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The potential of process facilitation in supporting global new product development teamwork
- A study in the context of university education

Master's Thesis

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Abstract of master's thesis

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Abstract

Nowadays developing new products is not only the task of companies' R&D departments. The increased global competition, the introduction of customer involvement, and the employee specialization have all been factors, which have driven the companies to use more of a holistic approach to the new product development (NPD) process. As a result, a lot of the design work is carried out in interdisciplinary teams, in which the existing knowledge of various specialists is transformed into new products. However, due to the challenges created by the nature of NPD and the global interdisciplinary teamwork, there is a need for practical tools, which can enhance the communication and collaboration within the team. One possibility is the utilization of process facilitation as a supportive method for the teamwork.

The objective of this study is to identify the facilitation needs of global interdisciplinary teams in NPD context, and to outline the requirements and the role of facilitator in long-term process facilitation. The study is conducted in university education setting, in which two master level courses from Aalto University joined their forces to provide the students the most authentic project based learning experience. The data is collected from five product development projects, which all had been accompanied by a facilitator pair.

Based on the literature review and the empirical study, it seems that the critical success factors and needs of the team are in alignment with the facilitator competences and activities. However, the research revealed that in NPD, the short-term intervention driven facilitation model was not sufficient enough to meet the needs of the teams. *Identifying team needs* and *transferring intervention results* were identified as two key challenges that hindered the process facilitators from supporting the teams. It seems that when engaging in such long-term facilitation process, the requirements for the role of the facilitator changes. As a solution, this study presents a framework, which emphasizes the setting up of the collaboration, integration of facilitators to the team and the importance of agile learning process through the transfer-phase.

Keywords process facilitation, new product development, global interdisciplinary team

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Tiivistelmä

Nykyään tuotekehitys ei ole ainoastaan yritysten T&K-osastojen tehtävä. Yritykset käyttävät enenevissä määrin kokonaisvaltaista lähestymistapaa koko tuotekehitysprosessiinsa. Syitä tähän ovat muun muassa kiristynyt maailmanlaajuinen kilpailu, ajatus asiakkaiden osallistamisen tärkeydestä ja työntekijöiden erikoistuminen. Suuri osa design työstä tehdäänkin tieteidenvälisenä tiimityönä, jossa useiden alojen spesialistien tieto muuntautuu uusiksi tuotteiksi. Uusien tuotteiden kehitykseen liittyy kuitenkin myös haasteita, jotka johtuvat niin prosessista kuin globaalista tieteidenvälisestä tiimistä. Yksi mahdollinen tapa helpottaa tiimin yhteistyötä ja kommunikaatiota on prosessifasilitoinnin käyttöönotto.

Tämän tutkimuksen tavoitteena on tunnistaa erilaisia fasilitointitarpeita, joita globaalilla tieteidenvälisellä tiimillä tuotekehityskontekstissa tulee vastaan sekä selvittää mitä vaatimuksia ja minkälainen rooli fasilitaattorilla on pitkäaikaisessa prosessifasilitoinnissa. Tutkimus on toteutettu osana Aalto yliopiston maisteritason projektityökurssien yhteistyötä. Työssä tutkitaan viittä tuotekehitystiimiä, joilla jokaisella oli oma fasilitaattoriparinsa.

Kirjallisuuskatsauksen ja empiirisen tutkimuksen perusteella vaikuttaa siltä, että tiimin kriittiset menestystekijät ja tarpeet vastaavat fasilitaattoreiden kyvykkyyksiä ja fasilitointiaktiviteetteja. Tutkimus kuitenkin paljasti, että kirjallisuudesta tuttu lyhytkestoinen väliintuloihin keskittynyt prosessifasilitointimalli ei vastannut riittävän hyvin tiimin tarpeisiin. Isoimpina prosessifasilitointihaasteina nähtiinkin tiimin tarpeiden tunnistaminen ja väliintulojen tulosten vieminen osaksi tiiminprosessia. Vaikuttaakin siltä, että fasilitaattorin rooli muuttuu pitkäaikaisessa prosessifasilitoinnissa. Tässä työssä ratkaisuksi ehdotetaan viitekehystä, joka painottaa yhteistyön käynnistysvaihetta, fasilitaattoreiden integrointia osaksi tiimiä ja prosessin muuttamista agiiliksi oppimisprosessiksi.

Avainsanat prosessifasilitointi, tuotekehitys, globaali tieteidenvälinen tiimityö

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Through joy! This is it - the top of the mountain that I've been on a quest to conquer for a while now. What a hike it has been and luckily I have had some amazing people supporting me throughout the whole journey!

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Berg Heil!

Helsinki, 22 December 2014

Heidi Tulensalo

”Se oli vaan sellanen Feenix-linnun nousu se kevät.”
–Fasilitaattori

Table of contents

List of figures

List of tables

Part I Introduction

1. Background and introduction

In this thesis the utilization of process facilitation is studied in the context of new product development. The goal is to explore the facilitation needs of global interdisciplinary teams in new product development (NPD), and to outline the requirements and the role of process facilitator within this context.

In this introductory part, the background and motivation (1.1) for the thesis will be presented as well as the context of the research (1.2), after which the research problem & objectives (1.3) and the study approach (1.4) will be introduced. At the end of the introduction, the structure of the thesis will be visualized.

1.1 Background and motivation

Nowadays developing new products is not only the task of companies' R&D departments (Khurana and Rosenthal 1997, Olson et al. 2001). Internationalization (see e.g Kleinschimidt et al. 2007), the introduction of customer involvement (see e.g. Johnson and Luo 2008), as well as employee specialization (see e.g. Bajaj et al. 2004) have all been factors that have driven the companies to use more of a holistic approach during the whole design process. Thus, also the emphasis of new product development has shifted its focus from products to knowledge work and how the existing knowledge can be transformed into something new by combining and fostering interaction between various specialists (Leenders et al. 2003). As a result, interaction and integration of ideas of a multitalented team have become the new norm of product development.

Previous research states that in order to achieve innovative products, the team needs to engage in information exchange and build on each other's knowledge

(Leenders et al. 2003). In other words, creativity of a team is an outcome of discussions, testing and refinement of ideas of individuals who are engaged in this collaboration. This has led to the introduction of interdisciplinary teams, in which the members represent various fields and specialties. Diversity has been seen as a way to generate *creative tension* or *constructive conflict*, which is believed to be the source of innovations when utilized in a correct way (West 2002, Bassett-Jones 2005). However, it also seems that when the tension is not managed well, the team members may end up distracting or even blocking the creativity of each other, and thus lead to low team performance in the task (Leenders et al 1993). Therefore, the challenge is to create an atmosphere in which a right type of conflict is obtained (Isaksen and Ekvall 2010). In addition, it has been argued that an environment, in which members are willing and able to share their doubts as well as ideas openly without the fear of negative judgment, has proved to be successful in their innovative development work (Edmondson 1999, West 2002). Edmondson et al. (2001) argue that this kind of *climate of psychological safety* enhances interpersonal risk taking and thus contributes to the collective learning of the team, which on turn affects the team performance (Edmondson 1999). Thus feeling of psychological safety has been identified as a key point in designing new products (Edmondson 1999). If the team lacks this kind of environment, the team members are less likely to share their ideas and take the project forward in an efficient manner (Edmondson and Nembhard 2009).

Therefore, the new product development (NPD) research has focused on identifying the critical success factors for new product development teams, on understanding the new product development processes as well as on leading the innovative work. For example in her research of managing innovative projects, Rekonen (2013) has identified managerial activities and challenges in different phases of the innovation process, and Lam and Chin (2005) focused on the factors affecting the conflict management within a new product development process. As a result, concepts like leading interdisciplinary teams (see e.g. Valle and Avella 2003), psychological safety (see e.g. Edmondson 1999) and conflict management (see e.g. Xie et al. 1998, Lam and Chin 2005) in NPD

have been developed.

However, it seems that there is a need for providing more practical tools on how to enhance the communication and collaboration within the team. One possibility that has not yet been studied thoroughly is the utilization of third party process facilitation as a supporting method for interdisciplinary teamwork. Process facilitation has been studied from both traditional (McFadzean and Nelson 1998, Wardale 2013) and virtual team contexts (Pauleen and Yoong 2001, Haukola 2012). In most cases, process facilitation is described as a short-term intervention to a team's work (see e.g. Bostrom et al. 1993, Nixon 1994). However, the literature does recognize the possibility of using a third party facilitator as a way to develop a team's own facilitation skills (see e.g. Schwarz 2002). Facilitation has also been studied in the context of implementing business process innovations (Smeds et al. 2001), yielding promising results for helping all of the stakeholders to work collaboratively and therefore achieve the project goals. This study aims to benefit both the interdisciplinary teams as well as the facilitators who are working in the new product development context.

1.2 Context of the research

The research is conducted in a university setting where two masters' level classes joined their forces to provide students the most authentic project based learning experience. The data is gathered from five new product development projects that were part of the Product Development Project (PDP) and Global Virtual Collaboration Project (GVCP) -courses in Aalto University during the academic year of 2012-2013.

Product Development Project (PDP) is an interdisciplinary master-level course taught at the Aalto University, which brings students from various backgrounds together to work on a product development challenge presented by an industry partner. The course is hosted by the Aalto University Design Factory, which is an experimental co-creation platform. The course is based on problem based learning (PBL) philosophy and the students work in teams of ten to fourteen

members. Adding to the teams members, who work remotely in partner universities, ensures the international flavor and global environment for the class. Each team is given a 10 000 euro budget to conduct the research, development work and to build a functional prototype. The class is stretched throughout the whole academic year and the students get to develop their product ideas from scratch to a working prototype, which is showcased to the public at the end of the course. The aim of the class is to educate a new generation of product developers who are used to working in interdisciplinary environments. (Product Development Project 2014)

Global Virtual Collaboration Project (GVCP) is an international virtual project course taught at the Aalto University in the Information Networks Study Program. The master-level students of the GVCP-course learn to facilitate and model virtual collaboration processes and work with interdisciplinary teams. The students aim to help the project teams with their process without interfering too much to the content of the project. Usually this means offering support to solve issues related to collaboration, communication and decision-making. The facilitators are paired up and placed into PDP teams, in which they observe and facilitate the product development process. (Global Virtual Collaboration Project 2014)

The five PDP-teams that took part to this experiment were selected by the PDP-teachers, whereas the GVCP- course teachers conducted the pairing of facilitators. The facilitators were assigned to the teams at the beginning of the course and worked with the team throughout the year. The teams had initially nine to twelve team members from various educational and cultural backgrounds. Also part of the team was located in a partner University and thus worked most of the time remotely. The facilitators added yet another discipline and culture to the teams.

1.3 Research problem and objectives

The objective of this study is to form a framework, which describes the process facilitation of global interdisciplinary teams in new product development (NPD)

context. As a result, this thesis will provide a guideline for setting up and carrying out process facilitation activities in NPD projects. The study focuses on identifying facilitation needs of the global interdisciplinary teams and on recognizing the main activities performed by the facilitators during the long-term process facilitation. For this study the following research questions were formed:

RQ1: *What are the requirements and the role of facilitator in long-term process facilitation?*

RQ2: *What are the process facilitation needs of global interdisciplinary team in NPD context?*

In this study, the focus is on the new product development process starting from the fuzzy front-end until the late development phases. However, in this study the expected outcome of the NPD -process is a functional prototype, not a fully validated product. Therefore, the commercialization of the product is not included to this study. The products developed during the study are all physical products and hence service innovations as well as other types of innovations are left out of the scope of this particular study. The study consists of five product development projects, which each have been facilitated by two process facilitators. Both perspectives, facilitators and team members, are taken into account in this study. The study is conducted in a university education context, with student teams. The generalization to the company context is out of the scope of this research.

1.4 Research approach

This study represents a *qualitative research approach*, in which the aim is to understand the complex picture of the problem at hand and form a holistic overview of it (Creswell 2014). Since the study aims to explore the interaction of individuals in a social context, adopting a qualitative research approach is a justified choice. In qualitative research, the goal is to learn the meaning of the particular problem to the participants and thus the data is usually gathered in a participatory setting (Creswell 2014). In practice, this means using for example

open-ended questions and observations, which is also the case in this study. The main source for empirical data in this study are the retrospective interviews, which were conducted as semi-structured thematic interviews (Hirsjärvi and Hurme 2008).

The analysis of the data is conducted by applying *thematic analysis*, a flexible method to analyze and interpret data (Braun and Clarke 2006). The method can be used to both "*reflect reality and to unpick or unravel the surface of 'reality'*" (Braun and Clarke 2006, pp. 81), which fits to the purpose of this research. This study examines "*experiences, meanings and the reality of the participants"* and therefore the realist approach is applied (Braun and Clarke 2006, pp. 81). Furthermore, this method acknowledges that the importance of a theme is always determined by the researcher and thus data can be interpret from various perspectives (Braun and Clarke 2006). Indeed, as during the analysis the researcher interprets the data, the results are always affected by the understanding of the researcher as well (Creswell 2014). In this study, the themes are formed on the semantic level and the focus is on understanding the meanings of data, not on identifying the underlying assumptions or ideas (Braun and Clarke 2006).

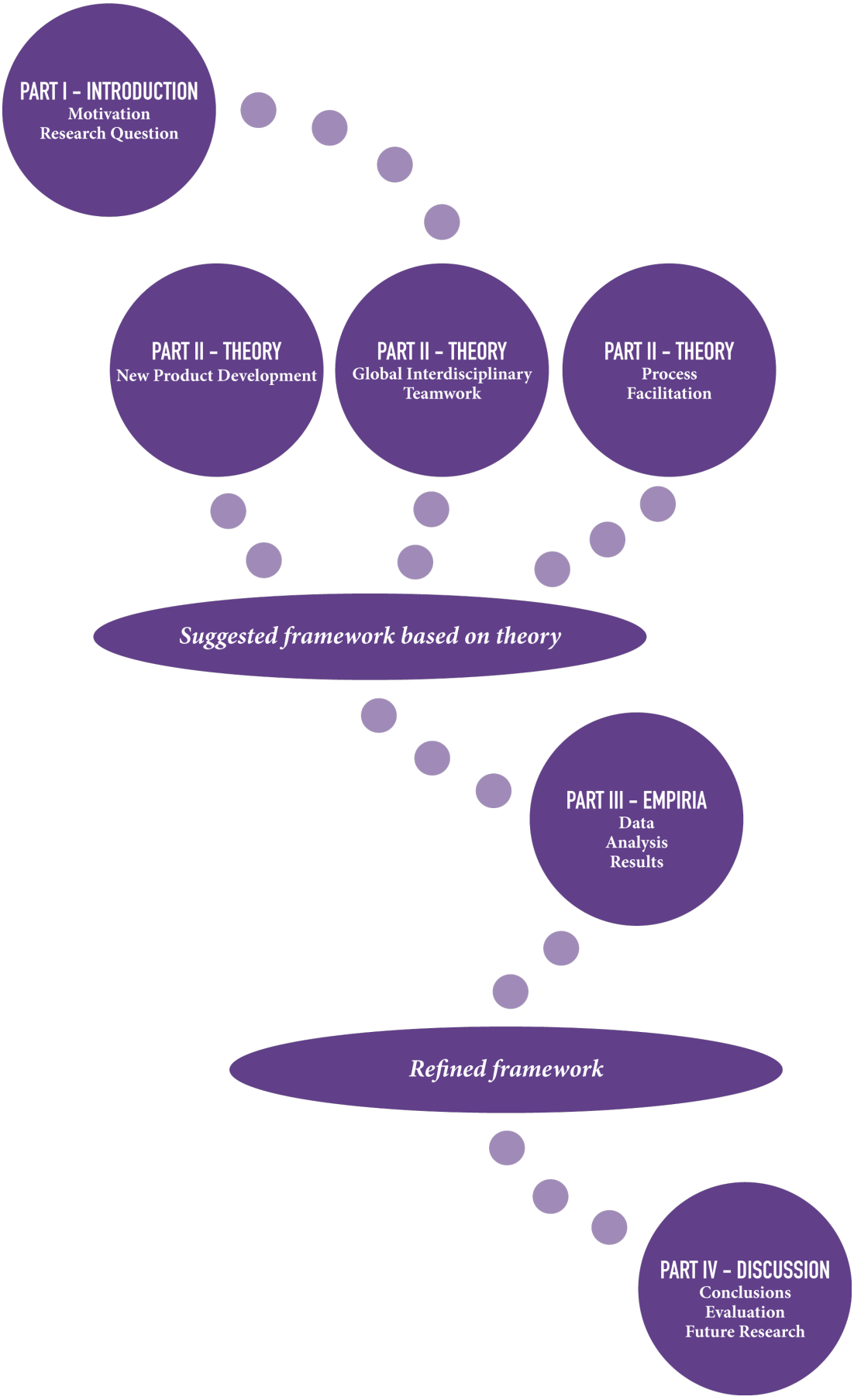
The thematic analysis in this study is conducted by following the process outline described by Braun and Clarke (2006). The data is analyzed as an iterative process, in which the researcher moves back and forth within the different steps to generate the themes. It consist of several steps during which the researcher familiarizes herself with the data, generates initial codes, searches and reviews themes and finally selects the relevant parts while writing the results (Braun and Clarke 2006).

Finally, the research is approached with systematic combining, which is grounded in abductive logic. The aim of this approach is to "*discover new things*" such as variables that have not been acknowledged in previous research (Dubois and Gabbe 2002, pp. 559). The approach builds on combining and refining theory and empirical data throughout the research. As a result, the

research is seen as an iterative process in which the theories from literature as well as the empirical data complement each other. Instead of coming up with new theories, the idea is to refine and develop the already existing ones. (Dubois and Gabbe 2002)

This study consists of four parts*: Introduction, Theoretical background, Empirical research* and *Discussion and Conclusions* (see Figure 1). The first part, introduction, outlines the motivation and presents the research questions for the study. From here the study proceeds to creating a framework based on the literature review (theoretical background), which will be elaborated further by the help of empirical findings in the discussion (empirical research). Finally, the study is concluded with a discussion, which answers the research questions, and evaluation of the study.

Figure 1 **Structure of the thesis**



Part II Theoretical background

The following chapters will provide some insights to the new product development (2) after which global interdisciplinary teams (3) and process facilitation (4) will be discussed. The findings gathered during the literature review will be revised in chapter 5 Theoretical syntheses.

2. New product development

In this section, a cohesive vocabulary for the rest of the study is created and the processes behind new product development are introduced. This section will provide insights to the environment, in which the global interdisciplinary teams and the process facilitators, who were interviewed for this study worked, and thus builds the context for the study.

2.1 New product development process

The roots of *new product development* (NPD) lie in the crossings of business, design and engineering research. Each of these areas approaches the designing or developing products in a slightly different manner, which has lead to usage of incoherent vocabulary within the research world (Marxt and Hacklin 2005). According to the literature review conducted by Marxt and Hacklin (2005), *product development* is used to describe the creation of new or improved products and delivering those to the market, where *product design* is identified as more of a holistic approach, which may also initiate changes not only in the product but also on function and concept level. In contrast, the *product innovation* refers to the creation of more or less radical changes in products, business models or even in technological concepts with the focus being on generating additional business (Marxt and Hacklin 2005). In conclusion, it seems that these three terms are used, more or less, to describe the changes and the work that needs to be accomplished in order to launch new products to the

market. In order to simplify matters, in this thesis the term *product development* will be used to describe the activities related to developing or designing new innovative products.

Nowadays, having a process is perceived as an essential part of any new product development work. In their book, Ulrich and Eppinger (2012) illustrated a couple of reasons for why companies are interested to use such processes. First, the processes are seen as means for creating a range of concepts that can be turned into reliable and producible products. Secondly, a development process can be used to translate the corporate objectives into design details, which can be directly used in production and sales. Finally, the power of processes may also be used to detect and eliminate risks related to product under development as early as possible. Whichever the reason is, a well-defined process forces the development team to at least review the quality of its work as well as to plan and coordinate tasks efficiently through the multiple checkpoints and milestones (Ulrich & Eppinger 2012).

Technically, a *product development process* can be defined as a set of steps and activities, which a company needs to take in order to create and bring a new or improved product to the market (Ulrich& Eppinger 2012, Marxt and Hacklin 2005). The number of steps differs according to the project needs, as does the form of activities (MacCormack and Verganti 2003): Physical activities, like prototyping, are just a tip of an iceberg behind which aspects such as establishing a project team or analyzing the market exist. As a result, there is no best practice and the development process should always be shaped to fit to the project needs (MacCormack and Verganti 2003).

The product development process models have been discussed in various research fields. Researchers from management to design studies and all the way to innovation literature have created their own models for the process. Traditional NPD models present the process as a linear one like the *generic product development process* –model by Ulrich and Eppinger (2012) or the *Stage Gate* –model by Cooper (1996). These traditional linear processes are seen as an

effective way to introduce process thinking to the novice designers and for establishing the development process management (Howard et al. 2008). However, it has also been argued that these models do not manage to represent the creative processes that prevail in new product development (Howard et al. 2008). Therefore, more of the research focus has been directed to explain and illustrate the non-linear parts of product development.

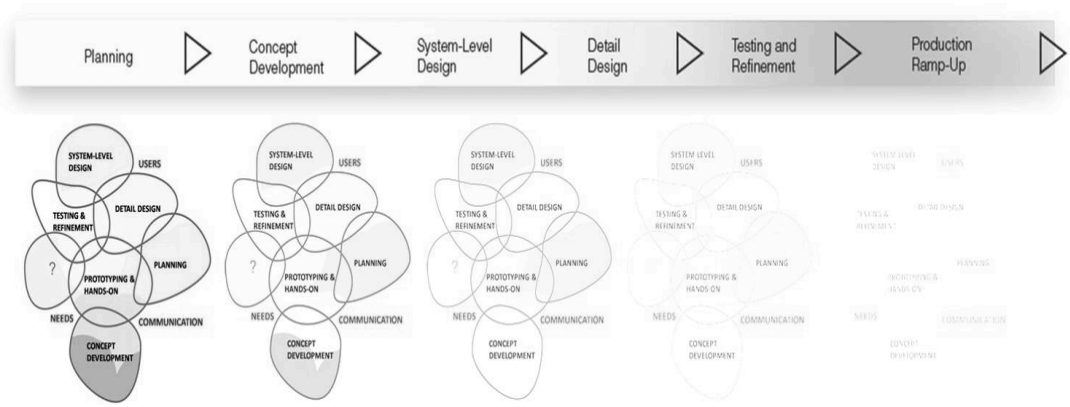
The non-linear models try to capture the simultaneous as well as the iterative style of work that is usual for the product development. These models do also consist of stages and steps, but instead of following a predetermined sequence, the team decides in which order to accomplish the tasks ahead (Buijs 2007). Also as Howard et al. (2008) noted, these models usually have integrated the evaluation and selection of ideas and concepts as part of the process. This means that after or even during the task, the team is encouraged to use time to reflect and determine the next step of the project (Buijs 2007). In addition, two sub-stages, *divergent* and *convergent*, have been identified within the non-linear process. The divergent stage refers to opening up minds and generating as many ideas or opportunities as possible without exposing those to critic (Buijs 2007). The team should afterwards have a large number of opportunities which to follow to the next phase. After gathering all the ideas, comes the second, convergent stage, in which the material gathered during the divergent stage is evaluated and validated against the original problem brief. At the end of this stage, the ideas are narrowed down and the team is able to continue with more detailed work on those selected ideas (Buijs 2007).

One of the models that tries to capture the divergent and convergent phases of product design process is the *Double Diamond* –model presented by Design Council (UK) in 2005. The model presents four distinct phases that each product development project has: *discover, define, develop* and *deliver*. Each of these phases consists of several iteration loops that allow refinement and testing of ideas (Design Council (UK) 2005). In this model, discover and develop –phases have typically divergent characteristics, since a lot of data and ideas are generated during them. In comparison, define and deliver- phases can be

perceived more as convergent as the goal is to reduce material into couple of understandable concepts.

Another conceptual model to demonstrate the dimensions, non-linear and linear, of product development process is presented by Reinikainen and Björklund (2008). The model acknowledges that during the NPD -process many of the activities are conducted simultaneously, due to the need to receive information and knowledge of multiply areas in order to progress with the project. However, the closer the launching of a product comes, the more structure is needed and therefore, the flexibility to make changes decreases dramatically. As a result, Reinikainen and Björklund (2008) suggest that the new product development process can be seen as the mixture of linear and non-linear approaches as demonstrated in Figure 2.

Figure 2 Non-linearity in NPD process. Reprinted with the permission of authors. Reinikainen and Björklund 2008, p. xx



The NPD-process can also be seen as part of the innovation process, which consists of three phases *Front End of Innovation (FEI), New Product and Process Development (NPPD)* and *Commercialization* (Buckler 1997). The FEI or "*fuzzy front end"* –phase describes the early activities (such as defining and planning the project), which form the foundation for the rest of the project (Khurana and Rosenthal 1997). The FEI is often seen as a bit chaotic, unstructured and difficult to predict (Koen et al. 2002), where the NPPD is seen as a more goal-oriented, predictable and within which the discipline to follow up budget and carry out tasks is present (Koen et al. 2002, Kim and Wilemon 2002). The

innovation process is completed with the commercialization phase, in which according to Buckler (1997, p. 43) *"you extract the value from everything you have created at these earlier stages"*. In this study, the interest is directed to the activities that result in a *proof of concept*, not necessary in a product ready for launching. Consequently, the next chapter only discusses in more detail the challenges of the early phases in which the ideas are developed into functional prototypes, and does not take into account the commercialization phase.

2.2 Challenges related to creating a proof of concept

The beginning of the new product development process is often called the *front end of innovation (FEI)* –phase. In the beginning of this phase, the customer needs, project objectives, possible technologies and actions of the competitors are still unclear to the product developers. Consequently, this phase has been identified as a critical point of the new product development process. In the FEI-phase, ideas are developed into concepts and the foundation for the success of the new products is build (Zhang and Doll 2001, Khurana and Rosenthal 1997). Moreover, Koen et al. (2002) argue that the FEI-phase differs from the rest of the NPD –process, since most of the work is experimental and aims to delivering inventions. Indeed, the researchers have identified that some of the major components of fuzziness in the early phases of NPD are ambiguity (Brun and Steinar Sætre 2009) and lack of structure (Koen et al. 2001). It has been suggested that ambiguity is created by the diversity and novelty that are characteristic and necessities for innovative work (Brun and Steinar Sætre 2009). Thus the ambiguity may relate to such aspects as product, market, process or organizational resources (Brun and Steinar Sætre 2009). However, in order to bring clarity and to be able to launch products, the ambiguity level needs to be reduced at some point (Brun and Steinar Sætre 2009). As a result, one of the challenges in the early phase of NPD is the balancing between ambiguity, which fosters innovativeness and clarity, which realizes the project (Brun and Steinar Sætre 2009).

However, before being able to develop a production-ready product, it is necessary to create a *proof of concept* to justify the spending of resources. A

proof of concept may be a prototype that is developed in the early phase of the project to illustrate the potential of a certain idea or technology (Veryzer 1998). Consequently, it can be argued that the building of prototypes should be included to the front end of innovation phase (Veryzer 1998). The power of prototypes lies in the visualization of ideas and user needs (Lim et al. 2008), providing a means for reconsidering design tradeoffs (Veryzer 1998), serving as discussion openers (Lim et al. 2008) as well as evaluation tool (Campbell et al. 2007). Engaging with this kind of early prototyping, it becomes possible to avoid the project delays and need for late corrective actions, which may have been stimulated by the lack of open discussion and testing of the ideas (Verganti 1997).

In addition, another critical aspect to consider in the beginning of the NPD-process is the need to question the given design problem, in order to ensure that the solution at the end is the most fruitful one. In new product development, the presented challenge can be considered as a *wicked problem*, which has no definitive conditions or limits (Buchanan 1992). This means that the challenge can be presented in a number of ways and that there are no fixed criteria for defining if a solution has been reached or not (Rittel and Webber 1973). Consequently, defining the problem becomes part of the solution, which results that the process of solving the problem is linked to understanding of it in the first place (Rittel and Webber 1973). In order to engage with creative problem solving, which the NPD-process is all about, the problem needs to be actively reframed (Schank and Abelson 1977).

2.3 Conclusion

New product development can be seen as a playground, in which new products are born as a result of cooperation between various fields. In order to come up with anything new, the development team needs to engage into a product development process that might take them to adventures they have never even dreamed of. Based on the literature review it seems that new product development processes vary, and the order of the different phases is not necessary linear as stated in the traditional NPD models. The non-linearity is

especially strong in the front end of innovation phase. The divergent and convergent characteristics of an NPD process also bring more flavors to the process. Thus it seems that each NPD process is unique, and therefore might have distinct needs for support. To sum up:

The NPD process has various phases, which are not necessary sequential. Each process is a unique entity and it's inherently different phases demand for diverse kinds of support.

3. Global interdisciplinary teamwork

In this section, we will take a closer look at the interdisciplinary as well as to global virtual teamwork. Also the critical success factors for global interdisciplinary teams will be discussed.

3.1 Interdisciplinary teamwork

Nowadays a lot of product development work is carried out in teams, due to the need for highly complex product designs resulting from increased global competition and rapid changes in technology (Hitt et al. 1998). The complexity in design coupled together with tight schedules has lead to a situation in which it is no more possible for a single individual to carry out this task (Edmondson & Nembhard 2009). As a result, the interdisciplinary teams have received a place amongst the key organizational tools in new product development (McDonough 2000, Holland et al. 2000).

Since the development of products requires combining new knowledge and solutions with already existing ones (Leenders et al. 2003, Alves et al. 2007), a team with a great amount of information from different fields is a justified first choice of any organization. However, it is not enough to just put individuals to work with each other, rather their work needs to have a high degree of interdependencies in order to fulfill the project goal (Holland et al. 2000). Such a group that consists of experts from various fields is in academic world referred to as an *interdisciplinary team* (see e.g. Boni et al. 2009) where in industry setting the term *cross-functional team* (e.g. see Denison et al. 1996) is more often used. In this study, such a diverse team is referred as an interdisciplinary team, whether it originated from academic world or not.

Using interdisciplinary teams is not only reasonable because of the amount of information that can be accessed but also because it links various skills to the product development process early on (Reilly 1999). Instead of making a product purely from the technology perspective, an interdisciplinary approach ensures a holistic view that takes into account also other aspects of the product

lifecycle, e.g. marketing and manufacturing. Compatibility failures and development costs are decreased, whereas product quality and innovativeness are increased (Edmondson & Nembhard 2009, Minguela-Rata and Arias-Aranda 2009).

During the past few decades, the increased need for specialized knowledge in new product development has also lead to the emphasized the role of interdisciplinary teams in NPD projects (Sapsed et al. 2002). The amount of knowledge available as well as the continuous feed of technical advances has lead into a situation in which it is no longer possible for the specialized experts to keep up with the technical achievements from other industries even when closely related (Edmondson & Nembhard 2009). In order to keep up with the emerging new technologies and changing customer needs, it is no more possible to work within one knowledge domain and re-use earlier solutions, but to actively modify and combine knowledge of variety of specialists to overcome the barriers (Fong 2003). It seems combining existing knowledge in different ways, to create something new, has become a norm in product development (Fong 2003).

The diversity of team members is expected to create tension, which forces the team to engage into collaborative communication and exploration (Edmondson & Nembhard 2009, Matthew and Sternberg 2006). Research indicates that especially moderate conflicts that are task or goal specific help the team to be more creative (De Dreu 2006), since they force the team to collaborate and communicate more than they would without the conflict (Cagan and Vogel 2002). As a result, the team is believed to deliver more novel ideas and products to the market (Leenders et al. 2003, Alves et al. 2007). However, an internal conflict is not always followed with a breakthrough idea and at times the conflicts have rather a negative impact to the creativity especially if they are related to personality issues rather than the tasks ahead (Matthew and Sternberg 2006). Thus the research suggests that in order to facilitate team creativity, teams should be lead by individuals that are able to "*establish norms of tolerance for diversity and conflict*" (Matthew and Sternberg 2006, p.34). The

goal for this kind of leader is to minimize the non-task conflicts, which are harmful for the project, and focus on the disagreements concerning the tasks, which foster collaboration (Cagan and Vogel 2002).

Nevertheless, it is not enough to just put random amount of individuals from various backgrounds to work together, and expect that whatever they come up will be a huge success. It is important to understand that working in an interdisciplinary team demands at least a bit of understanding on what the others are doing and which expertise they possess (Marxt et al. 2005). When succeeding to gain insight to each others' work and resolving contrasting ideas, each member develops a better understanding of the project as a whole (Brown and Eisenhardt 1995). As a result, simultaneous work becomes possible, which increases efficiency and shortens the time to market of a new product (Edmondson and Nembhard 2009).

3.1.1 Critical success factors in interdisciplinary teamwork

During the project, an interdisciplinary team is confronted with several challenges. In order to help the project managers to conquer those, researchers have presented various success factors. These factors are designed to tackle the issues that may rise to surface when working in an interdisciplinary team. When a team follows the guidelines presented in the form of critical success factors, projects are more likely to avoid the pitfalls and be more successful. Edmondson and Nembhard (2009) suggest that these challenges can be divided into five categories: *project complexity, team diversity, temporary membership, fluid team boundaries* and *organizational infrastructure*. Other studies have found challenges such as integration of the skills of team members to the project (Lakemond et al. 2013) and issues related to making cognitive, emotional and behavioral changes within the team, to be critical for creative collaboration (Jassawalla and Sashittal 2006), are discussed.

Holland et al. (2000) studied an extensive amount of relevant papers to find the factors that foster team success, discovering six categories that describe the

different aspects of the teamwork and what is needed for the success in each of those categories. The first category, *task design,* consists of factors that have an effect to forming and sharing tasks within a team, whereas the second category, *group composition,* directs the attention to the team structure and the roles within it. Quite closely related to the previous is the category of *group psychosocial traits*, which describes the factors that create a cohesive environment for the team. Such factors are mutual respect and flexibility to change. Some factors were also placed under *internal* and *external processes* – categories. The internal processes –category contains factors that describe how the team should communicate and organize their process in order to be effective, while the category for external processes focuses on managing the other parties, who are related to the project. Finally, the *organizational context* – category describes success factors that are related to the whole environment in which the team operates, e.g. having means to share learning between teams. The full list of critical success factors for interdisciplinary teamwork presented by Holland et al. (2000) is given in Table 1.

Table 1 Critical success factors for interdisciplinary teamwork. Adapted from Holland et al. 2000, p. 239

TASK DESIGN	Team empowerment Formal yet flexible integrative processes Customer focus Important, challenging task
GROUP COMPOSITION	Right functional mix Team leader selection Clear roles and responsibilities Team tenure
ORGANIZATIONAL CONTEXT	Clear mission from senior management Strategic alignment between functions Senior managers as champions Climate supportive of teams Project leader power Resources/time Training in team process skills Team-based accountability Team-based rewards and recognition Team co-location Mechanisms to co-ordinate activities and share learning between teams
INTERNAL PROCESSES	Overarching team goals Team leader skills and vision Frequent, genuine communication Creative problem-solving Sharing and use of uncertain information Constructive conflict
EXTERNAL PROCESSES	Boundary management
GROUP PSYCHOSOCIAL TRAITS	Mutual respect/trust Flexibility and openness to learning/willingness to change Team cohesiveness

3.2 Global teams

During the past two decades, companies have moved to compete on a global scale and, as a result, the demands for new product development procedures have also changed. The entrance to global markets has created a need to understand customers with various cultural beliefs and preferences, resulting in increased complexity for product design. Consequently, companies have started to utilize the power of distributed teams, in which the NPD expertise is not restricted to one single physical location. (McDonough et al. 2000)

In literature, distributed teams are usually referred to either as *virtual* or *as global teams.* The term *virtual team* has a two-fold meaning in literature: either it refers to a group that consists of members who hardly ever meet each other physically (Cascio and Shurygailo 2003) or it is sometimes used to describe a team that is physically located in proximity and share cultural similarities (Kayworth and Leidner 2000). In comparison, a *global team* can be defined as a group of individuals who are working as a team, even though they live in different countries and are culturally diverse (McDonough et al. 2000). The essence of both of these terms boils down to the fact that the team members, whether far away or not, cannot be in face-to-face contact on daily basis, which creates its own challenges. In this thesis, the term *global team* is used to describe teams that have various cultures within the team (whether on site or in distant locations) or at least part of the work is done virtually, without having the possibility to meet physically.

To overcome the barriers created by the separation, the work of global teams is usually facilitated by technological tools such as video- or teleconferencing (Cascio and Shurygailo 2003). As an addition Daim et al. (2011, p.202) have described *global virtual teams* as "*culturally diverse, geographically dispersed, electronically-connected workgroups".* They also continue to describe how the team members usually work for various projects. Thus the team members are constantly asked to prioritize their time and as a result effective communication within the global virtual team may be compromised (Daim et al. 2011). From the management point of view the appeal of distributed teams is undeniable, since it allows the usage of the individuals' expertize for various projects without having to relocate individuals physically, which means savings in money and time (Kayworth and Leidner 2000).

3.2.1 Critical success factors in global teams

The downside of global teams has been the struggles created by the physical distance between the members, different cultural and national backgrounds as well as the lack of mutual language (McDonough et al. 2000). Most challenges in

global teams are the same as in traditional teams, but having to work virtually together highlights some of the challenges. In their study Kirkman et al. (2002) found the following issues to be challenging for global teams: building trust, creating synergy, feeling isolated and detached, balancing technical and interpersonal skills among team members, as well as assessing and giving feedback for the members. In comparison, Kayworth and Leidner (2000) categorized the challenges as critical success factors of global virtual teamwork, which was based on a study of 12 virtual teams located across the globe. According to their research, the same themes of communication, culture and project management were equally important to both traditional face-to-face as well as to global teams, but some of the challenges created more tension within an virtual collaboration environment. As an addition, they found that the global teams also suffered from challenges related to technology.

In their work Kayworth and Leidner (2000) described communication challenges as a potentially vast burden for the global teams, since they cannot relay on the face-to-face interaction and still they need to ensure understanding, share ideas as well as make decisions together as a team. As a result, the team needs to find ways to overcome these barriers by using supporting media to transfer information.

Closely related to the communication issues are cultural differences between team members. Each individual has learned a set of beliefs and approaches through which they interpret the world around them. This may lead to a board range of misinterpretations of information, which may intensify the communication challenges. The ability to communicate ideas and to coordinate the project are hindered due to the cultural differences. Barriers such as language and sense of urgency and timing are just a couple of examples of these issues. (Kayworth and Leidner 2000)

Another challenging aspect in global teamwork is project management. The effects of poor management are far reaching. In their work Kayworth and Leidner (2000) listed a number of factors that potentially challenge project management and thus affect the team as well. Such challenges are: *shortcomings*

in articulating project goals and assigning responsibilities, and in providing feedback, lacking flexibility, not being empathetic, inability to provide a setting for teambuilding, and *in ability in building a sense of trust.*

At times, the challenges in global teams relate to technological and skill barriers. Not only the software tools used in the project may cause some problems when not working as well as they should, but also the skills and knowledge of the individual team members may prove to be critical (Kayworth and Leidner 2000). If the person is not familiar with the tools and is not keen to learn, it may cause a lot of trouble for communication within the global team.

The challenges can be transformed into critical success factors, and when those are fulfilled, the project is most likely to succeed. Table 2 sums up the critical success factors in global teams according to the research by Kayworth and Leidner (2000). In practice, in order to answer to all of these needs, project managers and teams need support from various entities.

Table 2 Critical success factors for global virtual teams. Adapted from Kayworth and Leidner 2000, p.190

VIRTUAL TEAM CHALLENGE	CRITICAL SUCCESS FACTORS FOR EFFECTIVE GLOBAL VIRTUAL TEAMS
Communication	Emphasize continuous communication Set meeting schedules and rules of engagement Conduct periodic face-to-face meetings Engage in team building activities to onset of virtual team creation
Culture	Instil a sense of cultural awareness Create teams from complementary cultures
Technology	Utilize multiple computer mediated communication systems (CMCS) Train team members in the use of various CMCS Ensure infrastructure compatibility among geographic locations Assess political and economic barriers to international telecommunications
Project management (leadership)	Set clear team goals and provide continuous performance feedback Build team cohesiveness Express flexibility and empathy towards virtual team members Exhibit cultural awareness

The solutions to address these issues are not always the same as in teams that meet face-to-face. Therefore project managers have to be more innovative with their controlling and rewarding systems in virtual environments. (Kayworth and Leidner 2000)

3.3 Conclusion

Based on the literature review it seems that global interdisciplinary teams do not only deal with the challenges related to the content of the project, but also to the process. Like in any teamwork, they have to cope with different kinds of misunderstandings and motivation levels, as well as to learn to utilize the tension caused by the team diversity to increase the creativity of ideas. The team members may also have difficulties in seeing what actually is the problem affecting the teamwork, due to the fact that they are so in midst of the whole process.

If we look at the critical success factors presented in the literature for both the interdisciplinary teams as well as for the global teams, it seems that the major themes for the factors are the same, however the emphasis placed on certain criteria may differ. In Table 3, the factors are combined to four categories (*team, communication, process and organizational context related factors*) to provide a suggested critical success factor listing for global interdisciplinary teams.

Table 3 Critical success factors for global interdisciplinary teams. Adapted from Holland et al. 2000 & Kayworth and Leidner 2000

CATEGORY	SUCCESS FACTOR	
Team related	Team empowerment	Flexibility and openness to learning/willingness to change
	Right functional mix	Team cohesiveness
	Team leader selection	Engage in team building activities at onset of virtual team creation
	Team leader skills and vision	Instil a sense of cultural awareness
	Team tenure	Create teams from complementary cultures
	Mutual respect/trust	Express flexibility and empathy towards virtual team members
Communication related	Emphasize continuous communication	Utilize multiple computer mediated communication systems (CMCS)
	Sharing and use of uncertain information	Train team members in the use of various CMCS
	Constructive conflict	Ensure infrastructure compatibility among geographic locations
	Boundary management	Assess political and economic barriers to international telecommunication
	Set meeting schedules and rules of engagement	Exhibit cultural awareness
	Conduct periodic face-to-face meetings	
Process related	Set clear team goals and provide continuous performance feedback	Customer focus
	Clear roles and responsibilities	Important, challenging task
	Formal yet flexible integrative processes	Creative problem-solving
Organizational context related	Clear mission from senior management	Training in team process skills
	Strategic alignment between functions	Team-base accountability
	Senior managers as champions	Team-based rewards and recognition
	Climate supportive of teams	Team co-location
	Project leader power	Mechanisms to co-ordinate activities and share learning between teams
	Resources/time	

To sum up this chapter:

Since the global interdisciplinary teams work in international environments with diverse backgrounds and complex design problems, they are also likely to encounter challenges related to the whole new product development process. Therefore, in order for the team to succeed the factors related to team, communication, process and organizational context need to be taken under consideration.

4. Process facilitation

In this section, we will first become familiar with ideas behind process facilitation. Afterwards the roles of a facilitator as well as the facilitation process and activities will be discussed in more detail.

4.1 The art of process facilitation

Facilitation as a term is a vague one, having bit of a different meaning depending on the context and person who is using it. However, what is common to all is the idea that facilitation is seen as *an activity*, which strives to relieve the workload (Bostrom et al. 1993) and increase the effectiveness of a group (Schwarz 2002). The fundamental assumption is that an ineffective team has problems with solving problems as well as with making decisions (Schwarz 2002) and thus guidance is needed. As a result, facilitation can be seen either as process or content oriented. The difference between these two approaches is quite profound: Where process facilitation supports the team to solve the challenges itself, the content facilitation provides straight answers (Griffith et al 1998). In this thesis the focus will be on the process facilitation.

Process facilitation can be seen as the art of developing and managing processes that help a group to reach mutual understanding, to solve problems and to carry out tasks (Huxham and Cropper 1994). In a sense, this means that it is not only about helping out the team in whichever possible way, but rather using the expertise of processes as a guide to construct an environment, that supports collaboration and creativity within the team. Bostrom et al. (1993) see facilitation as a *dynamic process*, which leads the team for a more effective meeting outcome. In this case, facilitation is strongly seen as part of the meeting structure and the role of a facilitator is related to managing relationships and structuring tasks within the context of meetings. Even when the emphasis on these two definitions is a slightly different, the idea behind the facilitation stays the same: Creating structures that activate individuals and make the team to be as successful as possible.

According to Rasmussen (2003, p.317) process facilitation aims to guide groups, organizations or networks *"to develop their visions, strategies and action plans."* In practice this may mean organizing an ideation workshop, creating a roadmap or clarifying the decision making process. However, facilitation is not as simple as it may sound, since the fundamental idea behind facilitation is to manage or at least somehow tolerate the chaos, created by the conflicting expectations, and

thus enable the utilization of the creativity of the group. As a result facilitation is also about emphasizing cooperation within a team as well as developing participatory methods for areas such as decision or strategy making. (Rasmussen 2003) Yet another view is to divide process facilitation into two types, *basic* and *developmental,* according to the expected learning outcomes (Schwarz 2002). The basic type describes situations in which the facilitation is used to solve substantive problems without interfering with the team's process otherwise. The developmental facilitation emphasis more the learning of a team and thus the facilitation is designed so that with time the team is able to become self-facilitating (Schwarz 2002). In practice, the basic facilitation can be seen as a short-term solution in which the interventions are planned as single occasions, where developmental facilitation is more long-term oriented with the goal of teaching the team to improve its own processes (Kolb 2004).

The literature concerning facilitation is quite extensive, however research within the field is rather limited to certain themes (Wardale 2013). One of the topics in which facilitation is discussed in more detail, is the Group Support Systems (GSS) literature, which focuses in on supporting group meetings especially through technological advantages. According to this branch of research, using technology to structure team activities can be seen as facilitation and it may even prove to be efficient when used properly. However, it has also been pointed out that technology cannot replace and mimic everything in the facilitation process such as designing meetings or managing verbal communications. As a result real people are needed to facilitate certain parts of an event. (Bostrom et al. 1993)

4.2 Facilitation process

A successful facilitator uses flexibly his or her experience, creative methods and awareness to enable creative cooperation within a group (Nelson and McFadzean 1998). Since the facilitator's task is to ensure that the team is working to reach its goals, and to reduce any possible distractions that might hinder the teamwork or the process, it is safe to assume that there should also be a well-thought process behind the facilitation itself. In the literature, the

facilitation processes are presented as temporal, yet systematic activity sequences that occur within certain time limit (Wardale 2013). These models tend to consist of at least three phases: *preparation, intervention* and *follow-up* (McFadzean 2002a, Wardale 2013). Each phase consists of a set of objectives decided together with the team and of distinct facilitation activities.

However, these temporal models are criticized for emphasizing only the first two steps and forgetting the aftermath of facilitation sessions. The study by McFadzean and Nelson (1998) added a fourth dimension called "*Post-Session Review"* to the model. The purpose of the Post-Session Review was to encourage all the parties to learn from the previous phases and make sure that implementation is an ongoing process. However, this particular dimension was quickly forgotten and bundled together with the rest of the follow-up phase (McFadzean et al. 1999). Nevertheless, in her study Wardale (2013) brings up the *transfer* or *implementation* phase again as one of the most important parts of facilitation process. According to her research the participants were more likely to implement the ideas from the intervention when they knew a follow-up meeting was coming up with the facilitator. Table 4 presents the phases of facilitation as well as some key aspects to consider in each phase.

Table 4 The effective facilitation model. Adapted from Wardale 2013, p. 123

CONTEXT– FIT OF FACILITATOR'S STYLE, CHOICE OF INTERNAL OR EXTERNAL FACILITATOR, INDUSTRY SECTOR, ORGANIZATION'S CULTURE AND SIZE			
PREPARATION	EVENT	SUCCESSFUL OUTCOMES	TRANSFER
Thoroughness Outcome clarity Pre-existing relationship between facilitator and manager Perceptions about the effectiveness of the facilitation	Facilitator - style - role - neutrality - shared language Group processes - customization - group dynamics Participants present Adequate time and timeliness	Achievement of content outcomes Achievement of affective outcomes Participant involvement Plan for implementation	Ensure implementation of outcomes Consider accountability Link to organizational plans and system

4.3 Facilitator's role

The facilitator has been defined in literature as the one who is in charge of guiding a process, but is not allowed to interfere with substance work of the

project (Rasmussen 2003). The facilitator is in most studies described as a person who is not part of the team and thus has no decision-making power. Therefore, the job of the facilitator is to assist the team in problem solving and decision-making and as a result, the facilitator can be seen as "*a process guide of creative cooperation*" (Rasmussen 2003, p.307). In practice the facilitator has at least three concrete tasks: Leading the process of thinking to new areas, managing the social processes within a group and being the neutral party (Huxham and Cropper 1994).

First, the task of a facilitator is to *lead the thinking process of a group to new areas* as well as to raise discussion within the team on what they are actually supposed to be doing (Huxham and Cropper 1994). The process expertise, which facilitators have, should be used to draw the focus of the participants to the path they are about to follow, when creating ideas, making decisions or reflecting (Rasmussen 2003). Often this means using modeling technics, which support the analysis of a problem, or offering a range of tools and helping the group to select the right ones for the situation (Rasmussen 2003, Huxham and Cropper 1994). In practice, a facilitator might visualize all the ideas that the team is producing to a white board, and categorizing those under certain themes or encouraging the team to try out other perspectives while working with the problem.

The second task of a facilitator is to *manage the social processes within a group*. This means making sure that all the team members feel comfortable enough to share their ideas, thoughts and insights with the rest of the team. In practice, it might mean encouraging quieter members to speak up or blocking the more dominant ones. However, to be successful in this field, a facilitator needs to have great judgment of the situation and ability to sense what is really necessary for the team, in order to support the progress of the team as wanted. (Huxham and Cropper 1994)

The third and final task of a facilitator is to *act as the neutral party*. As the facilitators are seen as mere process guides they should not possess any interest

or decision-making power for the project outcome. This makes the facilitators outsiders who are rather interested in designing the process of how to reach a certain goal, without really having an opinion what the goal should be in the first place. (Huxham and Cropper 1994) If a facilitator takes a stand in content matters, it may lead to a situation in which part of the participants do not see the facilitator as a neutral party anymore (Rasmussen 2003, Schwarz 2002). As a result, trust towards the facilitator is compromised and the team members might lose their sense of responsibility for solving problems (Schwarz 2002).

One of the important things to realize is that the facilitator is not a project manager (Rasmussen 2003). This is due to the fact that project managers are deeply involved in the content work as well as in the decision making of any project (Schwarz 2002). Since the role of project manager is always associated with a certain amount of responsibility, a project manager can never be truly neutral. However, project managers may use their expertise of processes together with their expertise of the content to lead their team (Phillips and Phillips 1993, Schwarz 2002).

4.4 Facilitation activities

Successful facilitation is not only about the process, but also consists of a set of activities, which the facilitator chooses according to the needs of a team. In order to be able to select the proper activities, the facilitator needs to possess some knowledge and capabilities. The personal abilities and capabilities together with the knowledge of creative methods are the key competencies of any facilitator, and thus critical for effective facilitation (Rasmussen 2003). According to McFadzean (2002b), facilitator competencies can be divided into five main categories: *planning, group dynamics, problem solving, communication* and *personal growth.* Table 5 summaries the general competencies associated with each of these categories and gives practical examples of the activities the facilitator might use while working with the team and using a certain competence.

Table 5 Facilitator competencies according to McFadzean 2002b, p.541-543

CATEGORY	COMPETENCE	EXAMPLE ACTIVITY
Planning	Developing working partnerships with clients	Identify client needs
	Use time and space to support group processes	Plan and monitor effective use of time
	Understand the client's problem and develop a process to meet the needs	Gather information and understand the perspectives of the client group
Group Dynamics	Honor and recognize diversity enduring inclusiveness	Bring forth the diversity of the group
	Facilitate group conflict	Mediate conflict
	Demonstrate behaviors that support team values and processes	Encourage positive ideas, suggestions and criticism when appropriate
	Facilitate group self-awareness	Listen, question, clarify and summarize to elicit the sense of the group
	Encourage trust and neutrality	Encourage trust in the group and the experience of the participants
	Encourage optimism and enthusiasm	Establish expectations
Problem Solving	Evoke group creativity, blending all learning and thinking styles	Encourage creative thinking
	Employ multi-sensory processes	Assess group sensory needs and abilities
	Guide the group with clear methods and processes	Establish a clear context
	Guide the group to consensus and desired outcomes	Adapt processes to changing situations
	Ask in-depth questions of the group participants	Uncover the profound insights of the group
Communication	Assess/evaluate client satisfaction	Evaluate facilitation process
	Demonstrate effective interpersonal communication skills	Demonstrate ability to observe and provide feedback to participants
	Teach the client team the appropriate skills, tools and techniques for effective meetings	
Personal Growth	Maintain a base of knowledge	Develop knowledge in management, organizational systems and development, problem solving and creativity
	Contrast facilitation methods	Know a range of processes
	Maintain professional standings	Engage in ongoing study
	Approach situations with self-confidence and an affirmative manner	

Each of these categories consists of number of facilitation activities. Out of these activities, the facilitator pays closer attention to certain aspects that support the teamwork in the best possible way. When making the decision on to which aspect to focus on, the facilitator should consider both the objectives as well as the level of the team (McFadzean 2002b). In order to find the right objectives, facilitators can use models such as *diagnosis-intervention cycle* (Schwarz 2002),

which guides the facilitator through the observation process and thus helps to find the problem spots.

The research suggests (McFadzean 2002a) that also the level of the team has a great impact on the facilitation activities. There is no reason to focus on emotional aspects such as team feeling, when the team is on a lower maturity level and only interested in accomplishing certain tasks and meeting specific goals. However, on a more advanced level, when the tasks are more complex, also the emotional responses need to be taken into account in the facilitation work (McFadzean 2002a). Moreover, it is not only the abilities of the facilitator that are crucial for the success, but also the composition of the group has an influence on the outcome. In other words, some groups lack from the very beginning the willingness and ability to transform into a creative team, and thus even the most skillful facilitator will not be able to enforce cooperation within it. (Rasmussen 2003)

4.4 Conclusion

The literature review suggests that process facilitation can be seen as an activity, which could be used to increase the effectiveness of a team and to make the workload more manageable. The facilitator acts as a neutral party, who does not possess any decision-making power within the group. Since the facilitator is not part of the group, he or she can observe the teamwork and pay attention to aspects such as the ways of working and team dynamics.

In the literature, most of the processes for facilitation deal with short-term, basic facilitation, in which the goal is not to teach the team to become self-facilitating but only to solve the problem at hand. This process has four distinct phases: preparation, event, successful outcomes and transfer. In each phase, the facilitator is supposed to use his or her capabilities and knowledge to pick out the appropriate activities that would help the team to solve their challenges. The results of this literature review can be summed up as follows:

As an outsider, a process facilitator is able to observe the team and by using his or her capabilities, pinpoints the weaknesses of the team. Since the facilitator is a neutral party, he or she is can act as a process guide, who leads the creative collaboration but does not interfere with the content work of the team. The goal of process facilitation is to increase the effectiveness of the teamwork by paying attention to the team dynamics and process related issues.

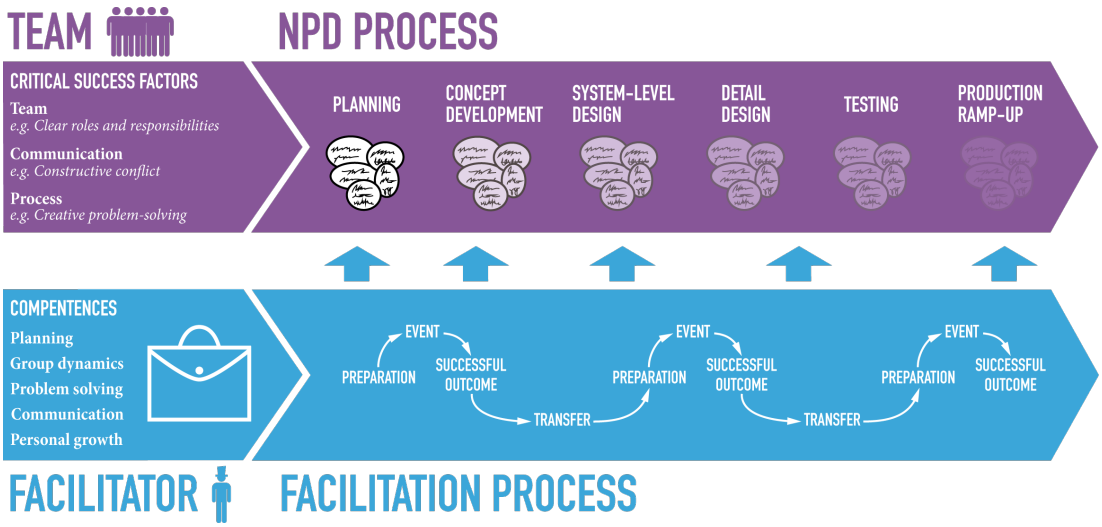
5. Theoretical synthesis

In the previous chapters the characteristics of a NPD process, the critical success factors associated with global interdisciplinary teamwork as well as the competencies of process facilitators were discussed. The purpose of this section is to bring these topics together and provide a suggested framework of process facilitation as a supporting tool for a global interdisciplinary team in NPD context (5.1).

5.1 Suggested framework of process facilitation as part of NPD process

The literature review revealed that in new product development a team is expected to answer to various demands in order to carry out the project successfully. The process as well as the teamwork itself may create challenges, to which the team cannot necessary find answers on its own. In the suggested framework (Figure 3), process facilitation is presented as a possible supportive structure in new product development. In this framework, process facilitation is illustrated as a separate process that proceeds in parallel to the process of a new product development team.

Figure 3 Suggested framework for process facilitation in NPD context



The suggested framework consists of two distinct parts: new product development process described by Reinikainen and Björklund (2008) and process facilitation process suggested by Wardale (2013). This product development process model was picked since it illustrates nicely both linear and non-linear dimensions of the product development and integrates the different project phases to it as well. The process facilitation model by Wardale combines various models from the literature and hence it was used as a basis for this framework. The suggested framework also illustrates the actors that take part in these processes and what is needed from them in order to conduct a successful project. For global interdisciplinary teams, the literature outlined potential critical success factors (Holland et al. 2000, Kayworth and Leidner 2000), which were grouped into four distinct categories:

1. Team related
2. Communication related
3. Process related
4. Organizational context related

Moreover, the literature provided a list of facilitation competences, which fell into following categories (McFadzean 2002b):

1. Planning
2. Group dynamics
3. Problem solving
4. Communication
5. Personal Growth

When comparing the critical success factors and the facilitator competences, it becomes clear that one potential solution to support a global interdisciplinary team is the engagement of third party process facilitators in the process. Table 6 indicates that the facilitators would potentially be able to support the team with issues related to *team, communication* and *process.* Therefore, the framework suggests that as the facilitator observes the team, he or she should be able to

identify and affect to the issues related to these three areas of critical success factors of the team, and thus use his or her capabilities to guide the team through the process.

Table 6 Comparison of critical success factors and facilitator competences

CATEGORY	SUCCESS FACTOR	FACILITATOR COMPETENCE
TEAM	Mutual respect/trust	Encourage trust and neutrality
	Team cohesiveness	Encourage optimism and enthusiasm
	Team leader selection	Facilitate group conflict
	Team leader skills and vision	Demonstrate behaviors that support team values and processes
	Right functional mix	Facilitate group self-awareness
		Honor and recognize diversity enduring inclusiveness
	Team empowerment	
	Team tenure	
	Flexibility and openness to learning/willingness to change	
	Engage in team building activities at onset of virtual team creation	
	Instil a sense of cultural awareness	
	Create teams from complementary cultures	
	Build team cohesiveness	
	Express flexibility and empathy towards virtual team members	
COMMUNICATION	Sharing and use of uncertain information	Demonstrate effective interpersonal communication skills
	Emphasize continuous communication	
	Set meeting schedules and rules of engagement	Teach the client team the appropriate skills, tools and techniques for effective meetings
	Exhibit cultural awareness	
	Boundary management	Assess/evaluate client satisfaction
	Utilize multiple computer mediated communication systems (CMCS)	
	Constructive conflict	
	Conduct periodic face-to-face meetings	
	Train team members in the use of various CMCS	
	Ensure infrastructure compatibility among geographic locations	
	Assess political and economic barriers to international telecommunication	
PROCESS	Set clear team goals and provide continuous performance feedback	Guide the group to consensus and desired outcomes
	Assess/evaluate client satisfaction	Evoke group creativity, blending all learning and thinking styles
	Formal yet flexible integrative processes	Guide the group with clear methods and processes
	Customer focus	Ask in-depth questions of the group participants
	Important, challenging task	Employ multi-sensory processes
	Creative problem-solving	

Part III Empirical research

6. Methodology

This section presents the data analysis, which was used to conduct this research. The research is based on five product development projects that were closely accompanied by facilitator pairs. The research data consists of interviews that were conducted just after the participants had finished their projects. The following chapters describe the projects used in this study (6.1), the data collection through follow-up interviews (6.2) and how the data was analyzed (6.3).

6.1 Project descriptions

The data was gathered from five product development projects that were facilitated by two process facilitators. The participants were students of the Product Development Project PDP and Global Virtual Collaboration Project (GVCP) -courses in Aalto University during the academic year 2012-2013 (see chapter 1.2).

Project team A consisted initially of 12 members representing the design, business and engineering fields. However, one of the engineers decided to quit quite early on and thus the project was carried out with 11 members. The team was distributed across the globe and four of the members worked remotely. The sponsoring company was a medium-sized Finnish company from the recycling and organic waste management industry. They gave the team the task to develop a system for organic waste management for communities such as schools. The team was facilitated by two GVCP-students, who had no previous experience of facilitation.

Project team B had in total 11 members, with a background either in design or in engineering. The team also had three remote members working in two different locations. In this case, the design brief came exceptionally from a

research group working on delay-tolerant communication systems. The team was asked to design a do-it-yourself –style router, which could be easily utilized anywhere. In this team, one of the facilitating GVCP-students was a doctoral student, who had previous facilitation experience and the other, a master's degree student, had prior knowledge of the topic the team was working on.

Project team C had in total 12 members, who were representing engineering, business and design students. All the remote team members of this team were located in one University and were able to work as a remote team for most of the time. However, the size of the remote team was reduced, when one of the members moved to Helsinki and became part of the local team for the spring term. The sponsor was a large paper manufacturing company, who challenged the team to develop a solution that would decrease the noise level of paper machines. The facilitators of the team were two GVCP-students who had studied facilitation in theory, but had not been involved in practical facilitation before.

Project team D consisted of engineers and designers. Two of the designers were located in a partner University and thus for the most part of the project they worked remotely. A medium-sized medical device company sponsored the team and the design challenge was to develop an easy coil positioning system. This team was facilitated by two GVCP-students, who had no previous experience of facilitation.

Finally, project team E had initially nine members from three disciplines (business, design and engineering). However, the team lost two engineers in the middle of the year and had to survive with seven members until the end of the project. In this team, only one of the members worked as a remote member for a major part of the project. The team worked with a large-sized medical device company, who asked the team to develop a system that would cool down a patient's skin during a therapy session. The two facilitators of the team were GVCP-students, who had not practiced facilitation before.

Table 7 provides an overall picture of the product development projects that have been examined in this study. It introduces the composition of the teams, names the industry of the sponsoring company and describes shortly the project brief given to the team.

Table 7 Project information

PROJECT	TEAM					INDUSTRY	BRIEF	EXPERIENCE OF FACILITATORS
	TOTAL	BUSINESS	DESIGN	ENGINEERING	REMOTES			
A	12(11)	2	4	6(5)	4	Recycling and organic waste management	Bringing organic waste management to communities	None
B	11	0	4	7	3	Delay-tolerant communication	Create a DIY router	Some
C	12	2	1	9	5(4)	Paper manufacturing	Decrease the noise level of paper machinery	In theory
D	9	0	3	6	2	Medical devices	Create an easy coil positioning system	None

6.2 Data Collection

The main source of research data for this study is the material gathered through retrospective interviews of the projects. This data consists of 11 semi-structured thematic interviews conducted right after the projects were finished. Based on the researcher's observations and preliminary discussions with both the Product Development Course (PDP) and the Global Virtual Collaboration Project (GVCP) – course teachers and students, it was decided that the interviews would deal with three parts: the beginning of the project, time after Christmas break and general feelings of the collaboration. Within these parts, the major discussion themes would then be:

1. Challenges that the teams and their facilitators faced
2. Activities that the facilitators introduced to the teams
3. The role of the facilitators

The frame for the interviews was tested and developed further together with the Global GVCP – course teachers. It was decided that since the participants represented two slightly different perspectives, the questions would be adapted

to correspond to their experience and knowledge. The full interview frame and questions can be found in appendix 1. During the interviews, the participants had also a possibility to use the PDP-timeline and the GVCP -process map as visual guidelines (appendix 2). These objects were utilized in order to help the participants to indicate the phase of the project they were discussing in the interviews.

The interviews were conducted during May and June in 2013, just after the participants had finished their project work. All the facilitators were invited to participate in the research and only one of them declined, since he had left the country already at that point. With the product development teams, the initial goal was to interview at least one member from each team. Unfortunately, none of the team members from Project B were willing to participate, and thus their viewpoint is not present in this study. Table 8 presents the interviewees of this study.

Table 8 Interviewees of this study

INTERVIEW	PROJECT	PARTICIPANTS
1	A	2 x Facilitator
2	B	2 x Facilitator
3	C	2 x Facilitator
4	D	1 x Facilitator
5	E	2 x Facilitator
6	A	1 x Project Manager, 1 x Local Member
7	C	1 x Project Manager
8	E	1 x Project Manager
9	A	1 x Remote Member
10	C	1 x Local Member
11	D	1 x Local Member

Since the facilitators had worked as pairs, they were also interviewed together, except for project D, from which only one of the facilitators could be present at

the interview. The product development team members were mostly interviewed in one-on-one discussions. However, one of the interviews was held as a pair discussion, since the team representatives of project A wished so. The length of the interviews was on average 58.5 minutes. In total the duration of the audio records was 10h and 43 minutes. The interviews were conducted in Finnish and English, depending on the preference of the interviewees. The transcription of records and translation of the extracts used in this study are conducted by the researcher after the interviews.

A secondary data source for this study is formed by the informal discussions with the PDP and the GVCP –course teachers and students that took place while the courses were still running. In addition, the researcher was able to observe for some extent how the facilitators and project teams collaborated throughout the year. Even though the secondary data has not been analyzed further in this study, it has allowed the researcher to understand the context and thus supported the interpretation of the primary data.

6.3 Data analysis

The data analysis was conducted by following the general guidelines of thematic analysis presented by Braun and Clarke (2006). This particular analysis process consist of six steps: *familiarizing with the data, generating initial codes, searching themes, reviewing themes, defining and naming themes and producing the report* (Braun and Clarke 2006). In this study, the researcher first familiarized her with the data by reading through the transcripts and making some early notes to structure the material. After the first step, the data analysis process by Lichtman (2013) was utilized to provide more detailed guidance for creating codes and meaningful categories out of the raw data. This process also consisted of six steps: *initial coding, revisiting initial coding, developing an initial list of categories, modifying initial list based on rereading, revisiting categories and subcategories and moving from categories to concepts,* which were adapted to fit to the analysis needs of this study (Lichtman 2013). As a result, the coding and categorizing process ended up being an iterative process, in which the

researcher had to go back and forth to re-arranging the segments as well as the categories in order to make sense of the whole data set.

The analysis process started with initial coding of all the transcripts. During this phase the data was studied carefully and codes that described the content were generated. This work resulted altogether 683 segments with a vast number of codes. Therefore, the second step of the analysis was to revise and clarify the codes. At the same time the initial categorization of the data was started. The segments were grouped into bigger bundles and as a result 18 categories with 143 sub-categories were developed.

The first round of categorization proved to be a vital part of reviewing the data, after which the decision was made to put some of the data aside as irrelevant for this particular study. At this point, it was also decided that the remaining data needed to be organized and re-categorized. In this phase, the theoretical categorization (see Table 6) was used to guide the analysis process. Consequently, after the second round of analysis, the data consisted of 558 segments that had been divided into three classes consisting of eight categories and 34 sub-categories.

The final revision of the categories was conducted, while writing the results as part of the reporting phase as suggested by Braun and Clarke (2006). During this phase the categories and the sub-categories were studied for the last time to make sure that there would not be too much overlapping within the various categories. As a result, the final data analysis has only two classes, six categories and 23 sub-categories, which are presented in the following chapter.

7. Results

This section presents the results of the empirical research conducted for this study. The results have been arranged into two classes that describe the facilitation needs that rose in global interdisciplinary teamwork (7.1) and how the process facilitation was perceived in product development context (7.2). At the end of this section, a summary of the results is presented in chapter 7.3.

7.1 Facilitation needs of global interdisciplinary teams

This class describes the facilitation needs the teams faced during their new product development project. These needs are grouped into three categories and presented in more detail below: *Team dynamics* (7.1.1), *Communication challenges* (7.1.2) and *Project progress* (7.1.3).

7.1.1 Team dynamics

This category describes how the dynamics of the team affected the progress of the project by creating tensions between the team members and leading to motivational problems. Within this category, the facilitation needs could be placed under three subcategories: *level of commitment, project manager's authority* and *capabilities and characteristics of team members.*

The first subcategory, *level of commitment,* presents how the amount of participation and contribution to the project within the team differed greatly. Since some of the individuals felt that not everyone was working equally, issues such as frustration towards the free riders and lack of motivation to work on the project appeared as described by one of the project managers:

"*I had a team member, who was basically doing nothing. And then half of my team mates got angry with him.*" – Project manager

It was also noted that some teams struggled to establish a team feeling and tried to follow the rules set together. Thus the motivation to work on the project was compromised at times. One of the members explained how he spent weekends working on the project as agreed, and how frustrated and annoyed he became, when the other team members did not show up to joint meetings on time. Obviously, these team members did not respect each other's time and consequently negative feelings towards the project replaced any team spirit and motivation that there might have been.

Furthermore, facilitation needs emerged due to the *project manager's authority*. This subcategory describes how the team members reacted to the authority the project manager showed during the project. In a few cases, the team members did not always agree with the way a project manager was leading the project, and hence found ways to work around:

"So the (PM) was officially the manager, but then there was (Member 1) and (Member 2) who took care that the project was actually running. They did most of it… They did those things that needed to be done and gave tasks for others. And also took care, that those were done" - Team member

Moreover, one of the team members stated that their project was actually progressing better when the project manager was not present. Thus at the end, the team members distributed the project management tasks and took care of those as well. Also one of the project managers described how her authority was challenged by one of the team members, which created tension throughout the project. This particular member had so much influence on others that none of the ideas the project manager wanted to take further were carried out without the support of this key person.

Finally, the facilitators made remarks concerning the composition of the team and how that affected the project. The subcategory, *capabilities and characteristics of team members,* describes how putting a group of individuals to work together, does not necessary mean that the group will turn into a team

that is able to respond to the project needs. The facilitators described how the lack of certain skills, or having a majority of passive, quiet team members caused the project to slow down quite a bit:

"Usually at the meetings everyone was quiet, except the (PM) who tried to explain something." - Facilitator

The facilitation needs and the number of mentions related to the team dynamics are presented in Table 9.

Table 9 Facilitation needs related to team dynamics

TEAM DYNAMICS		
SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
Level of commitment	17	
Project manager's authority	11	1
Capabilities and characteristics of team members	1	8

It is worth of noticing that when comparing the facilitation needs related to team dynamics, the team representatives and the facilitators paid attention to different aspects. Where the team representatives emphasized the issues related to the personal relationships within the team, the facilitators were more concerned with the structural issues of the teams.

7.1.2 Communication challenges

This category presents the facilitation needs of a team related to misunderstandings and poor knowledge flows within the project work. The category consists of six subcategories, which are: *unawareness of the project status, inadequate information flows, reconciliation of time zones and cultures, inappropriate virtual platforms and tools, lack of sponsor involvement* and *lack of common language.*

The first subcategory, *unawareness of project status*, presents challenges related to being aware of the work the other team members are conducting, and of the need for external help. First of all, at times the team members lost the track of

the project status and thus they were not be able to tell what the rest of the members were working on, and how the tasks related to each other. One of the team representatives described a situation, in which their team had split into various subgroups and after a short while none of the local team members in Helsinki had an idea how the remote team in India was trying to contribute to the project.

The second part of this subcategory describes how asking for external help for the project was at times demanding. One of the project managers presented the problem in a following way:

"You know that you have a problem, but then you cannot really say precisely what it exactly is, and then you cannot really ask for any external help for it, before you can say: 'This is our problem. Will you help us?'" – Project manager

In this case, the project manager felt that since the team was not able to identify their problem explicitly, they were not entitled to receive help from external sources such as the facilitators. Nevertheless, it is worth noticing that these challenges were only reported by the team representatives.

The subcategory, *inadequate information flows*, describes situations in which the team had decided that all the information to the remote members should only go through via one team member. As a result, the communication chains were long and information was lost on the way. The situation was even compared to the children's game Chinese whispers (also known as broken telephone):

"It was like Chinese whispers. The three of us were skyping and I was like 'No but (PM) told me this' and (Member) was like 'No I think we are doing this.'" – Remote member

The team members reported most of these challenges, however also one of the facilitator pairs noticed that the centralized communication hindered the

information flow and thus the reports from the remote team did not get through to the rest of the team, as they should have.

Closely related to the previous subcategory of inadequate information flows, is the subcategory of *reconciliation of time zones and cultures*. This subcategory describes how the teams struggled to keep their remote members informed of the project progress due to team being dispersed and having various cultures creating barriers for understanding. One of the team members described the challenges their team had with the remote members in China:

"The Chinese have their own cultural issues. They are not used to work like this (PBL) and they don't understand what it is about. Maybe if you'd get them to do PDP for a third time, they would be able to perform like the people in here (Finland) on their first PDP-round."

- Team member

Since some of the teams were located on multiple continents, the team representatives reported that a lot of time was spend to just keep the remote members notified of the developments of the project. One of the project managers stated that most of her time went to scheduling and having Skype-meetings with the remote members instead of focusing on other project management issues. Similarly, a couple of the facilitator pairs mentioned how the cultural differences had created misunderstandings and how coordinating between multiple locations proved to be an extra effort for the team.

At times, information was lost due to the team trying to use virtual platforms and tools that were not utilized by all the team members or did not function as well as was expected. These challenges are grouped under subcategory *inappropriate virtual platforms and tools*. Especially, the remote members would suffer, because of the poor choices made by the team concerning the virtual communication:

"The group in China was extremely isolated from the Finnish group. And not least because the main discussion channel in Finland was… a platform that is blocked in China. It really did not help." - Team member

Also the facilitators reported that some of the teams were not able to fully utilize the potential of virtual platforms and tools for their advantage. One of the facilitators described an incident, in which the project manager was asking the team for the old meeting memos and had obviously forgotten to check out the portal, in which all the memos had been stored as agreed. Even though the team had certain rules on how to use virtual tools, it was not always said that the members or the project manager would regularly remember to use them.

The subcategory, *lack of sponsor involvement,* indicates how valuable the proper feedback from the sponsoring company and having a working communication channel with the company are. One of the team representatives described how their work was slowed down tremendously, when they did not receive proper feedback from their sponsor. Another project had to cope with losing the communication channel altogether with their sponsoring company, as their original contact person was fired. Consequently, the team was not able to receive any guidance for a couple of months from them and the communication never fully recovered. The poor knowledge transfer between the sponsoring company and the team were also noticed by one of the facilitators:

"*The project manager was in charge of being in contact with the sponsor, and he did not do it… Of course you should not assume, that the project manager takes care of it and it's okay, but then came the half way report and all the grades were ones* [the lowest on the scale 1-5]. *From communication and everything."*
- Facilitator

The final subcategory, *lack of common language,* describes all those challenges related to communicating in a foreign language, whether it was linked to their cultural background or to the discipline of the team members:

"They would talk a lot, but kind of not of the same topic. Or they did speak of the same topic, but somehow they could not understand each other. So we came to the conclusion that they were not really listening to each other." - Facilitator

The facilitators noted that these challenges would especially come up in virtual communication with remote members, when the teams were trying to make decisions. According to the facilitators, the remote members had a hard time to convince the other members of their point of view, when their only means to communicate was Skype or email. However, it is worth to notice that none of the team members reported any challenges connected to this aspect.

All facilitation needs of the teams that were related to the communication challenges are presented in Table 10.

Table 10 Facilitation needs related to communication challenges

COMMUNICATION CHALLENGES		
SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
Unawareness of project status	11	
Inadequate knowledge flows	7	1
Reconciliation of time zones and cultures	4	3
Inappropriate virtual platforms and tools	6	4
Lack of sponsor involvement	5	1
Lack of common language		11

When analyzing the communication challenges reported by the facilitators and the team members, it is noticeable that two subcategories are only commented by one of the parties interviewed for this study. The communication issues related to unawareness of what the other members were working on was widely commented by the team representatives, where the facilitators paid

more attention to the lack of common communication language and how the team members understood each other.

7.1.3 Project progress

This category sums up all those facilitation needs of the teams that were related to the teams' ways of working as well as how to push the project forward. Within this category, four subcategories emerged: *clarity of the project goal, clarity of roles and responsibilities, lack of structure* and *inefficient decision-making.*

The struggles, related to finding a focus and understanding the bigger picture of the project are presented in the subcategory *Clarity of the project goal*. Especially in the beginning, most of the teams were unsure of the purpose of the project and thus lacked understanding on what they should have achieved by the end of it. One of the team members described how each of her team members had a different idea of what the final outcome should be and therefore also envisioned the focus of the project in different ways. As a result, she stated that the team was *"all over the place".* Also the facilitators reported that the teams faced troubles, when trying to understand their design challenge:

"It is an awfully complex system. The discussion did get jammed to tiny details. They could talk about things like the (project detail) for millions of hours without really getting anything sensible done." - Facilitator

When looking at the extract above, it becomes obvious that the team was not able to see the bigger picture and work towards a common goal.

The second subcategory, *Clarity of roles and responsibilities*, describes how the teams struggled to assign roles for the members as well as how the individual members were not willing to take responsibility on executing parts of the project. One of the facilitators explained:

"One of the team members would have needed some parts for the proto and kept asking 'who is going to order these?' Like hello, can you just order them on your own? And then he kept asking on Facebook: 'These should be ordered. I need them by this date.' And then no-one answers." - Facilitator

In most cases, the challenges emerged since the teams were unsure of what needed to be done next, and the members were not familiar with each other's skills. In addition, it was mentioned that especially giving tasks for the remote members was experienced as a challenge, since they were not so closely connected to the rest of the team and some of the tasks could only be done in Helsinki. However, the team representatives reported that as the project progressed, the roles became more obvious as did the tasks that needed to be handled.

The third subcategory, *lack of structure,* illustrates how some of the teams lacked an idea of how the work should be arranged so that the members would feel motivated to put some effort to the project. In practice this meant a slow start for the project:

"The team was planning to have clear goals and tasks in advance, however they somehow sank into an illusion that there is plenty of time and it would be okay to just hang out the fall period." – Facilitator

The lack of process structure also affected to the abilities of the teams to further develop each other's ideas. One of the team members described a situation, in which the project manager asked the team to draw sketches by the next team meeting. The team members would work on the task and gather a great number of ideas just to discover later on that those ideas were never further developed. As a result, a lot of ideas were just left to float in the air and never thought through nor fully utilized.

The most problematic events for many of the teams were the weekly meetings. Both the facilitators and the team representatives reported that the time was

not efficiently used in the meetings. In most cases this was due to the lack of a proper agenda, which resulted in unfocused discussions. As a result, the team members did not respect the team meetings and would come and go, as they liked.

Moreover, keeping the remote members updated in the progress and in speeding up the project, were also regarded as challenges. One of the facilitator pairs described how some of the ideas presented by the remote members would already be outdated by the time the local team would hear about them:

"The team did talk the remote member in Australia quite a lot. However, it was somehow difficult for them to really work together, when the situation was… For example when we had the ideation session, someone said: '(Remote member) sent these new pictures, should we look at these?' And then those pictures would really have nothing to do with the discussion they had had in this situation, even though they were really good." - Facilitator

Finally, the subcategory *Inefficient decision-making* illustrates how choosing between different options proved to take a lot of time and created insecurities within the team. One of the project managers described how some of his team members did not trust the mechanisms behind the decision-making and challenged the whole decision-making process. Also it was noted that some of the teams were missing the decision-making process altogether:

"They would just talk and talk and talk and then they did not really make… They did not make any decisions." – Facilitator

The facilitation needs connected with the progress of the project are summarized in Table 11.

Table 11 **Facilitation needs related to project progress**

PROJECT PROGRESS		
SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
Clarity of the project goal	12	6
Clarity of roles and responsibilities	13	16
Lack of structure	8	22
Inefficient decisionmaking	11	9

The facilitation needs concerning the project progress reported by both the team representatives and the facilitators seem to be quite in a balance. Both parties had made comments related to all the subcategories. The only major difference concerns the *lack of structure* –subcategory, which was especially emphasized by the facilitators.

7.2 Process facilitation in new product development

This class describes how the team members and the facilitators understood role of the facilitators. It also describes some of the activities that were utilized in order to facilitate the teams' processes, and major challenges the facilitators faced while supporting the teams. These ideas are grouped into three categories that are described in more detail below: *Facilitator's role* (8.2.1), *Activities of facilitation* (8.2.2) and *Facilitation challenges* (8.2.3).

7.2.1 Facilitator's role

Descriptions and remarks concerning the role of facilitators within the product development project are gathered under this category.

The first subcategory, *defining the role as a facilitator*, presents how in the beginning of the project the facilitator's role was not well communicated to the teams. One of the team members described the starting point like this:

"Well, maybe it would have been good in the beginning to emphasize their (facilitators') function in this project. I just thought they would organize some

facilities for us, which is quite different from what they actually did." – Team member

Most of the facilitators tried to explain the purpose of facilitation to the team members in the first meetings. However, only one facilitator pair reported feeling confident that they had managed to establish their role in the very beginning. Another pair stated that their role became a bit clearer after organizing a workshop and actively demonstrating facilitation to the team. The rest of the facilitators struggled throughout the year with trying to define their role within the project.

Consequently, a lot of suggestions were given in order to improve the facilitation process. The facilitators felt strongly that more attention should be paid on the introduction of facilitation to the teams, and such ideas as organizing an kick off workshop for the team or having a informal meeting with the project manager before hand, were raised.

The second subcategory, *clarity of the role,* describes the level of understanding both the facilitators and the team members had concerning the responsibilities of a facilitator. This was one of the most widely commented subcategories in the whole study. First, it includes statements that described the confusion some of the team representatives felt towards the tasks of their facilitators:

"I think I did not know how to use them (facilitators) or what their place was." – Remote member

If the team members were bewildered, so were the facilitators:

"We really did not have that clear picture that we should try to integrate to the team. We were quite… It did not help at all that we were completely clueless of what our role was in the beginning. It started to form a bit by bit." - Facilitator

Consequently, most of the facilitators also hesitated whether facilitation had an impact to the project success or not. As they struggled to see the value of their work, the motivation to do more than the bare minimum was hard to gather:

"Well you have like no… You can do whatever. And then the team is doing fine and you notice that they'll make it without you as well… So then you go from there where the fence is the lowest." - Facilitator

Even though most of the statements within this subcategory illustrated the confusion and the lack of understanding towards the facilitator's role, it also includes statements, in which the role was stated to be clear from the beginning. Moreover, one of the facilitator pairs reported that without them the team had most likely not delivered anything at the end of the project.

Different roles –subcategory presents the various roles the facilitators took, while working with the team. First of all, the facilitators spent time observing the teamwork and intervened only occasionally to the meetings:

"Well they mostly sat there and made some notes. And sometimes they might step in and say something… Somehow the whole thing ended up being kind of outsider." - Team member

Due to this observation work, a couple of the team representatives suggested that in the future the facilitators could be used to evaluate the team performance at the end of the project. However, it is worth to notice that none of the facilitators stated that their job could also include the evaluation of the team.

Some team members described the facilitators as a process support. Since the facilitators were familiar with the product development process of the team, they gave some guidance to the project manager on how to carry out the project, without really interfering with the substance work. At times, facilitators acted as messengers and sometimes even take the role of a cheerleader, who

pushed and cheered the team to go forward. For example, one of the facilitators described a team meeting, in which she showed her support for the struggling team by stating that she was available to help if needed.

Finally, the facilitators could also take the role of a friend and sometimes even a sparring partner. If the project manager was not comfortable to confiding in any of his or her team members, he or she could rely on support of the facilitators and seek for their advice:

"Sometimes there are issues I cannot discuss with my team mates directly so I can have someone to get suggestions from and advice." - Project manager

The team members and the facilitators also emphasized the importance of close relationship between the facilitators and project managers. One of the facilitators told a story of how a discussion concerning the progress of the team ended up being a pep talk to the project manager. Afterwards, the project manager confessed that he now understood the value of process maps and how those would have benefitted the team already earlier. Since mutual trust had been built up, the facilitator was able to advise the project manager how to carry out the planning for the rest of the spring without being ignored.

In table 12 the findings concerning the facilitator's role are summarized.

Table 12 Facilitator's role

FACILITATOR'S ROLE		
SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
Defining the role	10	28
Clarity of the role	19	52
Different roles	20	20

In this category, the team representatives as well as the facilitators had paid attention to similar aspects. One of the most widely commented sub-categories, *clarity of the role*, was mentioned 52 times by the facilitators and 19 times by the team representatives. Especially, the facilitators had given a lot of thought to

the matter and how it affected their motivation to work with the team. Moreover, both the facilitators and the team representatives were able to list several roles the facilitators took during the project.

7.2.2 Activities of facilitation

This category presents how the facilitators played their role in practice. It describes the facilitation activities that were used and found helpful while working with the teams, as well as gives some suggestions of activities the facilitators could have engaged in. This category consists of the following subcategories: *coaching the project manager, bringing a objective perspective to the project, ensuring everyone is on the same page* and *suggesting virtual and other tools to enhance communications.*

The first subcategory, *coaching the project manager,* presents how the facilitators would interact with the project managers. First of all, since the facilitators were familiar with the teams, they could work as a sounding board and hence ensure that the project manager would be able to reflect:

> *"At least you can have someone who knows your situation and you can talk to them. Even though they cannot give you advice, it is good to talk to them."* - Project manager

However, at times the facilitators took more of an active role and gave practical advice on such topics as how to handle free riders and how to divide the team into subgroups. The suggestions could be quite straightforward like showing how to divide documentation work, or subtler as recommending to contact the course teachers if the situation did not change.

Furthermore, when the team was stuck with their project in one way or another, the facilitators could step in and help the team to find a new approach to the problem. These activities are grouped under subcategory: *Bringing an objective perspective to the project.*

"They had to come up with new concepts. Then we challenged them to think about the various objects you need to have in a concept. We put the whole thing into pieces. And then we started to think about different options for the objects and how you can get new concepts by combining different objects." – Facilitator

As outsiders, the facilitators were able to remind the team of the bigger picture and encouraged to approach the problems from a new perspective like described above. As a result, the team was more likely to find creative solutions to the challenges. Especially, the team representatives emphasized that the facilitators' objectivity and lack of responsibility concerning the substance of the project, brought clarity to the project.

As an objective party, the facilitators were able to pay attention to the activity of all the team members. By organizing workshops and encouraging everyone to talk during the sessions, the facilitators promoted an atmosphere that gave each member a possibility to work as a part of the team. One of the team representatives recalled a situation in which the facilitators had put the team to build paper bridges to enhance the teamwork skills:

"They were working with our team. They would give us a task like cut the problem into pieces… they paired us up and we'd make a paper bridge. Like we worked as a team. Not like one and one. It was the whole package." – Team member

These interventions that had nothing to do with the design challenge, proved to be crucial in order for the team to start working as one entity. However, some of the team representatives stated that the facilitators could have helped the team a bit more with forming tasks and figuring out how to delegate those within the team. Especially, integration of remote team members was mentioned quite often as a problem spot, and facilitation was seen as one possible solution for it in the future.

The subcategory, *ensuring everyone is on the same page,* presents how the facilitators tried to take care that all the team members knew what was going on:

"If I'd feel that something was not well communicated, I would always ask for confirmation" - Facilitator

One of the team representatives described how the facilitators organized a workshop after Christmas, in which the schedule for the spring and the roles were revised. In this way, the team managed to create the team rules again and start fresh the second half of the project. However, in some cases the team representatives wished that the facilitators had taken even a bigger role with ensuring that the team was on the same page:

"Would've been good to kind of know… to set up a bit earlier… So have facilitators or someone coming at some point and said… even just to have a session… yea like 'what are your motivations?' so yea then everyone could have been on the same page."
- Remote member

Also the facilitators stated that they could have taken more of an active role with helping the team to organize themselves as well as with making sure that the team understood what the sponsor was expecting from the project.

Finally, the subcategory *suggest virtual and other tools to enhance communications* gathers together activities that described how the facilitators suggested various practices or tools to enhance the collaboration within the team:

"We tried to emphasis that you should have the task lists somewhere where everyone can assess and check what was their responsibility." - Facilitator

As illustrated above, the facilitators provided ideas for how to organize and document the work by utilizing virtual tools as well as demonstrated how to use analog means as whiteboards during the meetings to document ideas. In addition, the facilitators reported attempts to push any kind of usage of visualizations as part of the communication of ideas, tasks, decisions and process to the rest of the team.

Moreover, some of the statements in this subcategory describe how in the beginning the facilitators' suggestions were ignored and it took until spring that the team started to use those tools previously introduced:

"I did not get it back then when I was selling them "hey here you have this thing and you can solve it like this" that I was trying to sell solutions to the problems that the team did not even know they had. " - Facilitator

One of the team members also described a situation, in which the facilitators had in the beginning of the year drawn a process map for the team with the idea "*how this should be done*". However, the team did not find map useful and thus did nothing accordingly.

The summary of the facilitation activities in new product development process is presented in table 13.

Table 13 The summary of facilitation activities

ACTIVITIES OF FACILITATION		
SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
Coaching the project manager	5	9
Bringing an objective perspective to the project	26	12
Ensuring everyone is on the same page	12	9
Suggesting virtual and other tools to enhance communications	13	32

When comparing the responses of the team representatives and facilitators, it seems that the focus has been on different aspects. The facilitators tended to

pay attention more to the concrete tools they tried to provide to the teams, while the team representatives emphasized more the intangible aspects such as bringing an objective perspective to the project. However, each of the sub-categories was acknowledged and commented by both parties.

7.2.3 Facilitation challenges

This category presents events and circumstances that slowed down the facilitators while they were working with the team. Within this category, three subcategories emerged: *lack of experience and context understanding, mismatch in team's facilitation needs and facilitators' expectations* and *detachment of the facilitators.*

The subcategory, *Lack of experience and context understanding*, describes how little most of the facilitators knew about the product development process before hand. This would affect the facilitators' ability to notice some of the key challenges the team faced. In addition, suggesting different tools to enhance the collaboration proved to be difficult at times, since the facilitators did not have previous experience of them. One of the representatives of a team described the lack of knowledge and experience like this:

"Well they (facilitators) did not know… those mistakes and problems. Or if it says at the lecture slides 'In teamwork there is usually problems in communication', you do not understand what it actually is. Only after you've done a project like this you actually realize what it means."

- Team member

Furthermore, it was also stated that without the expertise of the NPD process it was difficult for the facilitators to plan activities that would feel meaningful for the team and take the project forward. Also some of the facilitators described how they felt insecure and inexperienced when trying to fulfill their role as facilitators. One of the facilitators explained that she could not ask "*stupid questions*" even when it was intended to be her task. According to her, everyone else in the team seemed to be on a more advanced level and thus followed the

process better than her since she was not familiar enough with the details of the product.

The second subcategory presents the *mismatch in team's facilitation needs and facilitators' expectations.* The statements that described what hopes the facilitators had concerning their role in the project, were not aligned with the team's facilitation needs:

"I was expecting that I'd be in more active role in the whole show, taking the discussion further. Like that the project manager would be more the manager and then the facilitator would take the leadership role." - Facilitator

Like described above, some of the facilitators expected the facilitation to be more hands on work with solving conflicts or leading discussions. When the role turned out to have lots of passive characteristics like observing the teamwork, facilitators became frustrated and lost some of their motivation. Moreover, in one of the teams the situation turned upside down and the project manager was helping the facilitators to pass their course than the other way around. In this case the facilitators reached for her when their deadlines were approaching instead of trying to stay in touch throughout the process.

However, it is also worth to mentioning that not all the facilitators even had prior expectations of their role. In those cases, the idea of facilitation was based on the course introduction lectures.

Finally, the subcategory *detachment of the facilitators,* suggests that since the facilitators were not considered as part of the team, they were not always up to date with the difficulties the team was facing. It proved to be difficult for the facilitators to learn about the team and its dynamics without being in the same boat with the whole team. One of the project managers described the situation as follows:

"Well the biggest problem is that if they (facilitators) are not there always when the team is working --- they cannot really say what is the cause and what is the effect for any situation. Meaning that whose fault this is and what the individuals could improve and what is a communication problem." – Project manager

In addition, the facilitators felt that due to the structure of the PDP-course, the teams considered facilitators as their own group, who was detached from the rest of the team:

"It felt like that the people were sitting in a circle, doing their thing and we as facilitators were left outside of it. From there we then tried to poke the team to different directions."
- Facilitator

This subcategory contains also the statements that described the difficulties the facilitators had when trying to communicate with the team. For example, one facilitator explained how the project manager of their team was not too keen to work with them:

"I feel that they could have used us more, but the project manager was just stubborn. I think he was not ready to accept help at the beginning and then at the end he got frustrated since he had to do a lot. -- We offered our help, making agendas or anything, but he didn't take it" - Facilitator

However, the facilitators also stated, that if the goal of facilitation is only connected to conflict resolution, it would not be vital for the facilitators to feel like belonging to a specific team.

Table 14 summarizes the challenges the facilitators faced while working with the team.

Table 14 **Summary of the challenges in facilitation**

FACILITATION CHALLENGES		
SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
Lack of experience and context understanding	13	25
Mismatch in team's facilitation needs and facilitators' expectations	2	17
Detachment of the facilitators	17	29

Even though team representatives and facilitators were able to give examples of each of the categories, most of the challenges were reported by the facilitators. It seems that the team representatives were able to notice especially those challenges that were directly related to facilitation skills, but in most cases they were not able to see the mismatch between the facilitators expectations and the team's facilitation needs. However, most of the challenges mentioned by both parties related to the detachment of the facilitators and how not being part of the team affected the facilitators' work in a negative way.

7.3 Conclusion

In this study, two classes, *facilitation needs of global interdisciplinary teams* and *process facilitation in new product development,* were identified. Both of the classes were divided into three categories, which consisted of three to six sub-categories. The findings concerning the facilitation needs are summarized in Table 15. It is worth to noticing that overall, both facilitators and team members were able to identify various facilitation needs of the team, however there is a slight difference in emphasis. As the team members reported needs that were related to the intangible aspects of teamwork such as the *level of commitment*, the facilitators focused more on how the team structured their work.

Table 15 **Summary of the facilitation needs in global interdisciplinary teams**

FACILITATION NEEDS OF GLOBAL INTERDISCIPLINARY TEAMS			
	SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
TEAM DYNAMICS	Level of commitment	17	
	Project manager's authority	11	1
	Capabilities and characteristics of team members	1	8
COMMUNICATION CHALLENGES	Unawareness of project status	11	
	Inadequate knowledge flows	7	1
	Reconciliation of time zones and cultures	4	3
	Inappropriate virtual platforms and tools	6	4
	Lack of sponsor involvement	5	1
	Lack of common language		11
PROJECT PROGRESS	Clarity of the project goal	12	6
	Clarity of roles and responsibilities	13	16
	Lack of structure	8	22
	Inefficient decision-making	11	9
TOTAL		106	82

The results regarding the process facilitation in NPD context are reviewed in Table 16. Within this class, both team members and facilitators identified each of the subcategories. However, when comparing the total number of mentions within this class, it can be noticed that the facilitators had almost the double of the amount of statements than the team members. In addition, it seems that the *clarity of the facilitator's role* was the most commented sub-category in this whole study.

Table 16 **Summary of the process facilitation in new product development**

PROCESS FACILITATION IN NEW PRODUCT DEVELOPMENT			
	SUBCATEGORY	MENTIONED BY TEAM	MENTIONED BY FACILITATORS
FACILITATOR'S ROLE	Defining the role	10	28
	Clarity of the role	19	52
	Different roles	20	20
ACTIVITIES OF FACILITATION	Coaching the project manager	5	9
	Bringing an objective perspective to the project	26	12
	Ensuring everyone is on the same page	12	9
	Suggesting virtual and other tools to enhance communications	13	32
FACILITATION CHALLENGES	Lack of experience and context understanding	13	25
	Mismatch in team's facilitation needs and facilitators' expectations	2	17
	Detachment of the facilitators	17	29
TOTAL		137	233

Part IV Discussion and conclusions

In this section, the results of the study are discussed (8), after which the practical and theoretical implications as well as the future research (9) are identified and the evaluation of the study is conducted (10). The conclusions of the study are presented in chapter 11.

8. Discussion

In this study, the aim was to learn the process facilitation needs of a global interdisciplinary team and to identify main process facilitation activities in continuous new product development process. The research was limited to a university education context. The two research questions presented for this study were:

RQ1: *What are the requirements and the role of facilitator in long-term process facilitation?*

RQ2: *What are the process facilitation needs of global interdisciplinary team in NPD context?*

Therefore, the main focus of this study was to reveal the potential of process facilitation in supporting global interdisciplinary teams with their product development quests. Table 17 combines the empirical findings concerning the needs of the teams and the facilitation activities to the success factors and facilitator's competencies discussed previously in the literature review (see chapter 5). When conducting a careful examination of the findings, it seems that the team needs that rose during the analysis are in alignment with the critical success factors of the global interdisciplinary teams, as are the facilitation activities with the facilitator's competences. There were, however, clear differences (e.g within the identified facilitation needs and facilitation activities) between the perspectives of the product development teams and those of the facilitators.

Table 17 Comparison of the team needs and facilitation activities

CATEGORY	TEAM NEED (EMPIRIA)	SUCCESS FACTOR (THEORY)	FACILITATOR'S COMPENTENCIES (THEORY)	FACILITATION ACTIVITIES (EMPIRIA)
TEAM	Level of commitment	Mutual respect/trust Team cohesiveness	Encourage trust and neutrality Encourage optimism and enthusiasm	
	Project manager's authority	Team leader selection Team leader skills and vision	Facilitate group conflict Demonstrate behaviors that support team values and processes	Coaching the project manager
	Capabilities and characteristics of team members	Right functional mix	Facilitate group self-awareness Honor and recognize diversity enduring inclusiveness	
COMMUNICATION	Unawareness of project status	Sharing and use of uncertain information		Ensuring everyone is on the same page
	Inadequate knowledge flows	Reconciliation of time zones and cultures	Demonstrate effective interpersonal communication skills	
	Reconciliation of time zones and cultures	Set meeting schedules and rules of engagement Exhibit cultural awareness		
	Inappropriate virtual platforms and tools	Boundary management Utilize multiple computer mediated communication systems (CMCS)	Teach the client team the appropriate skills, tools and techniques for effective meetings	Suggesting virtual and other tools to enhance communications
	Lack of sponsor involvement		Assess/evaluate client satisfaction	
	Lack of common language			
PROCESS	Clarity of the project goal	Set clear team goals and provide continuous performance feedback	Guide the group to consensus and desired outcomes	
	Clarity of roles and responsibilities	Clear roles and responsibilities	Evoke group creativity, blending all learning and thinking styles	
	Lack of structure Inefficient decision-making	Formal yet flexible integrative processes	Guide the group with clear methods and processes	Bringing an objective perspective and creativity to the process
			Ask in-depth questions of the group participants Employ multi-sensory processes	
				Establishing the role as a facilitator

Indeed, even though the observed needs and activities fitted nicely with the theoretical frame of the success factors and competencies, the results presented in this study indicate that the collaboration did not yield as great results as could be expected. It seems that there were especially two key challenges concerning the facilitator's role, *identifying team needs* and *transferring results,* both suggesting a need to transform the role of the process facilitator in order to provide better support for the teams.

8.1 Key facilitation needs of a global interdisciplinary team

The first indications of difficulties in identifying team needs can be seen when studying the class of *facilitation needs of global interdisciplinary teams.* Even though most of the sub-categories within this class were mentioned by both parties, the difference in emphasis is clear: the team representatives reported more of the needs related to the hidden or intangible aspects such as *level of commitment* and *unawareness of the project status*, where the facilitators paid attention to matters that were more visible and concrete like the *lack of structure* or *lack of common language.* As a result, it seems that the team members and the facilitators identified different needs. The same phenomena was repeated in reports of the *detachment of the facilitators*, stating that since the facilitators were actually not part of the team, they could never be fully aware of those most pressing team needs, even when carefully observing the team.

The second key challenge, which came through from the data, especially in the class *process facilitation in new product development*, concerned the transfer of results. In recent literature the *transfer* or the *implementation* -phase has been acknowledged as an important part of the facilitation process, in which the results of an intervention are followed up thoroughly (Wardale 2013). Unfortunately, during the data analysis it became clear that in practice this phase is still missing, which created challenges for the alignment of *facilitation activities* and *facilitation needs of the team* as well as for the *clarity of the facilitator's role* and *facilitator's expectations*. Especially, the novice facilitators struggled with understanding their role and thus their expectations did not

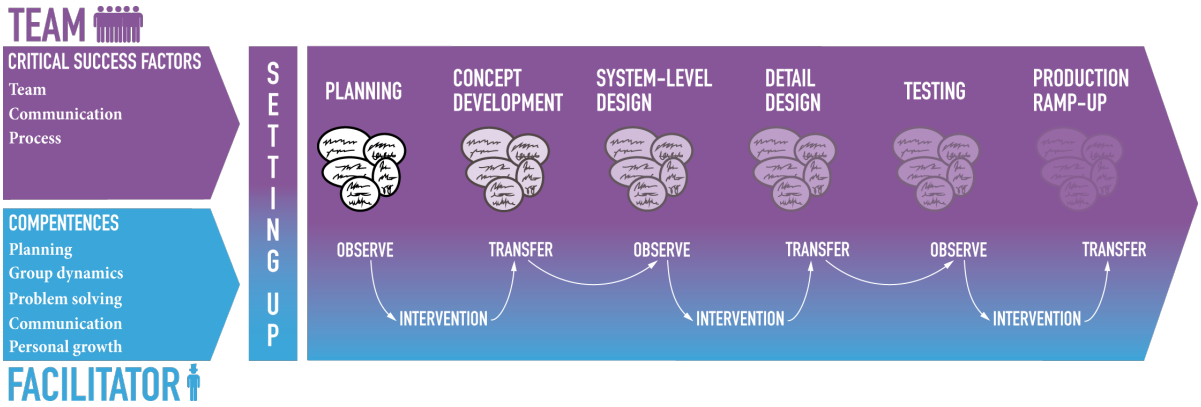
meet with the needs of the project. As a result the motivation to contribute to the project was compromised. On the other hand, the team representatives also had difficulties in recognizing the value of facilitation and thus overlooked some of the suggestions made by the facilitators. For example, the team ignored the tools for mapping the team's process due to the lack of understanding the importance of having such visual guides for the work.

It seems that when engaging in such long-term facilitation process, the requirements for the role of the facilitators may change. Therefore, the theoretical framework presented at the end of literature review (see chapter 5) has been revised to take into account the empirical findings.

8.2 Modified framework for process facilitation in NPD process

In the early framework NPD and process facilitation were portrayed as separate processes with not too many connection points (see chapter 5). The framework emphasized the neutrality of the facilitators by placing them outside of the team. The relationship between the facilitators and the team was short-term, intervention driven and the team was considered as a receiving partner throughout the collaboration. After the data analysis the framework was modified (see Figure 4) to illustrate the importance of perceiving the collaboration as an agile learning process. Therefore, the NPD and process facilitation -processes are brought closer to each other, a formal setting up – stage is added and the phases in process facilitation are re-named and – arranged. As a result, the facilitation process consists of three steps, which are repeated throughout the process: *Observing* step leads to identifying the team needs together with the team, during the *intervention* step action is taken to answer to the identified needs and finally the *transfer* step illustrates how the results of the previous step have affected the teamwork and how to prepare for the next round.

Figure 4 Modified framework for process facilitation in NPD context



The modified framework in Figure 4 suggests that by uniting the process facilitators and teams, the facilitators would have a flexible access to observing and interacting with the team. As the process moves forward the facilitators learn to know the team better and thus can identify the most troublesome spots within teamwork. At the same time, the team members are brought closer to the facilitation process, which should also encourage them to bring forth their fears and thoughts of the facilitation needs.

Emphasis is also placed on the *setting up* stage, since it defines how the collaboration between the facilitators and the team is going to be carried out throughout the project. During this phase the role of the process facilitator, the objectives of the collaboration, and the common ways of working are established. This stage is essential when tackling the issues related to clarifying the role of the facilitators and reducing the other facilitation challenges, which were identified during the data analysis. Therefore, the goal of this stage is to ensure that all of the participants are on the same page and understand the opportunities as well as the limitations of the process facilitation. As a result the collaboration should be meaningful for all parties straight from the beginning

In addition, the modified framework also perceives the *transfer -phase* as one of the key elements in the collaboration. Since it seems that in long-term process facilitation one of the key motivational factors is to learn how the facilitation relates to the project progress, the framework suggests that both facilitators and team members engage in reflective work after each larger *intervention*, in

order to share the understanding concerning each other's work. This regular reflective work helps everyone to see how the project moves forward with the help of facilitators and therefore pointing out the added value from process facilitation. The transfer phase is a perfect spot for evaluating the usefulness of the facilitation, redirecting the focus of the facilitation to the real needs that the team has and thus ensures that the next iteration of the facilitation process is even more successful. As a result, the whole collaboration transforms into an agile learning process, in which both the facilitators and the team members are allowed to learn from the past experiences, and thus they are able to shape the future facilitation activities to fit better to the team needs.

8.3 Implications of modified framework for process facilitation

The effects of these modifications may be far reaching. By uniting the process facilitators and teams as well as establishing a clear setting up stage for the collaboration, issues related to the facilitator's *lack of experience and context understanding*, may be directly solved. The literature presents a number of facilitation capabilities, which are seen as an essential part of the process facilitation (McFadzean 2002b). Also it has been argued that the facilitators do not need to be familiar with the context in order to facilitate the process (Rasmussen 2003). However, in this study most of the participating facilitators were novices and thus lacked many of the facilitation capabilities as well as the knowledge related to the NPD process. Giving practical tips without previous experience in product development and therefore not understanding the process or the product, proved to be difficult. The facilitators reported that when they could not keep up with the newest developments of the product, it became almost impossible to know if the team members were still on the same page or not. Thus, if considered as part of the team, these practicing facilitators would gain more information of the team without enormous effort and have more authority within the team, which might compensate the lack of other related skills. This could also alleviate to the motivational problems the facilitators faced, since their input would also be evaluated as part of the team's success.

Moreover, establishing a setting up stage and paying attention to the transfer phase, may improve the *clarity of the facilitators' role*, which was one of the widely commented topics in this study. For the majority of both parties, facilitators and team representatives, the responsibilities of facilitators were not clear from the beginning. Since the teams had no previous experience of working with facilitators, they had difficulties asking for their guidance. On the other hand, most of the facilitators were equally first timers and thus also lacked the understanding of how to contribute to the project in a proper manner. It seems that in such long-term NPD projects, without proper understanding of the roles in the beginning, the facilitation activities are not fully supported and thus learning from the previous interventions does not happen. It is also possible that if the roles are not clear, the line between a project manager and a facilitator may become blurred when the project matures. Therefore, to ensure understanding of the roles during the whole project, a well-thought setting up stage should be seen as a pre-requirement as well as reserving time for giving feedback and reflecting during the transfer phase.

However, when making these modifications to the framework, the question of facilitator neutrality rises. Although considered as a key aspect of process facilitation in the literature (Rasmussen 2003, Schwarz 2002), it can be argued, that since the characteristics of NPD projects include such aspects as interdisciplinary approach (McDonough 2000, Holland et al. 2000), creative problem-solving (Matthew and Sternberg 2006) and various phases with distinct needs (see e.g. Koen et al. 2002), the demands for neutrality in NPD context may be diverse. The diversity and novelty create ambiguity and constructive conflict within the process, which is needed for innovative work (Brun and Steinar Sætre 2009, Bassett-Jones 2005). Therefore, it is important to create an environment, in which the team members are able to openly communicate doubts and ideas (Edmondson 1999, West 2002). This kind of feeling of psychological safety has been identified as a key aspect in designing new products (Edmondson 1999) and thus the team members need to be able to perceive the facilitators as part of this environment as well. Indeed, it seems

that engaging in such a long-term NPD process affects the role of the facilitator. Instead of remaining distant for the sake of neutrality, the facilitator may have to integrate to the team for certain extent in order to not to be easily ignored. As a result, finding the right balance between objectivity and team memberships becomes crucial.

In conclusion, the modified framework for fitting process facilitation into new product development suggests that the two processes that previously were pictured as separate ones are united, illustrating how it truly should be collaborative work and not just a joint project. Instead of the facilitators giving input every now and then, the modified framework suggests a more bi-directional and constant relationship, with the team taking a stronger part in the facilitation process and providing input especially during the transfer phase. The framework also has a clear setting up stage, which integrates the facilitators to be part of the team and sets the rules for working.

9. Implications

9.1. Practical implications

The practical objective of this study was to provide a starting point for utilizing process facilitation as a supporting function for global interdisciplinary teams in the context of new product development. The practical implications of this study should apply to both new product developers and facilitators. The framework, suggested in this study, aims to help with setting up and running such collaboration in a way that is valuable for the both parties.

The framework illustrates how the process facilitators are united with the global interdisciplinary team and in which phases the interaction between the parties is essential. Emphasis is given especially to the setting up and transfer phases, since those can potentially fix the challenges related to the identification of team needs and perceiving the value of process facilitation, which were found to be the two major hindrances in this study. As a result, the framework can be utilized as a map, which guides the user around the most common pitfalls. However, it can also be used as a preparation tool, since it gives an outline for the process and reminds of the aspects that should be settled before hand.

Furthermore, the results of this study can also be utilized when explaining the NPD context for the novice facilitators who are lacking the experience of facilitating such projects. The identified challenges the global interdisciplinary teams faced during their product development projects could be used as guidance for observing and identifying facilitation needs of the team. Moreover, this study presents how the facilitator capabilities found in the previous research can be combined with the success criteria of the global interdisciplinary teams, and therefore may help the novice facilitators to better understand their role in relation to the facilitation needs of the team.

9.2. Theoretical implications and future research

The aim of this study was to provide insight on what are requirements and the role of facilitator in long-term process facilitation of the new product development process. This study suggested a framework for process facilitation in supporting global interdisciplinary teamwork in new product development context.

In this framework the process facilitators were integrated to the NPD process to ease the team's product development journey. The previous research has emphasized that a facilitator should not be perceived as part of the team, since the neutrality and objectivity of the facilitator are then compromised (Rasmussen 2003, Schwarz 2002). However, this study suggests that having the facilitation and NPD process concerned as separate entities creates challenges in identifying the real facilitation needs of a team and thus the facilitation activities are not seen as a valuable part of the project. Since the results are not consistent with the suggestions of the literature on this matter, it might be valuable to study how the balance between neutrality and being part of the team, could be obtained, and if the difference is due to the educational setting in which this study was conducted.

The results of the study indicate that due to the longtime involvement of the facilitators, the process needs to have continuity in order to keep the motivation level of all the participants up. The framework suggests that the collaboration between the facilitators and team should be seen as an agile learning process, in which the results of facilitation are made tangible for all the participants during the transfer phase and used as starting point for the next rotation. Thus, the results of this study confirm the findings of Wardale (2013) concerning the importance of transfer phase in process facilitation, and how facilitation should be considered as a process through time and not only as an one-off event.

Since the framework is based on literature review and empirical data from five product development projects conducted in university setting, further research should be placed to test and elaborate the framework in various contexts, with

multiply teams and several researchers. It would be especially important to conduct a similar study in an industry setting with various new product development projects and with both skilled and novice facilitators. Furthermore, it might be interesting to conduct the research as a longitudinal study and interview the participants in different phases of the project, in order to get a better view to the topic.

In future, it would also be interesting to make a comparison of the facilitators' and project managers' role in these long-term projects, in which both are involved for the majority of the time. In this study, there were signs that these two roles have a lot of similarities and that in most cases the project manager takes care of the "everyday" facilitation activities. This led to questioning the amount of authority the facilitators should posses in order to have an impact to the team and carry out their job as successfully as possible. Thus it would make sense to define the role of the facilitator in long-term project context.

Finally, during the study it also became obvious that the effect of facilitation is difficult to measure. A successful product development project consists of numerous variables and being able to determine, which part of the success was due to facilitation is hard. Hence it would be important to create a tool that helps to evaluate the performance of facilitation and thus either confirm or bust the benefits of facilitation in product development process.

10. Evaluation and limitations of study

In this study, data collection and analysis followed the qualitative research approach (Creswell 2014). In order to evaluate the qualitative work Guba and Lincoln (1989) suggested four criteria: *credibility, transferability, dependability and confirmability.* In the following this study is evaluated in the terms of these criteria.

According to Guba and Lincoln (1989) the criteria of credibility refers to the truthfulness or the trustworthiness of the findings. In order to increase the probability of establishing credibility of the study various techniques such as *prolonged engagement, peer debriefing* and *member checks* are recommended. In this study, the researcher has spent a sufficient time within the research context by being part of the PDP -course, both as a course participant and as a teaching assistant, and familiarizing herself with the GVCP-course teachers and students. Thus it can be stated that the technique of prolonged engagement has been utilized in this study and therefore the researcher was able to understand the context, build trust with the participants and thus overcome the effects of possible misinformation (Guba and Lincoln 1989). The researcher also engaged herself with the peer debriefing, in which through explain the categorizations and results, the researcher was able to find any bias and assumptions that might have affected the data analysis (Guba and Lincoln 1989). The data used in this study presents multiple perspectives (facilitators and various team members), which also influences the trustworthiness of the results. Since the data is not limited to one viewpoint, it provides a holistic overview to the whole process and the credibility of the study is increased.

The second criterion in evaluating qualitative research, transferability, discusses how well the findings of a particular research can be applied to other situations (Guba and Lincoln 1989). However, it is always relative and depends largely on how much there is overlapping in different circumstances (Guba and Lincoln 1989). The only way to ensure transferability is to provide a *thick*

description, in which the researcher provides as *"extensive and careful description of the time, the place, the context, the culture"* to which the findings of the study related (Guba and Lincoln 1989). The aim is to ensure that anyone who wants to apply the study to other situations is able to make the judgments if it is transferable or not (Guba and Lincoln 1989). In this study, the researcher aimed to describe the research project in dept. In the first chapter, the context of the research and the research approach (1.4) are presented. The methodology including the project descriptions, data analysis and data collection are illustrated in chapter 6. The results are described by using extracts to support the analysis made by researcher and those are presented in the chapter 7. The limitations of the study are also presented as part of the evaluation chapter (10).

The third criterion, dependability, refers to the consistency of the findings and repeatability of the study (Guba and Lincoln 1989). Therefore, dependability suggests that the process and the decisions made during the study are somehow available for outside review. This way the reviewer can examine and understand the factors that lead the researcher to certain interpretations (Guba and Lincoln 1989). Guba and Lincoln (1989) recommend the technique of *dependability audit*, in which the process and method decisions are exposed for external review. In this study, all the changes concerning the process and decisions were discussed with the instructure of the thesis in order to gain dependability for the study. In addition, the process was presented to fellow master's thesis writers twice during the project, were it was also reviewed by the supervisor of the thesis.

The final criterion, confirmability, refers to the reliability of the findings and thus examines the degree to which the researcher's interests affect the results (Guba and Lincoln 1989). According to Guba and Lincoln the confirmability of the study can be evaluated by tracking the data to its sources and that the logic behind the interpretations is coherent and leads back to the data (Guba and Lincoln 1989). The technique to evaluate this particular criterion is called *confirmability audit* (Guba and Lincoln 1989). In this study the analysis process

was conducted systematically by following the data analysis process described by Lichtman (2013). The raw data was transcribed and coded accordingly. The categorizations were formed as an iterative process in which the instructor was presented the findings in between the rounds. The final categorization was also validated by a peer reviewer and the results of this study are supported by providing extracts from the data.

In addition, it is possible to identify some *limitations* concerning this study. The data was gathered retrospectively after the product development projects were already finished and as a result some of the participants were not able to recall all the events happened during the year that might have had some importance for the research. Since the study was conducted in a university setting and the collaboration of facilitators and product developers was tried out for the first time, some of the confusion described by the participants may actually be caused by the piloting nature of the cooperation. However, in qualitative studies it is not possible to separate the research objectives from the world around them. A further limitation is posed by the amount of data. In this research 11 interviews were conducted, out of which five were facilitator pair interviews and rest six consisted of team members interviews. Out of the five projects studied in this research, one team did not have any representatives taking part to the interviews. The roles of the participants in the project also differed and not everyone had as much of experience of the topic as others. Also due to the semi-structured interview format, the emphasis of each interview was a bit different, which may have affected to the results as also the researcher's inexperience of conducting interviews may have done. However, the utilization of several sources from different perspectives (facilitators, project managers, local team members and remote team members) and rigorous analysis enhance the reliability of the obtained results.

11. Conclusions

The aim of this study was to identify the facilitation needs of the global interdisciplinary teams, and to outline the requirements and the role of facilitator in long-term process facilitation in new product development context. The research revealed that in chaotic, prolonged NPD process, the short-term intervention driven facilitation model, in which the focus is on preparing and conducting a one-off event, was not sufficient enough to meet the needs of the global interdisciplinary teams. As a result, two key challenges, *identifying team needs* and *transferring intervention results*, were identified to hinder the process facilitators from supporting the teams in best possible way. Indeed it seems that when engaging in such long-term facilitation process, the requirements for the role of the facilitator changes. As a solution, this study presented a framework, which emphasis the setting up of the collaboration, integration of facilitators to the team and the importance of agile learning process through the transfer-phase.

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1. Background
- Major
- The **motivation** to participate the PDP class

2. The beginning of a project
- How did your project start out? General feelings (easy question to get on the mood)

- **When** did you get to know that you are going to have facilitators? How did you feel about it?

-How did you picture the role of an facilitator at the beginning? What were your **expectations**?

-How & when did the facilitators step into the project?

-What kind of **challenges** did your team face during this phase?

-Did the **facilitators help** your team to solve these issues? If so, how? If not, why?

-**With whom** did the facilitators work within this phase?

-How did the **team feel** about the facilitation at this point? What kind of boundary object were used?

-How about other used tools and platforms?

PDP

3. After Christmas break
- How did your project start again after Christmas break?

- In which part of the **design process** was your team?

-What kind of **plan** did you have for this period?

- What kind of **challenge**s did your team face during this phase?

- Did the **facilitators/staff help** your team to solve these issues? If so, how? If not, why?

- **With whom** did the facilitators work within this phase?

-- How did the **team feel** about the facilitation at this point? ? What kind of boundary object were used?

-How about other used tools and platforms?

4. General feelings of the collaboration
- How did the facilitation **fill your expectations**?

- What kind of **challenges** did you have **with the facilitators**?

- Did you find the **facilitation helpful** in general? If so, how? If not, why?

- Would you **recommend** facilitators also for the other teams?

- How would you **develop** the collaboration of these classes further?

- What did you **learn** from the collaboration with the facilitators?

- What kind of activities made you **"inspired"** /your team? Was it a person? Was it contagious?

4. General feelings of the collaboration
- How did the collaboration with the PDP-team fill your expectations?

- What kind of challenges did you face as a facilitator?

- Did you find your work to be helpful for the PDP-teams? If so, how? If not, why?

- How could the facilitators also help those teams that are not assigned with a facilitator?

- How would you develop the collaboration further?

- What did you learn from the collaboration with the PDP-team? What did you learn from facilitation in general?

1. Background
- Major
- The **motivation** to participate the GVCP class

GVCP

2. The beginning of a project
- How did the collaboration with your PDP-team start out?

- When did you **meet** your team **first time**? How did they take you (welcoming etc)?

-How did you picture your role as an facilitator at the beginning? What were your **expectations**?

- What kind of **challenges** did the **PDP-team** face during this phase?

- Were you able to **help** your PDP-team to solve these issues? If so, how? If not, why?

- **With whom** did you work within this phase? Why?

-Would you do something **differently** now if you could? What? How?

-What kind of boundary object were used?

-How about other used tools and platforms?

3. After Christmas break
- How did the PDP-team start working after Christmas break? Did they need **additional help** to start working again?

- Did the team follow any **design process** at this point? If so, how? If not, why?

-What kind of **facilitation plan** did you have for this period? How affective was it?

- What kind of **challenges** did the PDP-team face during this phase?

- Were you able to **help** your PDP-team to solve these issues? If so, how? If not, why?

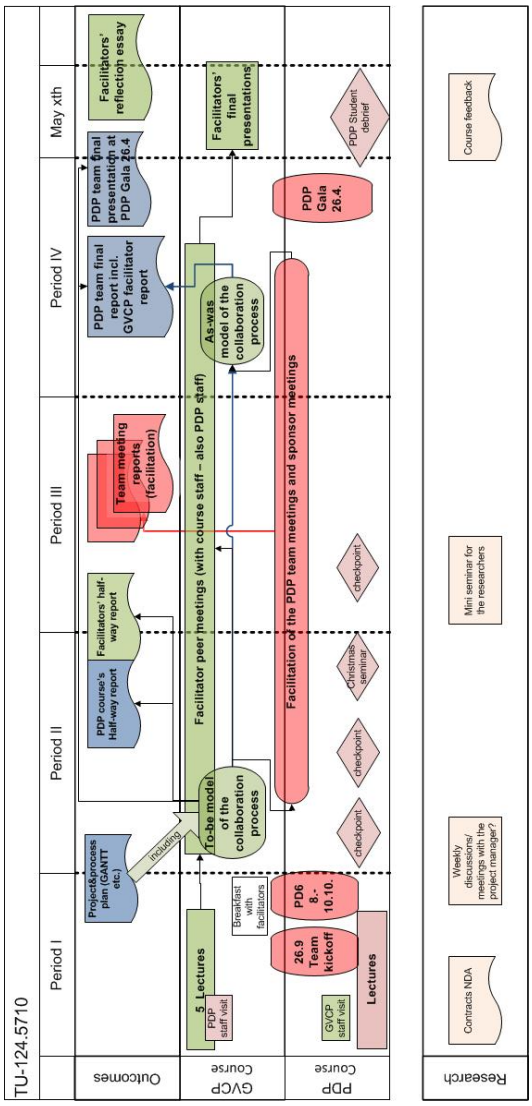
-With whom did you work within this phase? Why?

-What kind of boundary object were used?
- How about other used tools and platforms?

-Would you do something **differently** now if you could? What? How?

Appendix 2

Global Virtual Collaboration Project 2012-13 process map (GVCP 2014)



Product Development Project 2012-13 timeline
(PDP 2014)