because it is the only way to engage students. Another of the facilitators of the course, however, is skeptical about the problem and mentions he does not think it was a good starting point for co-design. During interview he describes his perception of the given challenge like this;

> *"The challenge that they set to you… It was too much driven about, they have a product, and they want to bring it to another market. In terms of co-design that`s the wrong way around. You should first identify a need within your audience, and*

then come up with solutions for that. But it felt a bit like they were trying to validate their own idea, and that they were like - oh yeah, we can also bring this to consumer market, and we need you guys to prove that." - facilitator of process two

The group then returns to the studio to discuss how to interpret the challenge. They begin to prepare their own reformulated design brief, after being advised to do so by the main facilitator. They send to reformulated design brief by mail to the client, and quickly receives a response saying that the design brief is ok and that the group seem to have understood the challenge.

Conducting user research and analysis

The next day the team receives an introduction to how to conduct user research and what techniques can be used. After this the group prepares questions related to the of the client, that they want to ask potential end users about. They go out to interview people on the streets, and then conducts a focus group interview on the topic of hospitality and trust. Afterwards, they go back to the studio to fully write the interview data before putting it up on the analysis wall. The team then begins to look for relationships between the data they had collected this day, to se if any patterns are emerging, as the process facilitator calls it. All the conducted interviews were also supplemented with images of the interviewed users, or sketches of those users that did not want to be photographed. This was done at the facilitators's request, believing that this would help the team to remember that it was people they designed for and not a *"homogeneous demographic user group",* as he describes it.

After that, the team has a feedback and reflection session with the two reflective coaches. These sessions enables participants to give feedback to each other on different topics, through various exercises. All of the interviewed team members later says that the feedback sessions were an eye opener. Two of the participants said that the feedback sessions they had were the best part of the whole course. One of the other participants says he believes the team would have had a lot more tension and irritable mood if they had not had the feedback sessions to vent all the frustration and joy. He describes it like this;

"What we did is giving the feedback twice a week. That was great. Having feedback from someone you work with, and trying to think that is it for the best, it is not a

judgmental process. It's for you, my colleague, to grow, so that I can grow with you." – group member of process two

User research with generative techniques

The next day the team once again performs user research out on the streets. The group uses different generative techniques to get a new type of insight into the users. They allow the users to draw, associate words and similar techniques to reach deeper levels of knowledge of the users, as learnt by the main facilitator.

In addition to the generative techniques and short interviews, the team also conducts an in-depth interview with three people regarding their relationship with their home, as well as access and hospitality. The team then went back to the studio to write all the data to full texts and to hang it up on the analysis wall. Again, the team was encouraged by the coach to try to see relationships and patterns in the data they had.

The team expressed that they experienced stress during this period. One participant said she felt stressed because she did not feel she fully understood what the client was actually looking for. She also said that it felt unusual and uncomfortable to have spent a week without having yet come up with any solution. The facilitators kept on encouraging the team to really try to understand the user before they began to propose solutions to the client.

Making concepts

After the team spends half the day doing research, the process facilitator suggests it is time to do an exercise to produce ideas, based on the main insights from research. The exercise was led by the facilitator and encouraged the team members to each draw ten ideas, under a limited amount of time. The ones that were done before time, was encouraged to draw ten new concepts. Afterwards, the group was asked to present to one another and vote for the best ideas. The group was then left to themselves to work on the ideas and make them into concepts. This was performed by the team by discussion and drawing. The facilitator later explains during interview why he insisted on making things visual;

> *"I really believe in making things visual, and if possible even physical, because talking about ideas is like... it's the same with the metaphor of a picture is worth a thousand words, it's the same with... if you create a prototype, its maybe worth a thousand pictures."* – facilitator of process two

Struggling with prototyping

On Monday, the team were to be guided through its first round of prototyping. The group was told to draw the concepts from Friday and make simple prototypes in cardboard, to then go out on the street and test the prototypes and document the feedback. The facilitator then left the group by themselves. After testing the prototypes, the team returned to the studio to get all the insights and feedback from the test on the analytical wall.

During interviews, several of the team members states that this part of the innovation process should have been guided more thoroughly. The team felt very uncertain about prototyping and testing, and several team members also said that they would have preferred to receive more guidance ever since the elimination of concepts started. One of the team members states it like this, during interview: *"We were struggling in the prototype phase. We were not innovating much. We were prototyping considering the facts of reality"*.

The client is not impressed

In the afternoon the team had a planned meeting with the client to update him on their process. When they met the team presented their concepts to the client, which led to negative feedback from him. The client said he believed the presented concepts to be obvious and had little innovation. He had also stated that he had expected more of the team. Furthermore, the client told the team to look more broadly at human emotion rather than just potential product lines. The team got confused by this meeting, because saying during interviews that they thought the client wanted a proposal for a solution.

After this meeting, the group expresses anger towards both the client and the main facilitator. Two of the team members state that the facilitator chose the side of the client, and that they would have been at a better stage in the process if the facilitator had been more involved along the way. One of the participants also says in interview that the client made him feel that

the team never did enough work, no matter how many hours they spent working. During interview he says explains it like this;

> *"I remember being pissed off when we first got negative feedback from the client. I think partially the way the client delivered it, the feedback came across as obnoxious at the time. As if we were making a mistake that was really obvious. I felt that he was at least partially responsible for the route that we had taken, based on the brief he gave us. So yeah, I was a bit pissed about that."*
>
> – group member of process two

The team is given a homework, to think of ten new concepts each, which will be made into prototypes the following day. The facilitator also announces that the client will be the one facilitating the prototype session.

The client facilitates round two of prototyping

The next day the client meets to guide the team members through a new round of prototyping. All group members are encouraged to produce at least 15 prototypes in 20 minutes. The client also urges them not to think too much or be too critical, but rather just create. He encourages them to think big and unrealistic, saying that prototypes can also be made to provoke responses from a user group and that they do not necessarily have to be related to a final product. After the prototype generation is over, the team presents their prototypes to each other. The group then votes for the best prototypes, which are then tested internally.

After the prototype session with the client, the group has different opinions on how it was experienced. One of the participants said afterwards that it was this specific session that made her understand "the design way of working". She further says that she would like the prototype session to be at the very beginning of the course, so she could have understood a little more of the design mindset, thus becoming more creative. The other team members express similar wishes in the interviews - that learning to prototype from the very beginning would bring them into the correct mindset. One of the team members says it like this; *"... I think we were limiting ourselves a little bit. At least I think for myself, I was limiting myself a lot before the prototyping session took place."*.

Nevertheless, several of the team members believe that the prototype session should not have been performed by the client, because they felt that it prevented them from expressing themselves completely.

Provotypes and more analysis

After the prototype session, the prototypes were brought to the street to test with end users, to provoke reactions from them. Half a day was spent on testing, and afterwards the team returned to the studio to hang up all the data on the analysis wall, and try to look for new connections. This time, the team was encouraged to look for strange and unexpected connections by the facilitator, and not the obvious ones.

The following day iterations were performed on the prototypes. The testing of yesterday's prototypes had not given much insights on the user group , such as the team hoped for.
The group now decided to use more prototypes to learn more and deeper about the users and their needs. These prototypes were called provotypes by the coach and the client. As usual, the feedback was documented along the way, and later hung on the analysis wall.

The client expected presented prototypes

The group had to present to the client the following day, and therefore attempted to make a final conclusion of the analysis wall. They decided to present main insights instead of prototypes, as they themselves thought they had not come far enough in prototyping to deliver something.

On Thursday, the group were to present to the client. They spent the first half of the day preparing for the presentation. Again, they spent some time looking at the analysis wall to find main findings. Different team members got different responsibilities from the main coach; someone made the oral presentation, some cleaned up the analysis wall and made it more visually appealing, others made deliverables - a book to the client with all data and findings.

During the presentation the group chose to talk about the process, all the iterations they had been through, and their main insights on the user group. Based on the insights, they came with

tips to the client about how he could utilize this into his business. The client gave the team feedback after the presentation, saying that he was expecting the team to present prototypes and not only insights.

A full day of reflection and feedback

On the last day of the summer course the whole day was set for feedback and reflection. The group was coached through reflective exercises with different focus. A large part of the day was also used to review the two-week process and look into what could have been done better. A lot of reflections were shared around the client and his influence on the process. Three of the team members said afterwards that they think the client affected the process too much. Furthermore, they said that the course should have been more tailored to the students' needs, pointing out that it was actually the students who paid for the course and not the client. This chapter has presented the findings of two separate processes; process one that took place in Norway and process two that took place in the Netherlands. Both processes were presented by depictions, as well as quotes. The next chapter of the thesis will present the analysis, where the findings have been analyzed with the co-design framework from the theory chapter.

Analysis

In this chapter, the author will analyze the collected data, based on the co-design framework presented in the theory chapter. A within-case analysis will first be performed for each case, in which the cases are treated as separate entities. Then a cross-case analysis will be conducted, where the two innovation processes will be seen in comparison with each other, and the co-design framework. Both differences and similarities will be analyzed. In addition, factors affecting the processes will be analyzed. The analysis chapter is terminated with a review of the co-design model, based on the analyzed data.

Within-case analysis

In this part of the analysis, two separate analyzes of the two processes are presented. Both analyzes will look at co-design principles, co-design activities and phases, as well as presenting a visualized model of the process, based on the co-design framework. First, process one will be presented, thereafter process two.

Process one: the unstructured process

Co-design principles

Although neither the organizers nor the group did not follow any particular process methodology, the author argues that the process matched several co-design principles.

Firstly, the design of the event is in line with one of the most important co-design principles, in that students without a background in innovation are invited to participate, which is consistent with the basic assumption that all the people are creative and can contribute to design (Sanders and Stappers, 2016).

At the start of the event, all students were divided into groups where all participants had different backgrounds. This complies with the co-design principle of having multidisciplinary teams as a criterion for co-design (Tan, 2015).

As the empirical data review describes, the organizer of the innovation process had invited a student who belonged to a health care startup, to talk about her team and their process. The

student repeatedly emphasized the importance of involving the end users in developing a solution, right from the very beginning. She can therefore be said to encourage the enrolled teams to fulfill an important co-design principle, namely that the end user are the expert of his/her experience, and that it is therefore critical to include them in the design process (Sanders et al., 2014).

The student team also engages in activities that complies with co-design principles. Some of the first days of the event, the group plans to observe a surgery to get a deeper understanding of the problem. This can be seen in relation to the co-design principle of empathizing to understand the end-user, i.e., trying to grasp the situation through the perspective of the end user (Sanders and Stappers, 2016). The group says they had hoped to get a new perspective on what the end user's (surgeon) problem really was and they express a lot of disappointment when the operation is cancelled. This can be interpreted as the group having a need to empathize with the end user, which is an important part of co-design.

The group contacts both a radiologist, surgeon and an expert in image diagnostics to discuss if the technology would be a good solution to the given problem. They therefore address a wide range of stakeholders and take the entire ecosystem around the solution into consideration. By doing this, they additionally include end users in the process, which is an important co-design principle (ibid).

It can thus be argued that the arrangement and its guidelines are in several ways consistent with co-design, although this has not been a conscious choice by the organizer.

The thesis will now analyze the process, by examining the different phases and activities related.

Co-design phases

Preparation

At the start of the event, the teams were presented with problems to be addressed, by an external client, which resembles what is referred to as design brief in co-design (Cross, 2001). After the presentation, the group asked questions to the expert who had developed the technology to which the problem was linked. In addition, the group talked a lot about how to best spend the two weeks of the innovation process to come up with a solution. This can be

interpreted as the group attempting to design a project brief, which is done before commencing a co-design process (ibid).

When analyzed by the co-design framework, these activities correlate to the first phase of a co-design process; namely the preparation phase. It can therefore be argued that the group's activities indicate that they were in the first phase of a co-design process.

Concepting

At the first day of the innovation process the group did a brainstorming session. While brainstorming, The team members visualized their solutions to better explain them to each other. During the brainstorming session one of the team members began to draw props, to then play a scenario by using the props. This was to illustrate to the group how a surgeon would behave in a given situation. Even though the team member does not do it intentionally, she can be said to perform a co-design technique to illustrate and generate solution suggestions, namely to play a scenario (Schneider et al., 2012).

Both brainstorming and visualizing solutions are typical activities related to the phase of concepting in co-design (Tan, 2015). Analyzed by the co-design framework, it can be said that the activities of the group during this period correspond to the activities performed in phase four of a co-design process, namely concepting.

Research

During the opening day of the event the student team also begins to talk with experts, to ask clarifying questions about the presented problem issue. The group conducts interviews with several experts to explore the context of the problem issue.

As mentioned earlier, the group also had an intention to participate in an operation to perform observation. Both of these techniques match the tools used in co-design for better understanding of the problem (Tan, 2015).

It can be argued that these activities correspond to activities typically performed in phase two of a co-design process, namely research. It is only the first day that the group conducts interviews where the presented technology in the problem is not the starting point for the research.

Prototype

At the fourth day of the event, the team meets the developer of the "ScanX" technology to which the problem issue is linked. During the meeting, they are allowed to try the technology to see how it works in practice. After this meeting, the group continues to have interviews with experts, but from now on it is to present the technology and get feedback on it. The technology is presented by verbally explaining it, as the group thinks something else is not possible because a important component of the technology still does not exist, leaving it impossible to be built, according to them.

Based on a co-design perspective, this activity can be interpreted as testing the prototype with users (Wong and Khong, 2011), although they do not present anything visual or tangible. By "testing" this way, the group also involves the end user, thus ensuring a degree of user-centered process, which is a important principle in co-design (Sanders and Stappers, 2016).

By analyzing the group through the co-design framework, it appears that they are already performing activities correlating with prototype phase in co-design, as they have already started focusing on one specific solution (Wong and Khong, 2011).

As previously mentioned, the fact that the group is conducting interviews, may make it seem as if they are in the research phase, but since all the interviews are linked to an existing solution, the author chooses to interpret it as performing verbal testing of a prototype. By looking at the content of the interviews to the group, it can therefore be argued that from a co-design perspective, the group performs activities linked to the prototype phase of co-design, ever since day four when they went to the developer`s office.

Implementation

During the last two days, the group is working on preparing the presentation for the client as well as a written submission. The written submission corresponds with what is called a deliverable in co-design. At this point the group has also stopped testing the prototype, and can therefore, from a co-design perspective, be said to be in the final phase of a co-design process; namely implementation.

Visualized process

Following is a full overview of all the phases the group went through, analyzed by the co-design process model. The arrows illustrate when the group diverged and converged.

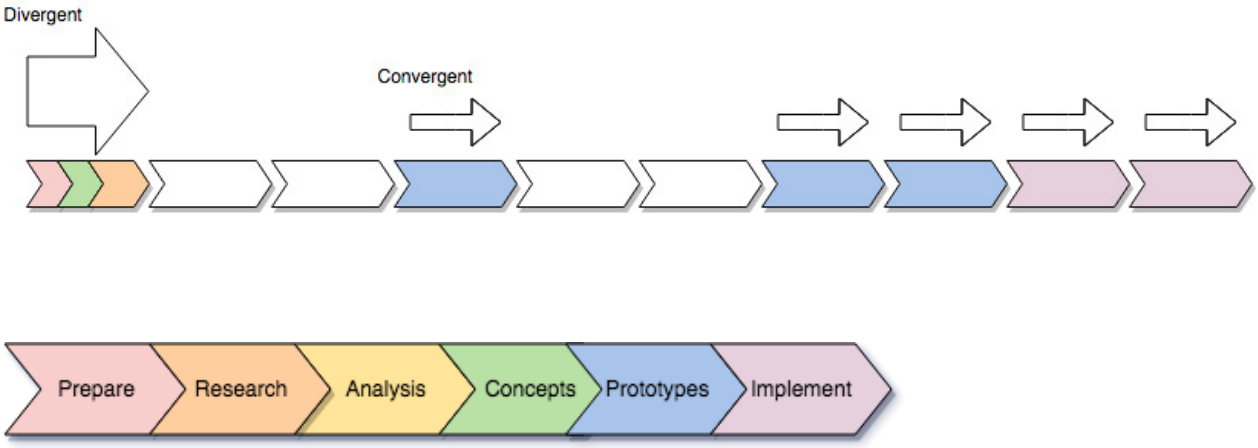

Figure 6 Visualization of process one

By analyzing the overall process with the co-design framework, several aspects appear interesting. In the previous section, the author analyzed which co-design phases the group went through, based on the performed activities. In this section, the author will look at the process in an overall manner, based on the process model.

It can be argued that the activities of the group correlate with the preparation phase at the start of the process, although this is only for a short period of time – barely one third of the first day.

After this, the activities performed implies that the group enter into a concept phase, when analyzed by the co-design framework. The concept phase of the group is short and is performed at a different time than it would have been performed, when compared with the co-design framework. After the brief concept phase the group engages in the first day of the process, no more concepting is conducted. According to the co-design model the concept phase normally follows after the analysis phase, which does not happen in this groups` process.

The team also barely starts performing activities related to the research phase of co-design. Already on the second day of working, the group performs activities related to the prototype

phase of the co-design model. This starts when they meet the developer of the technology related to the problem issue. The group thus continues to perform activities that match the prototype phase major parts of the innovation process. The last two days the group performs activities related to the implementation phase of a co-design process.

Seen from the perspective of co-design, the groups has mostly been performing activities related to the last two phases of a co-design process during their innovation process. It is also apparent from the graphical illustration that the group is inactive for a whole of four days of the total ten days the process is supposed to last.

It is also apparent from the graphical illustration that the group is only involves in divergent thinking in the first day of the process. On the given day, the group performs both brainstorming and user research, and can therefore be said to diverge; ie to widen the general scope and generate a broad range of solutions (Tan, 2015). On the second day of working, the group shifts to a convergent way of working, by narrowing the scope, and starting to focus on one single solution. Based on the activities performed, the group can be said to be convergent throughout the rest of the entire process.

Summary of within-case analysis of process one

Without it being a conscious process, the team in the unstructured process performs many co-design principles, as well as co-design activities. The group's process corresponds to several co-design principles, both the belief that all people are creative, multidisciplinary teams, to be jointly exploring, engaging in empathizing with the end user, conducting an activity-based process as well as including the end user in the process .

The group also conducts activities related to the phases of preparation, concepting, research, prototyping and implementation. The group partially meets the goals of the preparation phase, research phase and implementation phase. The team spends most time in the prototype phase and arrives quite fast to this phase, and generally spends the most time in the last two phases of the design process. In addition, the group mostly conducts convergent thinking, as opposed to divergent thinking.

Process two: the structured process

Co-design principles

Both the arrangement by its design and the participants' way of working, fulfilled many co-design principles, which is not surprising as the summer course consciously had chosen this methodology.

Firstly, the enrolled team consisted of people with different backgrounds as well as nationalities, thus matching the co-design principle of working in multidisciplinary teams (Tan, 2015).

In addition, the work process largely consisted of performing different activities, such as interviewing, writing and visualizing data, brainstorming, using generative tools, drawing concepts, building prototypes. It can therefore be argued that the group performed the co-design principle of creativity by doing (Van der Lugt and Stappers, 2006).
The team also worked iteratively, in the way that they switched between different phases of the process and went back to perform activities related to previous phases where necessary. A good example of this is the sixth day of the process, when the team went from the prototype phase and back to the concept phase, because the client was not happy with the presented prototypes.

The facilitators focused greatly on providing room for reflective sessions, during the innovation process. During these sessions, team members discussed what worked and did not work with the process and teamwork, and gave each other positive and constructive feedback. This complies with the co-design principle of implementing reflection as part of teamwork, to clarify team members' motivation and interests in the co-design process (Steen, 2013).

The team also performs to a certain extent the principle of including end users in the co-design process (Sanders and Stappers, 2016), by interviewing end-users, using generative techniques for obtaining information by end users, and testing lo-fi prototypes and proving on them. At the same time, they do not take the initiative to invite an end user to become a full member of the design team, as some co-design practitioners believe is crucial for a real co-design process (ibid).

Co-design phases

The team performed many activities that match activities in a co-design process. Based on these activities, the author will try to categorize the different phases of a co-design process that the group went through.

Preparation

On day two of the summer course, the team got a presented challenge by an external client, which in co-design is often called a design brief, and is a natural first part of a co-design process (Cross, 2001).

A design brief contains setting a goal, some constraints within which the goal must be achieved, and some criteria for recognizing whether the solution is successful or not (ibid). The brief the group received had a set goal, namely to explore the perceptions of accessibility and hospitality of people. It also contained some constraints within which the goal must be achieved, which was to focus on people living in midsize buildings with 20 tenants in Utrecht. The design briefing did not contain were criteria for recognizing if the solution is successful or not.

Another characteristic of a design brief, is that it does not specify what the solution will be (ibid). Even though the design brief itself did not specify what the solution should be, the team still felt that the client put constraints on them, by presenting their own technology and saying that the background for the challenge was a desire to enter a new market with their technology.

The team also worked to reformulate the design brief and transform it into its own. They sent it to the client and received feedback saying it was ok, which corresponds to the co-design framework, specifying that a reformulation of design briefing is an important part of a co-design process (ibid).

By analyzing these two activities with the co-design framework, it can be argued that the group's activities correspond to the preparation phase of a co-design process.
In addition to the activities highlighted as important in a co-design process, the team also performed an additional activity in the preparation phase, namely setting team culture. This

activity is not mentioned in the framework as an important activity, but was considered particularly important for the team members during the summer course.

Research and analysis

The group used interviews, focus groups and generative toolkits to get information about users, which are common tools in co-design to drive user research. Nevertheless, it should be pointed out that during several parts of the process, the group collected data about users based on the existing technology of the client, and the questions they asked were often associated with this technology. User research should be based on uncovering the user group and their needs (Giacomin, 2014), and not being linked to a solution.

Every day after conducting research, the group visualized all data to analyze it on the analysis wall. It therefore appears as if research and analysis was an intertwined process, and these two phases were performed in parallel with each other.

Concepting

The team also worked to generate a quantity of ideas, which was also visualized. Visualizing is an important principle in co-design when developing concepts (Tan, 2015).

In addition, mock-ups were made, where solutions were sketched quickly on paper, and then brought to users for feedback. All of these activities are important in co-design, and according to the framework, they are linked to the concept phase.

Prototyping

Team members also developed several prototypes in different materials. The group was told to make simple prototypes in cardboard, to then go out on the street and test the prototypes while documenting the feedback. This corresponds to creating a lo-fi prototype in co-design (Wong and Khong, 2011).

All though the team created prototypes and tested them with users once, they mostly made "provoking prototypes" to elicit responses from the users, and thereby learn more of their opinions and needs. Most of the prototypes were therefore not intended to be early versions of a final solution. The author therefore choose to interpret most of the groups "prototyping"

activities rather as research activities, as the main intention was to learn more of the user, and not to test possible solutions.

Implementation

Finally, the team prepared a presentation that they presented to the client, as well as a book with the data and insights from the process which they handed over to the client. This correspond to deliverables, based on the co-design framework.

Based on these activities, it can be argued that the group's activities complies to activities performed in the final phase of a co-design process, namely implementation.

Reflection

In addition to having undergone the usual phases of a co-design process, the group also had a day of additional activities. The last day was dedicated solely to reflect on the process, themselves and the others as team members, as well as how to make the process even better next time. Due to these additional activities, it is argued that the group added its own phase of a co-design process, namely reflection.

Visualized process

Following is a graphical representation of the phases the team went through in its innovation process, based on a co-design perspective.

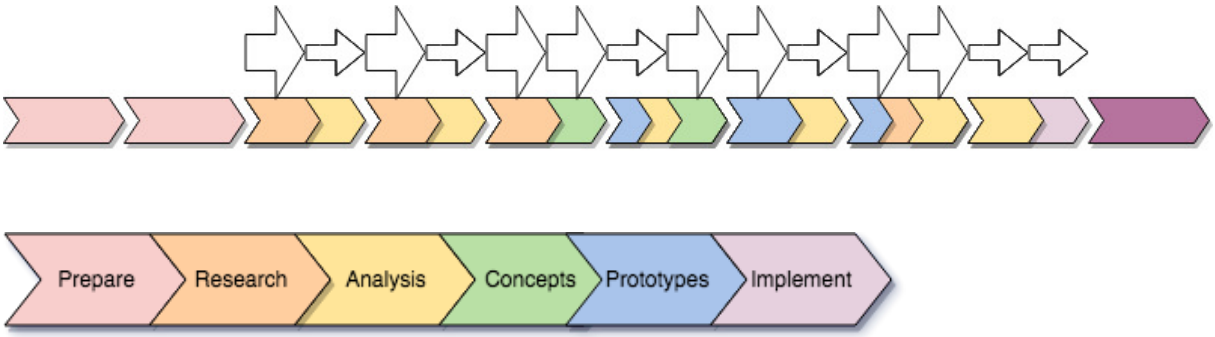

Figure 7 Visualization of process two

By analyzing the process with an overall perspective, it appears that the team devotes a lot of time to activities related to the preparation phase of a co-design process. In addition, a lot of research-related activities are performed, especially when one interprets the group's testing of

prototypes as a way of performing user research. The group can then said to spend six of ten days on research, and little on prototyping.

Another thing that reveals by comparing the group's process with the co-design framework is that activities related to analysis are performed almost daily, and thus appear less like a separate phase than in the co-design framework. Analysis is also conducted until the last moment, as opposed to what the co-design framework illustrates.

In addition, the group uses very little time on activities related to the implementation phase of co-design - they do not start with this until a few hours before the actual presentation.

Based on the graphic illustration, it is also seen that the group adds a separate phase to the co-design process, namely reflection. The whole last day of the innovation process is spent on reflective activities.

By comparing the team's innovation process with the co-design framework, one also sees that the process of the team appears to be much more iterative than the co-design framework. Among other things, the group moves from the prototype phase and back to the conceptual phase, as well as from the prototype phase and back to research. The process is also iterative in the sense that the group sometimes finds itself in three different co-design phases in one day, and generally shifts a lot between phases.

Concerning convergence and divergence, the group also distinguishes itself from the co-design framework. The graphical representation shows that the group has a high degree of exchange between divergence and convergence. It appears that the group changes daily between convergent and divergent thinking. The team is not included in convergent thinking for extended periods until the same day as the presentation for the client.

Summary of within-case analysis of the structured process

The team of the structured process conducts several co-design principles and activities. The team complies with both the principle of believing all people are creative, having multidisciplinary teams, jointly be exploring, implement reflection in the process, to alternate between divergence and convergence, empathize with the end user, have an activity based

process, iterative process and to include the end users. The team fulfills all the principles of the co-design framework, except abduction and including end-users as equal team members.

The team goes through all the phases of a co-design process, and spends a whole of two days in preparation. In this phase the team has a specific focus, which is building team culture and facilitating trust and bonding. In addition, the team also adds another phase to the co-design process, namely reflection, which is implemented throughout the whole process, as well as having a whole day for reflection at the very end of the process. The team has a very iterative process, and also alternates between convergence and divergence on a daily basis.

Cross case analysis

In this part of the thesis, the author will look at differences and similarities between the two processes. The analysis will focus on co-design principles, and co-design activities and phases. Factors that influence the processes will also be analyzed.

Differences between the two processes

Co-design principles

All though both processes comply with many of the co-design principles, process two – hereby called the structured process, complies with a greater amount than process one – hereby called the unstructured process. In general, there are no co-design principles the unstructured process complies, that the structured one does not comply as well.

However, the structured process fulfills some co-design principles that the unstructured process does not. The team in the structured process performs a great deal of reflection, which is one of the co-design principles.

In addition, the team in the structured process also alternates more between convergence and divergence, which is a co-design principle. The team in general performs more of both divergence and convergence than the other team, as convergence requires a synthesis of alternatives and choosing the best option (Tan, 2015), and not just sticking to one alternative.

The structured process also fulfilled the co-design principle of having an iterative design process, by shifting between different phases and going back to previous phases when necessary. This co-design principle was not performed by the team in the unstructured process.

Co-design phases

By comparing the two processes of the teams and analyzing the phases with the co-design framework, some interesting differences appear.

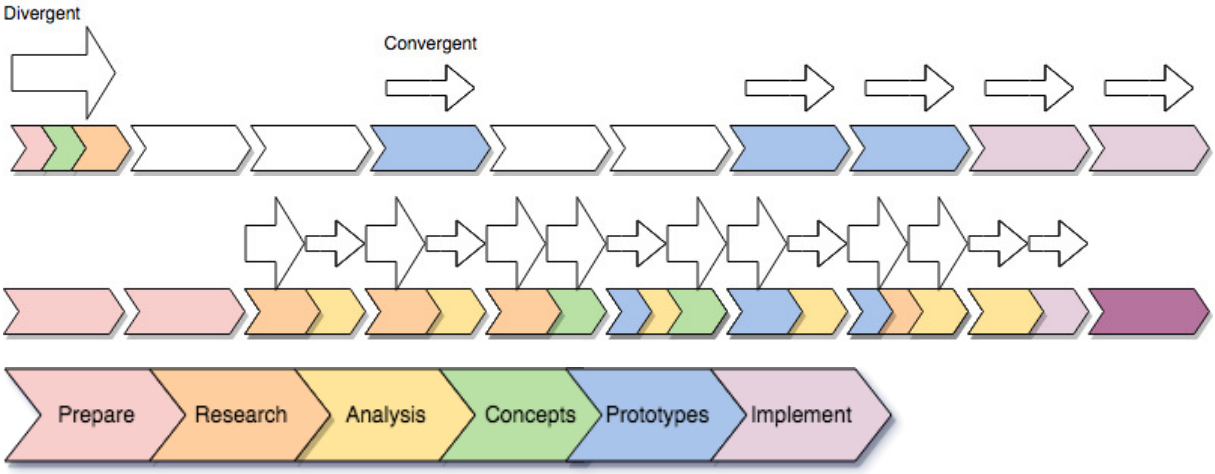

Figure 8 Comparison of the two processes

The two processes differ from one another already in the first phase of the process, namely the preparation phase. While the event of the unstructured process is designed for the team to have a couple of hours of preparation, the organizer of the summer course of the structured process has planned two whole days for preparation, before the actual innovation work begins. Only the team in the structured process reformulates the design brief.

The two groups also differs from each other regarding how much time they spend in the second phase of a co-design process; the research phase. While the team of the unstructured process is doing research solely the first day, the team of the other process spends five days on research. Because the group states they are developing prototypes and testing them to learn more about the users and not because they represent an early solution, it can be argued that the team is doing research and not prototyping in this phase, and that they therefore can be said to spend a whole five days on research. The team of the structured process conducted a greater variety of research methods in the research phase, than does the team in the team in the unstructured process.

The team of the unstructured process event never started activities related to the analysis phase of a co-design process. As a counter argument to this assertion, it can be said that dividing up a process in a pure analysis phase might be an over-simplification and that the team probably performed some form of analysis while conducting research. However, as this paper concerns the analysis phase as defined by the co-design framework, the team cannot be said to have conducted analysis. The team in structured process, on the other hand, is in the analysis phase almost daily for six days. This is also the only team that accomplishes the goals of the analysis phase, namely to create insights, and identify the most potential of the insights.

The fourth phase of the co-design process, namely concepting, is something that the team in the unstructured process performs for a short period of time, the first day of the process when they start on a visualized brainstorming. The team in the structured process also performs conceptualization, for a total of one day. Only the team in the structured process accomplishes the goal of generating a great amount of visualized solutions, and identifying the most potential of the solutions. All though the team in the unstructured process conducts a short brainstorm, they never reach this point.

The groups differ the most when it comes to activities related to the phase of prototyping. While the team of the unstructured process begins the prototype phase already on their second day of work, the team of the structured process does not start until the sixth day of the process. Moreover, as previously mentioned, it can be discussed whether the team of the structured actually begins prototyping at all, or if they are only conducting physical material research. Prototyping is the phase that the team of the unstructured process spends the most time in of all of the co-design phases, while it is the phase the team of the structured process spends the least time on.

In the final phase of the co-design process, the two teams also differ significantly. While the DRIV team performs two full days of implementation, the Utrecht team does not enter this phase until a few hours before the actual presentation for the client starts. The team in the unstructured process is the only team that fulfills the goal of presenting a prototype for the client.

In addition, the team of the structured process has added an extra phase to its process, namely a reflection phase. The team spends a whole day to reflect on the process after they have presented to the client.

The structured process also differs from the unstructured one, by the fact that the team is undergoing several phases in one day – it is much more iterative. It can also be said to be more iterative as the team went back to previous stages along the way in the co—design process where it was necessary, such as returning from prototype to research.

The teams are also quite different from each other in terms of how they entered into divergence and convergence. While the team of the unstructured process quickly went from diverging one time to remaining convergent throughout the rest of the process, the team of the structured process found itself in a divergent phase eight times. It is thus striking how the team of the unstructured process quickly adopts convergence as a way of thinking, while the team of the structured process alternates daily between divergence and convergence.

The team of the unstructured found itself most in the prototype phase and much in implementation. They did not perform any form of analysis as it is described by the co-design framework, and little concept and research. The team of the structured process spent most of the time on activities related to research and analysis, as well as a lot of time on preparation. It can be argued that they did not spend much time performing real prototyping, as it is defined by the co-design framework. Little time was also spent on implementation. Thus, one of the team spend most of its time in the prototype phase, while the other barely does at all.

Looking at the processes in an overall perspective, one can also see that the team of the unstructured process discovered its solution quite early in the process, while the team of the structured process never managed to come up with a final solution.

In addition, it can also be said that the team of the unstructured process mainly found itself in the first three stages of a co-design process; prepare, research and analysis, while the other team spent most time in the last stages; prototype and implement.

Similarities between the two processes

The two innovation processes have several similarities, both regarding co-design principles, the activities related to the phases, as well as factors that affect the process.

Co-design principles

Both teams fulfill all co-design principles related to team, both that the processes are based on all people being creative, multidisciplinary teams, and to be jointly exploring.

In relation to co-design principles concerning mindset, both teams comply to the principle of empathizing. The team in the unstructured process does this by planning to observe at a surgery, and by interviewing potential end users. The team in the structured process does this by applying multiple research tools to learn more about the end user. In addition, both teams comply to the co-design principle of performing activity-based creativity through means of engaging in various activities throughout the span of the process. Due to the principle of empathizing, they both also include the end-users in the process, by interacting with them and actively searching out their opinion.

Another similarity between the groups is that none of them fulfills the principle of abduction, namely looking for both solution and the true problem at the same time. Both groups seem to struggle to try to uncover what the true problem is, as they are affected by the client's already existing technology, and fail to break free of this influence when conducting research. The result of this is that in the unstructured process the group relies on the client's solution throughout the whole process, while the structured process group is unable to present a final solution in the form of a prototype as they never manage to uncover a real problem.

In addition, none of the groups meeting the co-design principle includes including end users as equal participants throughout the process, for example by inviting an end user to become a full member of the design team.

Co-design phases

Both processes meet, to some extent, the phases of preparation, research, concepting, prototyping and implementation – all though they do so to a different degree.

In the first phase of a co-design process, namely implementation, both groups perform the activity of receiving a design brief. None of the groups meet any of the two goals of the first co-design phase - neither to gain an understanding of the design brief, nor to have a plan for further progress.

This affects the processes later. Both groups are struggling to understand what the problem really is and what the client actually wants help with. For the first group, this results in the fact that they continue to work on the original solution, and for the other group, it results in a mid-term feedback from the client saying that they do not innovate as expected. The fact that none of the groups had a clear plan for progress is also reflected in the processes. For group one, it is clear that they do not have a backup plan to empathize with the end user when the observation of surgery is canceled, and for group two the data review reveals that they do not have time to complete the design process and thus unable to make prototypes they can present to the client.

In the research phase of a co-design process, both groups use interview as the main method of acquiring knowledge about the end-user. Both teams manage to fulfill the goal of identifying the target user in this phase. Nevertheless, none of the two groups is able to identify the real problem or the true user need.

As mentioned above, this is something that influences the processes to a large extent. Both groups end up feeling that the design briefs they worked with really had no real problem and were not built around a true user need. It took quite some time to come to this recognition in both processes. The fact that the challenges were not built around a real problem or user need also influenced participants' motivation in a negative way.

Another similarity between the two processes is that both groups spend little time in the concept phase, which is called the most important phase of innovation in a co-design process. The team in Utrecht is experiencing uncertainty in this phase regarding how to develop concepts and what is the appropriate procedure.

This affects the processes in the form that none of the groups manage to release themselves from the client's already existing solution, because they do not spend enough time trying to generate their own solutions. Along with the problem that none of the groups managed to

identify a real problem, it was also difficult to generate solutions when the problem was lacking.

The prototype phase also appear to be challenging for both groups, based on statements during the interview. The DRIV team did not build its own prototype based on self-developed concepts, but rather related to the client's prototype. The Utrecht team did little prototyping in the form of testing early-phase solutions to any end-users. They used the prototype phase to learn more about the users, thus ending up not having a final prototype to present to the client, even if the client was expecting them to have one final prototype. In the prototyping phase, none of the team accomplished the goal of evaluating ideas, or the goal of refining the ideas.

This affected the processes in the way that none of the groups managed to present further developments of a prototype based on end user feedback. In the process of team one, the presented prototype was the same as the client already worked with, without any improvement. In the process of team two, no prototype was ever developed, which in turn resulted in a dissatisfied client.

In the final phase - implementation, both groups perform the activity of delivering deliverables to the client, and both meet the goal of communicating the findings to the client.

In addition, both groups participate to a certain extent in both convergent thinking and divergent thinking through the innovation process.

Table 1 comparing co-design principles of the two processes

Principles	Process 1: Unstructured	Process 2: Structured
Belief of all people creative	x	x
Multidisciplinary	x	x
Jointly explore	x	x
Reflect		x
Abduction		
Divergence and convergence		x
Empathizing	x	x
Activity-based	x	x
Iterative		x
Include end-users	x	x
End-users as equal		

Table 2 Comparing the co-design phases and activities of the two processes

		Process one: the unstructured	Process two: the structured
Preparation			
activities	Design brief	x	x
	Reformulation		x
	Project brief		
goals	Understanding of brief		
	Plan for further progress	x	
Research			
goals	Identify target user	x	x
	Identifying the real problem/true user need		
activities	Interview(s)	x	x
	Observation		
	Focus groups		x
	Day-in-the-life		
	Cultural probes		
	Generative toolkit		x
Analysis			
goals	Create insights		x
	Identify most potential insights		x
activities	Analysis wall		x
	Stakeholder map		
	Personas		
	User journey map		
Concepting			
goals	Generate quantity of visualized solutions		x
	Identify most potential solution		x
activities	brainstorming	x	
	analogies		
	scenarios	x	
	mock-ups		x
Prototyping			
Goals	Evaluate ideas		
	Refine ideas		
Activities	lo-fi prototype		
	hi-fi prototype	x	
	Testing of prototype	x	
	wizard-of-oz		
Implementation			
Goals	Communicating findings to client	x	x
	Present prototype	x	
	Provide deliverables	x	x

Factors that affect the process

Facilitation

The provided facilitation is also an important theme for those involved in both innovation processes. The participants state in both the processes that they feel they are not getting enough guiding in the process. It is especially mid-way in the process that both teams perceive a lack of facilitation and guiding from the facilitators. It appears from the data that the groups need more support in both the analysis, concept and prototype phases.

This again affects the motivation of the participants, and creates a uncertainty among the team members in how to further proceed. It seems as if both groups choose to follow "the safe road" as a result of this, by staying close to the clients already existing solution.

Although both groups are missing more facilitation in the middle of process, they handle it quite differently. The team in the unstructured process relies on guidance of their client and arranges frequent meetings with him, while the team in the structured process continue to work on their own, even though they are also staying close to the existing solution of their client.

Time allocation is also something that both groups have challenges with, albeit in their own way. The team in the unstructured process uses three days of prototyping and two days of implementation, which can be said to be final stages in co-design. They are therefore skipping several important phases, according to the co-design framework. The team in the structured process never really starts with the prototype phase, as well as spending some time on implement. This affects the process in such a way as in leaving it incomplete – team one skips important phases of the process, and spends insufficient time in the first part of the process. The result is that they don't spend enough time getting to know their end users. Team two on the other hand, spends too much time in the first part and therefore doesn't have the time to create and iterative on a prototype to present to the client. Based on this, the client gives the team feedback that they haven't seem to completed their innovation process.

Challenges

The presented challenges appear to be an important theme for the participants of both innovation processes. It seems that the challenges are the most influencing factor for whether the participants are satisfied with the events or not. The participants in both the innovation processes raise the presented challenges as a source of discontent.

During interviews the participants point out that there were no real problem in the challenges. This does not match their expectations and needs - the participants want to find a solution to a specific problem by attending the event.

In addition, it is also experienced as a problem by the participants that the challenges are linked to already existing solutions. It is perceived as limiting by the participants, as their

motivation for participation is to try to find the solution to a real problem. The fact that the problem is linked to an existing technology can also help explain why participants in the innovation processes perform user research based on technology, thus struggling to have a user-centered process.

From the perspective of the organizers in both processes, there is a difficulty to challenges with a level of complexity that matches the competence and experience of the participants. In both events, the participants experience their own skills to be insufficient and at a level too low to respond well to the presented challenges.

In addition, it appears from the data that in both the events the organizer's shortage of time partly determines the presented challenges of the event. The process of collecting and assessing different challenges to determine which one is most favorable for such an arrangement, seems to be somewhat short and unstructured.

Client involvement

The two teams also share the similarity that both have a client who is very involved in the innovation process throughout the event. However, the client has different effect on their respective teams.

In process one , the client and team meet frequently, and it may appear as the client affects the team to stay on the same track in terms of choosing a solution; they stick to the solution he has developed. It can be argued that the client encourages the team to be in a phase of convergence.

The team of process two meet their client a total of three times; during the design brief, to get feedback midway and for the prototype session. The client influences the students midway to choose a different direction of their process; he encourages them to think and work differently than they have already been doing. The client wants them to generate ideas, think big and new, and can therefore be said to encourage them to divergence. In addition, the second meeting with the client causes the team to return to a former co-design phase, namely research. The client thus affects the process to become more iterative.

A paradox emerges from the data material, which is how the organizers highly value the students' ability to be unbiased and creative, while at the same time allows the client to get close to the process. In both innovation processes, the client serve partly as a advisor for the teams. This might have inhibited the creativity of the participants, by bringing teams into a track that the client has already thought of. Because the challenges are perceived by the participants to be difficult to understand and interpret, the teams also becomes dependent on the client to understand the given problem definition.

Co-design process model revisited

Data reveals weaknesses with the process model

Based on the findings of this paper, the author argues that the proposed co-design process model appears as too simple, due to several reasons.

Firstly, a co-design process is much more iterative than what the presented process model shows. The graphic illustration of group two's process thus illustrates an important point - namely, that a co-design process does not have to be as straight forward as co-design process model presents. The findings from this paper have shown that a team often go through certain phases several times, and that a team can even perform activities related to several phases simultaneously.

In addition, the empirical data review also shows that the separate analysis phase in the co-design process model does not correspond to how a co-design process is performed. By analyzing the data from the two processes, it is revealed that analysis is often carried out in parallel with research, and thus it becomes unnatural to separate these two phases from each other.

The empirical data review has also shown that it may be wrong to only analyze which phase a group is performing, based on the activities the group conducts. The analysis shows that one of the groups, based on its activities may appear to be in the research phase as they were interviewing end users. Nevertheless, the interviews are based on an existing technology and the end user's perception of this technology. Therefore, the author argues that the group is in the prototype phase, and not in the research phase. The other group, based on its prototyping

activity, appears to be in the prototype phase. However, the group uses the prototypes as means to learn more about the end user and its true needs, and the author therefore argues that the group was in the research phase while testing the prototypes. What type of knowledge the group is looking for and what the goal behind a planned activity is, can therefore appear to be more important to determine which co-design phase they are in, rather than the activity itself.

Another weakness of the co-design process model that has emerged from the analysis, is that the model does not illustrate the importance of external impact on the process. Important factors of external influence concerns the client, the facilitators and the design of the presented challenges.

Updated co-design model

Based on the findings of the empirical data review and the analysis, the author sees the opportunity to propose a new framework to better describe the co-design process.

Based on the analysis it appears that the participants have certain needs, that might indicate that two new activities should be added to a co-design process; building team culture through facilitated activities, and continuous feedback and reflection sessions throughout the whole process.

A possible final supplementary phase is possible; reflection, where participants reflect on the performed process and work. It can be argued that this phase is most important in co-design processes in an educational context, and in cases where the aim is for the participants to learn the methodology and process of co-design for later use.

The new framework should also illustrate that research and analysis are not two separate phases, but rather two activities performed synchronously.

The framework should also clarify the great impact the client and facilitators have on the process itself. Students' motivation is also an important factor that should be a part of the new framework, which again to a large extent is affected by the design of the presented challenges.

The author suggests that an updated process model should look like this.

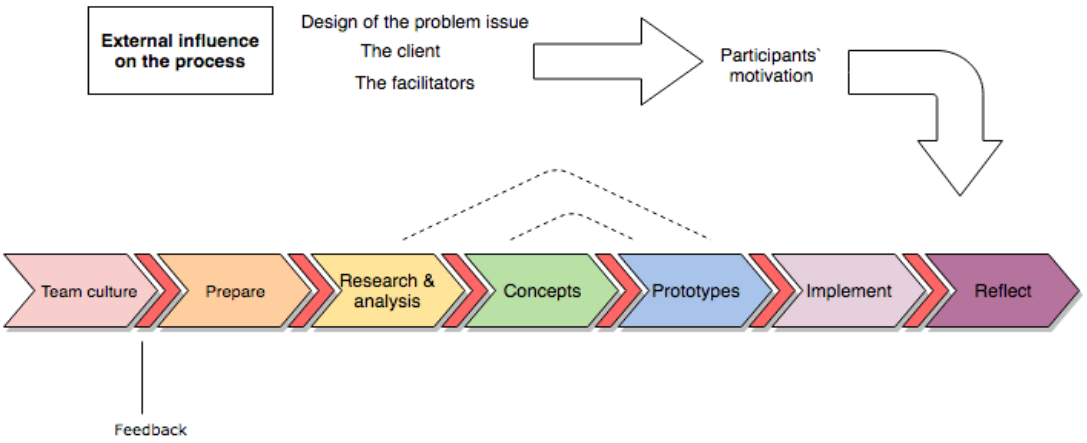

Figure 9 Updated co-design process model

Conclusion

The purpose of thesis was to explore co-design processes. Three research questions were presented to enable this. To answer the purpose the author has compared two different innovation processes, and analyzed them with a co-design framework. The analysis of the empirical data revealed several interesting insights. The author will now present the main findings in this thesis, categorized by the three research questions.

The first research question was as followed:

RQ1: How is a co-design process performed?

This thesis has illustrated how co-design processes can vary in the way they are performed. The team in the structured process conducted several co-design principles and activities related to co-design phases. The team fulfilled almost all the principles of the co-design framework. However – the team did not complete the process and failed to present a final prototype to the client. This reveals that fulfilling the co-design principles is not enough to have a successful co-design process. Analyzing the process of the team also reveals that research and analysis are rather performed as one integrated phase than two different phases of a co-design process.

More surprising is it, that in the unstructured process which did not follow any particular process methodology, the studied team still performed many co-design principles as well as

activities related to different phases of the co-design process. The group conducted activities related to five of the six phases of a co-design process, but spend most time in the last two phases of the co-design process, namely prototyping and implementation.

The two processes are also performed similarly in several aspects, most interesting in their absence of certain co-design principles and failure to meet specific goals of the co-design phases. None of the teams performs the principle of abduction in their process, and none of the groups are able to identify the real problem or need of the target user, which is an important goal of the research phase.

RQ2: how is a co-design process experienced?

Both the teams experience struggling in the prototype phase, by not understanding which techniques to use for developing prototypes and for testing prototypes. In addition, team two experiences experience a lack of facilitation and support in both the analysis- and concept phase, while the other does not perform these phases at all. Both indicate a lack of facilitation midway in the process, and thus it may appear that the groups experience lack of facilitation in the stages of both analysis, concepting and prototyping.

The team of process two has an additional goal as well as activity in the process, namely building team culture in the preparation phase, and continuous feedback sessions along the process. This was experienced as important and awarding by the participants. The team of process one states that they agreed throughout the process, but that they missed daring to disagree more. This indicate that participants have certain needs, which again might indicate that two new activities should be added to a co-design process; building team culture through facilitated activities, and continuous feedback and reflection sessions throughout the whole process.

In general, it can be said that the participants want restrictions on the process, but not on the solution. This need does not comply with the design of the two different processes. In process one the team experience to have restrictions on the solution, but not on the process. In process two the team experience to have restrictions on both the process and the solution.

RQ3: Which factors affect a co-design process?

The thesis also aimed at investigating which factor influence a co-design process. By comparing the two processes the analysis has revealed that the facilitation performed by the facilitators, the design of the presented challenges as well as the degree of client involvement affects the process by means of affecting the participants` motivation. Concerning how the factors influenced, the facilitation made the participants insecure by not facilitating sufficiently midway during the innovation process. The lack of facilitation of time allocation also influenced the processes – with one arriving at the finishing phases too early, while the other did not have enough time to finish the process. The presented challenges also influenced the process to a great extent. It influenced the participants experience and motivation in a negative manner, by having no real problem in the challenges. In addition, the participants negatively experienced the challenges because they were linked to already existing solutions, which did not match participants' expectations. Client involvement was also a factor that influenced the process, however in different ways. The client of process one affected the groups process to become more convergent, while the client of process two influenced the process of the team to become more divergent. However, both of the teams' clients affects their respective processes by keeping the team closer to the client's solution by their influence.

Finally, based on the analysis, the author has proposed an co-design process model, that shows how co-design processes are performed and which factors affect the process. This has been done by first proposing a co-design process model based on other process models from literature, and then by reviewing this model with the empirical data from the thesis.
The updated co-design model therefore look like this.

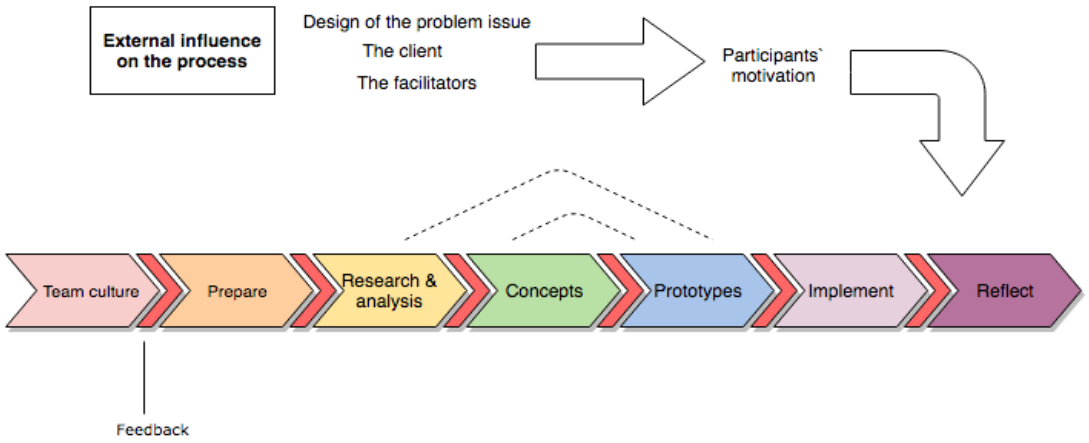

Figure 10 Updated co-design process model

Contribution

This thesis has contributed to the literature field of co-design by proposing a model of a co-design process that shows both the phases a co-design process should contain, as well as the factors that influence a co-design process.

The thesis has done so by illuminating the experience of participating in a co-design process. Thus, the thesis has helped to fill a gap in the literature field of co-design, namely the lack of literature on the experience of participating in a co-design process. The thesis has focused on participants' experience of what factors affect the process, as well as their needs and challenges along the way.

Discussion

This chapter present a discussion of the results when investigating how a co-design process is performed and experienced, and which factors affect the process. The chapter will discuss how the findings have contributed, which implications the thesis will have for the academic field as well and the practical field of co-design, as well as the limitations of the thesis and suggestions for further research.

Implications

The author has analyzed two different innovation processes with a co-design framework.

For the academic field this mainly has the implication that a new summarizing process model has been proposed - based on other process models from co-design and design. In addition, the thesis ends with an updated process model, which takes into account the implications of the collected data. Thus, a final process model of co-design has been presented based on the participants experience of the process. The final process model takes into account the needs of the participants as well as the factors that influence a co-design process.

In addition, the master thesis has several implications for practitioners of co-design, both for those who organize such processes, those who design challenges, clients of co-design teams, facilitators and not least the participants of co-design processes.

By applying the authors co-design framework, organizers can be able to better manage a co-design process and the preparation for it, to better fit the needs and expectations of participants. The process should be designed partly based on the expectations and needs of the participants, to ensure a thorough motivation. In addition, organizers should provide process facilitators that are available to the participants, with the possibility of continuous presence. According to the findings of this thesis, organizers should also ensure to have committed professionals and to give participants access to relevant networks.

The master thesis has generally shown three factors which influence the process; facilitators, design of the presented challenges, and client involvement. This implies that these are three factors the organizer should consider and think about how best can be facilitated to promote the participants' process. In addition, the master's thesis has revealed some of the participants' needs in an innovation process; both building team culture, having facilitated feedback sessions, as well as access to relevant networks and the ability to get close facilitation throughout the process. The mentioned activities and facilitation should be integrated into the innovation process.

The thesis also has important implications for those who design the challenges for co-design processes. The author has shown the importance of the problem issues and their formulation,

as this is the factor that influences the participants' motivation to the greatest extent. According to the thesis, when designing a challenge for innovation processes, one should base them on a clear problem or user need, as this is according to the expectations of participants. When choosing and formulating the challenge, the one responsible should also ensure it is not linked to an already existing solution. The person responsible of the challenge should also be available to the participants after the presentation, as the participants often need to ask questions about the presented challenges.

As a result of the thesis, several implications for the client of a co-design process have also emerged which should be taken into consideration. The thesis has revealed that participants process are quickly formed by the client's already existing product, values and perceptions. Therefore, if a part of the client's motivation is to get brand new ideas and impulses from the co-design team, she should try to keep a certain distance to the process itself by not interfering more than what is absolutely necessary.

For facilitators of co-design processes, the thesis also holds several implications. The thesis has shown that a co-design process is not necessarily something that happens by itself - it must be facilitated. The paper has shown that participants prefer facilitators who are experienced as safe and confident in their role, and that follow a process methodology for facilitating the group. In addition, the thesis has also shown that the teams need more follow-up than many facilitators assume, and especially in the middle of the process. Particularly in the stages of analysis, concepting and prototyping, groups can feel unsafe in a co-design process if they are not facilitated. Closer facilitation is especially needed in terms of time allocation, and help planning how much time to spend on each phase. Facilitators should therefore be engaged in the process, and constantly check in on the groups progress to see whether they need a specific kind of facilitation.

Perhaps most important of these points - the thesis has shown that participants often struggle with acquiring the design mindset, and that it is therefore important to provide training in this. Participants struggle to perform abductive thinking, namely to look for the true problem and solution at the same time. As an extension of this, the thesis shows that participants often struggle to find the true problem or need of the target user. This is therefore a specific aspect that facilitators should have an extra focus on, when facilitating.

For participants, the master's thesis also holds important implications. As it turns out that much of the motivation to participate in a co-design process depends on the topics and the design of the presented challenges, this is something participants can try to figure out in advance before signing up. The thesis has also shown that it is perceived as positive for the work process to get to know the team through exercises to build team culture, as well as feedback and reflection. This is something participants should encourage each other to perform. Participants can benefit from having knowledge of the different phases of a co-design process as well as the tools that belong to the process and what goals one wishes to achieve in the different phases. This is something this thesis can contribute to.

Limitations

A weakness of observation as a method is the general research effect (Hawthorne effect) where the research objects change their behavior because they know they are being observed (Adair, 1984). This can lead to incorrect information, thus lowering the validity of the results. There are also several weaknesses when using the interview as a method. Firstly, there are general limitations on memory that can lead to retrospective sense making (Eisenhardt and Graebner, 2007). In addition, informants will be able to perform an impression management, which may cause the information provided to be partially or highly adapted (ibid). In case studies generally, it is challenging to design for validity and generalization when the number of cases being studied is very limited (Yin, 2013). Due to the interview form, the context, the informants and the group dynamics that occur, the results cannot be reproduced, and replicability is therefore low.

In addition, the author herself participated in the one innovation process, which may have influenced how the informants answered the questions. Participants' perception of the authors experience of the process might have influenced them to match their answers with what they think the author believes and hopes for. The fact that the author has participated in one process may have influenced how they are perceived, and thus also how they are analyzed.

A weakness that might also have affected the results of this thesis is that the chosen participants and facilitators for interviews were the ones that were open for being interviewed. Alas, the results stem from the more open and volunteering participants of co-design processes, and not the group as a varied entity.

In addition, the data is collected from a university context, in other words, people who are initially motivated to learn. To know if the findings can be generalized to other groups, more research is required.

Further research

By working on this master thesis several needs for further research has been revealed. Further empirical research is needed to assess whether the empirical findings from this thesis are applicable to a general range of co-design processes in the educational sector. In addition, more research is needed to discover whether the findings from this thesis can be used in contexts other than university and educational contexts.

The work with the master's thesis has also shown that more research is required in the field of participants' experience of a co-design process. This thesis has covered how a co-design process is performed and experienced, as well as pointed out some of the factors that influence such a process. There are many other aspects of co-design processes that should be researched, topics that will be mentioned further down.

The thesis has revealed that participants in co-design processes struggle to perform the co-design principle of abduction, as well as to identify the user's problem or need in the research phase. Future research should therefore look at how co-design processes can be better adapted to respond to these challenges.

The thesis has also identified that there are at least three factors that affect a co-design process. The thesis shows that they influence by influencing participants' motivation, but not in which way. Exploring the relationship between the participants' motivation and the three factors could therefore serve as an interesting topic for research.

Another interesting topic for further research are challenges and how they should be designed to promote a co-design process. Specifically considering how a problem or user need should be implemented into the challenge, and how the level of the challenge should be adapted to the level of participants knowledge. In addition, further research should look at what more criteria of what a suitable co-design challenge should fulfill.

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Appendix 1: Observation guide

The event:
Who is present?
Which presentations are given?
How is the timeframe of the day structured?

The team:
Who is present?
Who is talking? Who talks a lot? Who doesn't talk?
What do they say?
How is the eye contact and body language of the participants?
Do participants seem to have fun? (smile, laughter, expressed enthusiasm)

The facilitators:
When does the facilitators assist the team?
In which ways do they facilitate?
What does the team members ask the facilitators?

The activities:
Which activities does the team conduct?
How are the activities performed?
How do they explain the reason for doing the activities?

The principles:
Does the team express opinions that relate to co-design principles?

Appendix 2: Interview guide, participants

Introduction – who am I? Who are they?
Some small talk, make them feel comfortable
What the study is about
Information: they can withdraw at any time, and also after the interview.
All information will be used only for the purpose of the thesis, and the informant will be anonymized.

Expectations
Which background do you have?
Why did you sign up for the course?

Activities
Can you tell me which acitivities you did during the process?
What was the purpose of the different activities?
What do you think about the challenge you were presented?

Facilitation
What was the role of the organizer throughout the course?
What was the role of the two facilitators?
How did you experience the facilitators?
How were they encouraging you to work?
What did your team struggle the most with?
How was the dialogue within the group?

Phases
Which kind of phases did you go through in the co-design process?
What are the different phases about?
How did the facilitators teach you the design process?

Evaluation
Throughout the process - was there any time you think the process wasn't guided enough?
Throughout the process - was there any time you think the process was guided too much?
Did you feel you had creative freedom during the challenge?
Is that important to you?

How was your motivation throughout the course? why?
How would you describe the experience of attending the process?
How did you feel along these two weeks?
If you were to arrange a course like this for students, how would you set it up differently?

Appendix 3: Interview guide, organizers

Introduction – who am I? Who are they?
Some small talk, make them feel comfortable
What the study is about
Information: they can withdraw at any time, and also after the interview.
All information will be used only for the purpose of the thesis, and the informant will be anonymized.

Planning the event
How did you proceed to prepare the event?
Which actors were involved in preparing the event?
Who financed the event?
What was the purpose of the event?

Challenges
How did you proceed to find the right challenge?
Why did you choose the final challenge?

Facilitators
Which facilitators did you hire for the event, and why?
Which kind of facilitation were given to participants during the event?

Participants experience
How do you think the participants experienced the process?
How do design the event to fit participants needs and motivation?
If you were to hold the event of the process again, would you have done anything differently?

Appendix 4: Interview guide, **facilitators**

Introduction – who am I? Who are they?
Some small talk, make them feel comfortable
What the study is about
Information: they can withdraw at any time, and also after the interview.
All information will be used only for the purpose of the thesis, and the informant will be anonymized.

Questions
How did you perform facilitation during the event?
What do you think is important when facilitating a group in such a process?
What did you think about the presented challenges?
How did it seem as your group were experiencing the process?
How do you think your facilitation affected the process of the team?
Did you get any feedback from the participants on your facilitation?