



TAMPEREEN TEKNILLINEN YLIOPISTO

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BUSINESS MODEL INNOVATION IN PRODUCT-SERVICE SYSTEMS

Master's thesis

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## ABSTRACT

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Transformation from product oriented to more service oriented business models has been observed to create various advantages for companies especially in current competitive situation, where competition with price is pressing the profit margins down. Without proper knowledge on how business models are created, particularly in product-service systems context, this transformation can be difficult or even make or break the company. Furthermore, the literature considering business models for product service systems is still rather uncommon. Thus this study aimed at shedding light on business model creation process in practice, describing what role an external researcher can have in this process and mapping the situation and attitudes towards services in engineering workshops.

This study was implemented as multi-method qualitative research and single case study, which focused on the case company's business model creation process. In data collection of the study, observations of the case company's process of creating business model were made. In addition, the interview study in engineering workshops was used to map the current situation of product-service systems in these traditionally product oriented companies. Moreover, the observations were used to illustrate external researcher's role in case company's business model creation process. The literature review described development of product-service systems and business model creation, taking also in consideration the construction industry context. It covered, furthermore, consultant client relationship and its characteristics.

Based on this research it may be said that the process of business model creation in case company revolved around similar issues as it does in the current literature, such as market segmentation and customer analysis. On the other hand, the process in the case company had not quite reached the business model described in the literature when data collection for this thesis ended. It remained more on business planning level. Additionally, research supported the views in which there is place for competitor element in business model framework. This study also supports earlier views; traditionally product oriented engineering workshops are still, according to this study, clearly more product than service oriented. There are clear differences in how these companies see overall service and how they view services in their companies, but in general workshops seemed to be rather close to each other at the assembly or system integrator stage. Considering researcher's role in project several similar challenges and advantages in cooperation have been recognized as in the current literature. Information flow and mutual trust are observed to be extremely important, and careful consideration on how to use an external researcher is deemed valuable.

## TIIVISTELMÄ

TAMPEREEN TEKNILLINEN YLIOPISTO

Tuotantotalouden koulutusohjelma

**VAITTINEN, EIJA:** Liiketoimintamallien innovointi tuotepalvelujärjestelmille

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Muutoksen tuotekeskeisistä lähemmäs palvelukeskeisiä liiketoimintamalleja on todettu tuovan useita hyötyjä yrityksille erityisesti nykyisessä kilpailutilanteessa, jossa hintakilpailu pienentää tuottomarginaaleja. Ilman tietoa liiketoimintamallien luomisesta, erityisesti tuotepalvelujärjestelmien tapauksessa, tällainen muutos on vaikea ja voi osoittautua kohtalokkaaksi yritykselle. Tuotepalvelujärjestelmien liiketoimintamalleja käsittelevä kirjallisuus on kuitenkin vielä kohtalaisen vähäistä. Tämän takia tutkimuksessa pyrittiin avaamaan liiketoimintamallin luomisprosessia käytännössä yrityksessä, kuvaamaan sitä millainen ulkopuolisen tutkijan rooli voi olla tässä prosessissa ja kartoittamaan konepajojen käyttämiä palveluita ja niihin asennoitumista.

Tutkimus toteutettiin kvalitatiivisena monimetoditutkimuksena ja yhden tapauksen tutkimuksella, joka keskittyi yrityksen liiketoimintamallin luomisprosessiin. Aineiston keräysvaiheessa havainnoiteja käytettiin yrityksen liiketoimintamallin luomisprosessin seuraamiseen. Lisäksi niitä hyödynnettiin kun tarkasteltiin tutkijan roolia yrityksen prosessissa. Palveluiden ja tuotepalvelujärjestelmien tilaa konepajoissa taas kartoitettiin haastatteluilla. Kirjallisuuskatsaus keskittyi tuotepalvelujärjestelmien kehittämiseen ja liiketoimintamalleihin, ottaen huomioon myös rakennustoimialan kontekstin. Lisäksi kirjallisuuskatsaus tarkasteli konsulttien ja asiakkaiden välistä suhdetta ja sen ominaispiirteitä.

Tämän tutkimuksen perusteella voidaan todeta, että yrityksen liiketoimintamallin luomisprosessi keskittyi pitkälti samanlaisiin teemoihin kuin prosessit tämän hetkessä aihetta käsittelevässä kirjallisuudessa. Tällaisia ovat esimerkiksi markkinoiden segmentointi ja asiakasanalyysit. Toisaalta voidaan todeta, että kun aineiston keruu tätä työtä varten oli tehty, yrityksen prosessi ei ollut vielä saavuttanut liiketoimintamallin määrittelyn kuvaamaa tilaa, vaan oli pikemminkin liiketoimintasuunnittelun tasolla. Tutkimus myös tuki kilpailijaelementin sisällyttämistä liiketoimintamallin viitekehykseen. Perinteisesti tuotekeskeisinä pidetyt konepajat ovat myös tämän tutkimuksen mukaan enemmän tuote- kuin palvelukeskeisiä. Kokonaisuutta tarkasteltaessa konepajat vaikuttivat olevan lähellä toisiaan valmistajan tai systeemien integraattorin roolissa, mutta lähemmin tarkasteltuna konepajojen välillä oli suuria eroja palveluiden hyödyntämisessä ja niihin suhtautumisessa. Ulkopuolisen tutkijan roolia tarkasteltaessa tutkimuksessa löydettiin useita yhteistyöhön liittyviä samankaltaisia haasteita ja hyötyjä, joita on tunnistettu myös kirjallisuudessa. Erityisesti informaation kulku ja molemminpuolinen luottamus havaittiin merkittäviksi tekijöiksi. Lisäksi tarkka harkinta siinä, mihin tutkijaa käytetään, todettiin tärkeäksi.

## PREFACE

Now that this thesis is finished it feels good to look back. There were ups and downs during this project and there are many people I owe thanks for helping and supporting me in this. Firstly I wish to thank Miia Martinsuo who was my examiner and instructor during this process and who gave me useful tips and guided me through difficulties that I faced during the creation of my thesis. I would also like to thank Sanna Nenonen for being the second examiner in my thesis and helping me in the process. Furthermore, I wish to thank case company's representatives for successful cooperation and my fellow researchers in TUT for support and valuable discussions. I would also like to thank Otto Thitz for feedback from earlier versions and Lassi Pohjoisvirta for his support and feedback from my whole Master's thesis.

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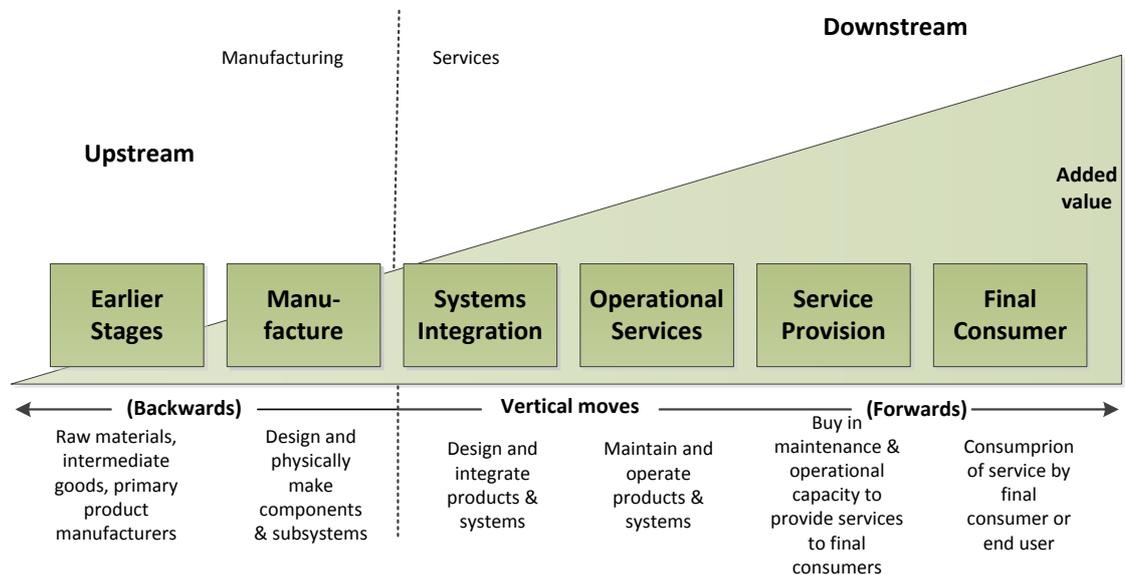
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**ABBREVIATIONS***BM**Business model**PFI**Private finance initiative**PSS**Product service system*

# 1 INTRODUCTION

## 1.1 Background

Product-service system (PSS) is a combination of products and services that are integrated to better fulfill specific demand of customers (Manzini & Vezzoli 2003). Cook et al. (2006) have noted that customers are increasingly interested in buying results instead of buying products. Positive outcomes, such as competitive advantages, environmental benefits, and cost reductions, are associated with moving into PSS (Baines et al. 2007). Thus, it is a common advice that product centric companies should move towards providing their customers not only products but also services and solutions (Aurich et al. 2010). This can also be seen as moving from raw materials production towards services for final customers. Davies's (2004) version of this capital goods value stream from early products to services is presented in Figure 1. It has been noted, on the other hand, that these earlier mentioned benefits do not automatically follow from the transformation to PSS system provider (Cook et al. 2006 tarkista lahde).



**Figure 1:** The capital goods value stream (Adapted from Davies 2004)

Still, there is little understanding about and advice on how to transform from product centric strategy to product-service system strategy (Martinez et al. 2009) or how to design new PSSs (Clayton et al. 2012) in the current literature. Additionally, the necessary methodology for spreading the PSS concept from academics to industry is lacking and

factors that enable a successful implementation of transformation to PSS are not identified in the literature (Cook et al. 2006). Sakao et al. (2009), in contrast, have emphasized how industries are creating and providing PSSs even though research on the outcomes of PSS development is not available in systematized form yet; current practice is more advanced than the research. Hence, it is important to study how in practice companies create new PSSs and how this creation can be supported by people outside these companies.

Business model can be defined as a simplified way to explain how companies create value (Aurich et al. 2010). These are explained to bring for example competitive advantage for companies when used properly (Shafer et al. 2005) and thus the understanding of these is important also in PSS context. There are several different definitions for business models and differing opinions on what the important elements in the business models are (Kujala et al. 2010) but still business models in PSS context are researched rather scarcely (Palo & Tähtinen 2011). To be able to fully utilize business models in PSS creation there is a need for more research on business models, especially in this context.

The study used in this Master's thesis is carried out as a part of Service Business Capabilities project, which is part of FIMECC's Future industrial services (FUTIS) –research program, funded by Tekes, research institutes and companies. It focuses on the development of the case company's business and the area of research has been chosen according to their interests. The emphasis is on creating new business model for enhanced material that has not been widely used in construction business but in which case company sees potential to become a competitive advantage in the future. Furthermore, different possibilities to use this material are considered, not forgetting the services that are needed to take this material into market and give it possibility to be successful there. Thus, the aim is to investigate PSSs and their business models.

## **1.2 Research questions**

This study concentrates more on researcher's experience during the business model creation process than on the results that the process created. Its object is to find out how open-minded product centric organizations are when considering services and especially product-service systems and to figure out how in practice company goes on with business model creation process. In addition, research aims at finding out what is the state of some product centric organizations now, when considering service business and observe the atmosphere and attitudes towards product service systems in companies.

As a result of this study, an example of business model creation process used in practice is presented and how it fits in when compared to current literature is described. In addition, the state of the product-service systems offered by a few Finnish engineering

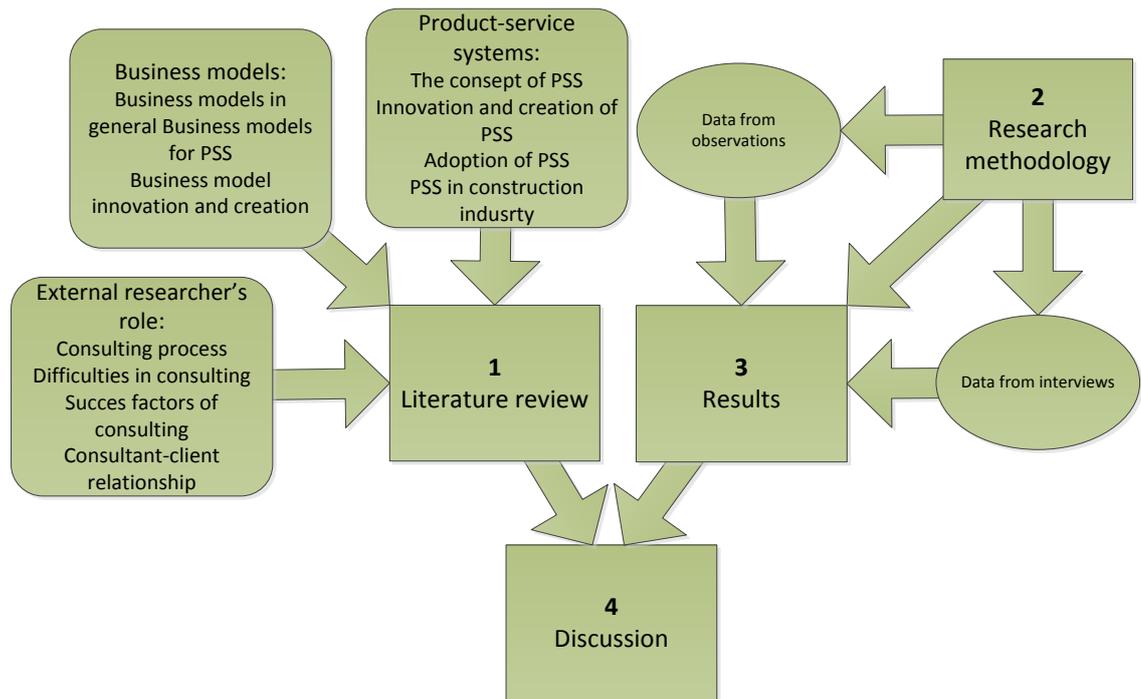
workshops is mapped and central problems in cooperation between external researcher and company are identified. Furthermore, some ways to deal with challenges in cooperation between researcher and company are provided.

Under examination are the differences between company's practical process of business model creation and the views described in the current literature. In addition, it is interesting to investigate the role of external researcher in this process and the position of product-service systems in product centric companies. Thus the research questions are formulated as follows:

1. How does the case company create business model for product service system in practice?
2. How do product centric organizations see product-service system ideas, what kind of attitudes companies have towards those and how services are used in these organizations?
3. What is the role of an external researcher in business model creation process and what kind of advantages and difficulties are related to working as an external researcher?

### **1.3 Structure**

The structure of this thesis is presented in Figure 2. Its key blocks are numbered in an order that follows the structure of this document, so that literature review begins the thesis and the discussion is at the end. Figure also represents the relations that different sections have. It presents, for example, what aspects literature review consists of and that research methodology has affected both the data gathered and the results created in this study. Furthermore, it illustrates how the discussion is produced based on the literature review, results and through those two everything else discussed in this thesis.



**Figure 2:** Structure and the formation of this thesis

This work is structured in a way that the next two chapters discuss the topics of this thesis in the light of current literature. First, the concept product-service system (PSS) is explained and then methods of creating these are described. After this the phase of adopting PSS is covered. The third chapter starts with an explanation of business models and their creation and then moves on to consider specifically business models for PSS. This is followed by taking PSS into the context of construction industry. After this, the external researchers/consultants role is discussed and specifically the difficulties in consulting are brought up.

Fourth chapter describes the research methodology of this study. First research strategy is explained and then the case company is presented. After these the ways in which empirical data was gathered for this research and how the data analysis was implemented are described. Chapter five proceeds to empirical part of this research. First, the background is introduced and after that the business model creation process in the case company is described. This includes the narrative of the progress of the process and the challenges and tasks during it. Then, the role of product-service systems in engineering workshops acquired in the interviews and some concluding figures are presented. Finally, the conclusions for this thesis, limitations, contributions and some ideas for future research are presented in chapter six.

## **2 PRODUCT-SERVICE SYSTEMS (PSS)**

### **2.1 Concept of PSS**

#### **2.1.1 The definition**

PSS has been researched now for over two decades (Clayton et al. 2012), and it has been defined in multiple different ways (Boehm & Thomas 2013). Different researchers have used it slightly differently but many of them have also noted the early definition by Goedkoop et al. (1999, see Clayton et al. 2012; Boehm & Thomas 2013; Mont 2002), which is that PSS can be defined as “a marketable set of products and services capable of jointly fulfilling a user’s need”. Also Baines et al. (2007) have presented this definition but more details; it describes how PSS consists of products and services but also networks and infrastructure that support it. This definition also highlights the objective of being competitive, satisfying customer needs and being less harmful for environment than traditional business (Baines et al. 2007). Manzini & Vezzoli (2003) then again described PSS as “an innovation strategy, shifting the business focus from designing (and selling) physical products only, to designing (and selling) a system of products and services which are jointly capable of fulfilling specific client demands”. Already in these three definitions there are multiple differences to be observed.

Baines et al. (2007) and Boehm & Thomas (2013) have listed many more PSS definitions used in the literature. These definitions differ widely, for example, in the consideration of environmental impact but they also have common themes like including both products and services. Sakao et al. (2009) have also stated that value creation and focusing on the customer are central aspects in PSS concepts. Based on their own research on existing literature Boehm & Thomas (2013) have stated that there are definitions that significantly differ from each other but on the other hand there also are several definitions, which have more or less the same meaning.

After all, the underlying idea behind PSS concept is that what clients really are interested in is not precisely buying the products or services that suppliers sell but rather the results that can be achieved with those (Manzini & Vezzoli 2003). This then makes it possible for suppliers to move from providing value for customer by exchanging the ownership of products to provide value of utility. This can be done by making it possible for a customer to use the product when needed or providing the customer with results achieved by using the product, so that the customer does not have to consider maintaining or disposing the product. (Tan et al. 2006) This again brings us to other aspect that differs among the PSS definitions. Some authors state that in PSS the ownership of product is not transferred from producer to client (Baines et al. 2007; Cook et al.

2006) where as others state that in PSS the ownership can be transferred. (Sakao et al. 2009)

Many of the positive environmental effects that PSS has stated to have are bound to the fact that manufacturer will keep the ownership of the product. In this case the basis is that asset ownership is not transferred and producer becomes responsible for product and its maintenance during its lifecycle. This then will not only provide producer with valuable information about product but also gives producer more motivation to create best possible products to reduce their own maintenance costs and costs associated with use of product (e.g. energy efficiency of the product). It is also considered that PSS will have positive environmental effect since producer is responsible for the recycling or deposition of the product and because the demand can be satisfied with a smaller stock of products. (Cook et al. 2006) Also when product ownership is transferred it is stated that some positive environmental effects will arise. Mont (2002) has explained that producers are encouraged to take their products back and upgrade or repair it and then re-use it. This then reduces the amount of waste.

On the other hand, Manzini & Vezzoli (2003) state that it is generally accepted that PSS does not necessarily create positive environmental effects since it might change consumer behavior. According to them it might, for example, cause customers to use saved “time or money in an unsustainable way such as buying more goods“. Also Tukker (2004) has found that mostly PSSs have from none to marginal improving effects on environmental aspects when comparing to alternative of providing a single product. When considering this and the fact that according to some authors it is not necessary for the producer to hold the ownership of asset in PSS the environmental effects of PSS are not evident. That is one reason why in this work the definition that Boehm & Thomas (2013) concluded based on their analysis of different PSS and related terms is adopted. This definition does not consider environmental friendliness as part of PSS. This core definition for PSS is: “PSS is an integrated bundle of products and services which aims at creating customer utility and generating value.”

### **2.1.2 Terminology surrounding PSS**

For business fitting into PSS description also many other terms have been used. Pawar et al. (2009) have noted that for an apparently identical phenomenon differing terms have been used often. By going through few articles (Park & Lee 2009; Tan et al. 2006; Sakao et al. 2009; Boehm & Thomas 2013), 26 terms were found that were used for rather similar concepts as PSS. These terms are listed in Table 1. Park & Lee (2009) had also listed product service and installed base service but both of these have services as an additional component so these were left out of the table.

**Table 1.** *Terms used to describe concepts that are rather similar to PSS*

Bundling	Integrated product service
Systems Selling	Integrated product and service offering
Functional sale	Integrated product and service engineering
Functional product	Integrated solution
Total care product	Solution
Extended product	Eco-Efficient producer service
Covalent product	Service/product engineering
Hybrid product	Service engineering
Hybrid value bundles	Service package
Hybrid value creation	Full service
Industrial product-service system	Servicizing
Compack	Servitization
Post mass production paradigm	Servicification

From Table 1 it can be seen that there are both almost similar terms and completely differing terms used. For example servicizing, servicification and servitization, which all are derived from same base word to describe similar concepts, have been used. This in addition to sheer multitude of terms used highlights quite well how unestablished the terminology surrounding this area of integration of products and services is. This makes it hard to find all necessary information to cover PSS. In addition, it is one reason why in this work, for example in PSS in construction chapter, also integrated solutions have been used due to lack of articles discussing namely PSS and construction.

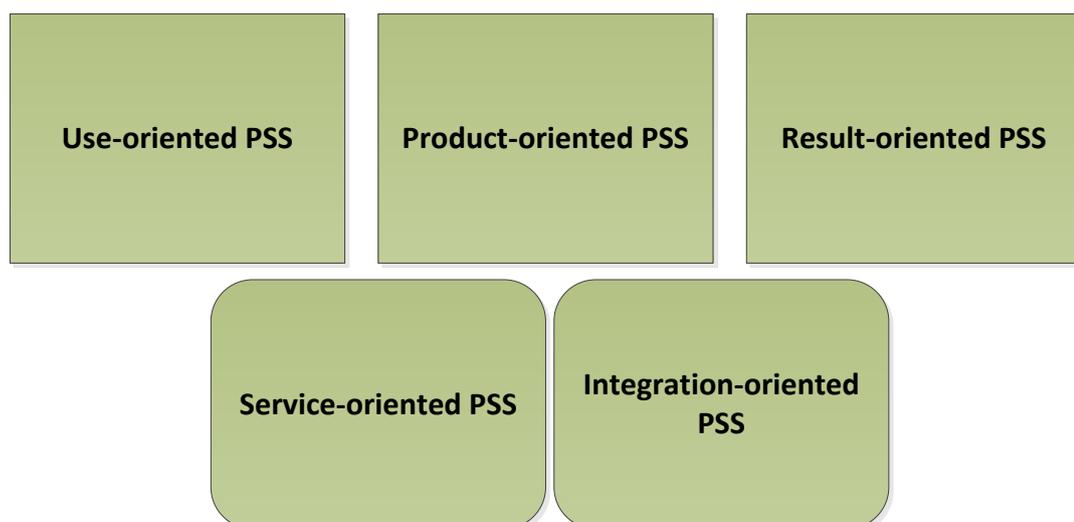
### **2.1.3 Classification**

PSSs have been compartmentalized in a few different ways. Most often used basic classification divides PSS into three categories, which are product-oriented PSS, use-oriented PSS and result-oriented PSS (Baines et al. 2007; Tucker 2004). Dongmin et al. (2012) state that in product-oriented PSS the product is sold in a traditional manner, so that the product ownership is changed, but also a service agreement is provided to assure the proper functionality of product in a certain timeframe. Similar definitions have

been given by Baines et al. (2007) and Tukker (2004). In use-oriented PSS on the contrary ownership of the product is not changed but customer buys availability or the right to use the product (Baines et al. 2007; Dongmin et al. 2012; Tukker 2004). Then again result-oriented PSS is similar to use-oriented since the ownership of the product is not transferred to customer but it differs from use-oriented PSS because customer purchases utility or the result that the product brings (Baines et al. 2007; Dongmin et al. 2012; Tukker 2004).

A practical example of this categorization could be made by using a washing machine. In product-oriented PSS machine is sold, for example, with installation and promise to repair it during the next two years and then dispose it for the customer. The use-oriented PSS could be service, in which service provider owns the washing machines but sells people time to use those. The result-oriented PSS then could be laundry service in which the service provider supplies customer with clean clothes instead of possibility to wash their clothes.

In current literature there are also other classifications. Manzini & Vezzoli (2003) have presented classification which resembles the aforementioned threefold basic classification. Their classification consists of services providing value added to product life cycle, services providing final results to customer and services providing enabling platforms to customer. First of these are similar to product-oriented PSS except that according to Manzini & Vezzoli (2003) the producer might retain partial ownership of the product. Services providing enabling platforms to customer is similar to use-oriented PSS, authors use the term platform for tools, products, opportunities or capabilities that producer provides customer access to. Furthermore, services providing final results to customer is similar to result-oriented PSS.



**Figure 3:** Basic categorization of PSS expanded according to Neely (2008)

Neely (2008) has broadened basic threefold classification with two more classes: integration-oriented PSS and service-oriented PSS, which have later on been used by for example Clayton et al. (2012). These are presented in Figure 3. According to Neely (2008, pp. 11-12, 30) “integration-oriented PSS result when firms seek to add services by going downstream and vertically integrating” and in service-oriented PSS services are integrated into products with emphasis on services. In integration-oriented PSS ownership is transferred to customer but supplier can offer services such as retail and distribution, consulting services and trucking services. In service-oriented PSS ownership is also transferred to customer but services are integral part of the offering, like in health usage monitoring systems. (Neely 2008, pp.19, 30) Tukker (2004) then again has divided the three main categories into subcategories. Product-oriented PSS includes product-related services and advice & consultancy, use-oriented PSS includes product lease, product renting and product pooling, result-oriented PSS then consists of activity management, pay per service unit and functional results. In this thesis the classification by Neely (2008) is applied.

## **2.2 Innovating and creating PSS**

### **2.2.1 Special characteristics**

Innovating and creating PSS is important subject when considering successful PSS. On the other hand there is need to define innovation in order to discuss it. Rogers (2002) has defined it being object, idea or practice that an individual or another unit of adoption considers as new. Then again there are multiple means to innovate: companies do not have to rely solely on their own personnel in this anymore, instead they can utilize partners, supplier and customers resources too (Kindström 2010). Kindström (2010) has also discussed the possibilities of service-related innovation. He has noted that using this extended resource base, the company can create new services and achieve new service based market positions. Furthermore open innovation is shortly discussed in chapter 4.2. Aurich (2010) then has discussed current service development ways and sees there a need for more systematic methods because, according to him, today companies develop most of their services ad-hoc, which causes problems in the service delivery.

When moving forward from innovation there are aspects that are partly different when comparing typical product design and PSS design and on the other hand many authors agree that these different ways are needed in PSS development. One of these things is the idea that designing of products and services needs to be integrated. (Marques et al. 2013; Clayton et al. 2012; Aurich et al. 2010; Kujala et al. 2011) Kindström (2010) has stated that separating service and product activities may cause problems in gathering the capabilities needed from different units in the company and in utilizing collaboration throughout the company. According to Clayton et al. (2012) an exception might be the case where either product or service is highly dominating in the integrated product service system. In that case existing product or service development systems might be ap-

appropriate for PSS development. Marques et al. (2013) have stated that requirements should be created thinking not only product or service but the whole PSS offering and both product and service development needs to be managed in integrated practice. Then again also differing opinions have been expressed. For example Kindström (2010) has also brought up an idea that company should create a separate service unit. According to him this would affirm personnel that services are taken seriously instead of just creating those with least possible resources along products. On the other hand this article deals more with independent services than with PSSs and he also briefly mentions the need to integrate the product and service development.

Another differing attribute is customer orientation and extreme importance of understanding customer needs to be able to utilize PSS offerings instead of just providing product. It is due to the presence of service component which according to Kowalkowski & Kindström (2013) needs more customer knowledge and focus than basic product development. This has received support for example from Gopalani (2010) who has noted that in services customer insights are in focus. It has even been suggested that customer needs to be taken in to PSS planning in an early phase of development (Baines et al. 2007; Tan et al. 2006).

One aspect that the current literature notes to be different between typical development activities in companies and the PSS development is origin of development. Tan et al. (2006) have stated that usually this is executed top-down but in PSS creation development it typically occurs bottom-up. One reason for this is new closer relationships with customers, which give the provider new insight into customers processes through personnel implementing services and communicating closely with customers. Then again it seems that this aspect has not stirred wider discussion in PSS literature.

In addition, Sakao et al. (2009) have concluded that when comparing to traditional design the main characteristic of PSS development is using the complex relations between products, customers and providers. This can be seen also in earlier differences in form of increased need to understand customers and their processes to be able to find ideas for development of PSS from that knowledge and understanding. This way it is possible to find new innovative ideas for providing value for customer through not only the product but providing solutions that can help customer to handle the complexities in their processes.

### **2.2.2 Different methodologies**

There are several different methodologies for creating PSS in the existing literature. Clayton et al. (2012) have listed six methodologies that according to them cover the PSS creation process and all the stages in it. These are: Austrian eco-efficient PSS project (AEPSS), the design exploration process, designing eco-efficient services, the Kathalys method, methodology for PSS innovation and the service system design ap-

proach. Deriving from these they have concluded six phases that PSS development includes. These are project initiation, analysis, idea generation and selection, detailed design, prototyping and implementation. On the other hand Kuo et al. (2010) have stated that PSS development steps emerging in literature can be classified into three categories: idea generation and selection, analysis and evaluation and implementation. The first step includes everything from finding ideas and selecting the best idea to the design of that.

In addition, to these two, Marques et al. (2013) have recently created methodology for product-service development and they divide this process into four different stages: organization preparedness, planning, design and post-processing. This classification can be opened up by using the six different activities they have listed into these stages. In the first stage planning and customer requirements are considered. This action is also included in the planning and designing stages. In addition to this in planning stage identification of needs and ideas is done and in the design stage concept development, preliminary design, detailed design and prototyping or/and other testing is implemented. The last stage includes the implementation similarly to other two methodologies. These different methodologies and their phases can be seen in Figure 4. For Marques et al.'s (2013) methodology also these activities are listed to create more comparable figure.

Clayton et al. 2012	Marques et al. 2013	Kuo et al. 2010
<ul style="list-style-type: none"> <li>•Project initiation</li> <li>•Analysis (external aspects)</li> </ul>	<ul style="list-style-type: none"> <li>•Organisation preparedness</li> <li>•planning and customer requirements</li> <li>•Planning</li> <li>•planning and customer requirements</li> </ul>	
<ul style="list-style-type: none"> <li>•Idea generation and selection</li> </ul>	<ul style="list-style-type: none"> <li>•needs and ideas</li> </ul>	<ul style="list-style-type: none"> <li>•Idea generation and selection</li> </ul>
<ul style="list-style-type: none"> <li>•Detailed design</li> <li>•Prototyping</li> </ul>	<ul style="list-style-type: none"> <li>•Design</li> <li>•planning and customer requirements</li> <li>•concept development</li> <li>•preliminary &amp; detailed design</li> <li>•prototyping &amp; testing</li> </ul>	<ul style="list-style-type: none"> <li>•Analysis and evaluation (idea)</li> </ul>
<ul style="list-style-type: none"> <li>•Implementation</li> </ul>	<ul style="list-style-type: none"> <li>•Post-processing</li> <li>•prototyping &amp; testing</li> <li>•implementation</li> </ul>	<ul style="list-style-type: none"> <li>•Implementation</li> </ul>

*Figure 4: PSS creation processes and their common areas*

From Figure 4 it can be observed that the first two designing methods are rather similar. They have somewhat congruent tasks in similar order. On the other hand Clayton et al. (2012) have stressed more external aspects, such as market analysis, than Marques et al. (2013). Kuo et al. (2010) then again have much more simplified process, which does not cover tasks before idea generation and instead of prototyping or testing highlights other analysis and evaluation such as feasibility of the idea. Still, it acknowledges some simi-

lar themes, such as idea generation and selection including design of the idea and implementation, with the other two. In addition similarly to Clayton et al. (2012) also Manzini & Vezzoli (2003) explained that PSS development should begin with analyzing the existing situation both internally and externally and then again similarly to Kuo et al. (2010) they have emphasized the evaluation of feasibility. So there are both differences and similarities between existing methodologies.

### **2.2.3 Problems in current PSS development models**

Some researchers that have studied PSS development models and compared those to development practices used in companies have found that differences between models and actual development happening in companies exists (Clayton et al. 2012; Tan et al. 2006). One of these is the lack of feedback in the models discussed in literature. Clayton et al. (2012) have stated that there is a big difference in the amount of feedback that can be found in real companies when compared to the models presented. Out of the models they examined, listed in previous chapter, only AEPSS had taken into account the role of feedback between the phases and even in that model the feedback had received significantly less remarkable role than in the company they had observed. They have noted that this is a significant weakness in the existing models.

Another significant difference is that many of the models represented in current literature seem to be sequential whereas in practice much more iterative processes have been found (Clayton et al. 2012). For example, Marques et al. (2013) have identified the iterative nature of PSS creation process and have also brought this up when explaining their methodology for PSS creation. They have noted that for example customer requirements and product design parts of their model are highly iterative. Thus their model differs from many others observed in literature. In addition, it has been noted that with PSS the development task does not only consider the phase of designing product, but it is expanded timely to cover also the use phase of the product to confirm that customers activities are considered when implementing continuous development of PSS (Tan et al. 2006).

Another difficulty related to the existing PSS development methodologies is the lack of empirical evidence of their functionality. Baines et al. (2007) have stated that even though there is selection of both methodologies and different tools there is not thorough and critical evaluation for performance of those in empirical context. Also the insufficient documentation has been noted to be problematic. According to Clayton et al. (2012) it causes variation in designing processes, which, furthermore, decreases the repeatability in designing different PSSs. This lack of repeatability according to them has been stated to cause many of the problems related to existing PSSs. This can partly be due to that PSS has to be designed for each customer taking into consideration their specific needs (Baines et al. 2007). In other words one cannot simply move existing PSS model from one client to other but they have to design a new one. This increases

the amount of designing needed and thus increases the importance of repeatability in PSS design processes.

### **2.3 PSS adoption**

In current literature there is multitude of positive outcomes from becoming a PSS provider listed but the process of changing orientation from product centric to PSSs is not an easy task. Baines et al. (2007) have based on their literature review stated that manufacturers who wish to achieve success through services have to understand how their services will be valued by customers and in addition to configure their organization to support the product-service offering. Indeed there are various different challenges or barriers that hinder this transition recognized in the literature (See for example Baines et al. 2007 and Martinez et al. 2009).

Oliva and Kallenberg (2003) have also described this transformation process from financial perspective and noted that even though when moving to product related services first the profit increases, it then starts to decrease. One reason for this has been found to be the mismatch between organization's offerings and organizational arrangements, which is discussed later. Then again for companies, which were even more deeply in service business the profit started to increase again. Additionally, Martinez et al. (2009) have, in their single case study implemented in OEMs in the UK, found that it needs time to build up profitability of company when moving into PSS business. This describes well the potential benefits but also risks involved in adapting PSS.

One method, used in the literature to both enhance the transfer of PSS into practice and on the other hand assess this, is called accessibility, mobility and receptivity (AMR) framework. This method was used by Cook et al. (2006) in their study investigating the transfer of PSS from the academia to manufacturing companies in the UK. They used semi-structured interviews and focus groups to find out what affected the adoption of PSS in 20 manufacturing firms. Point in AMR framework is that all these three parts need to be present. Accessibility is seen so that the concept and knowledge needed to use, for example PSS, are available for companies in a practical way. Mobility then describes the transferring of this information through intermediary channels from academia to potential companies, and receptivity is the willingness and ability of potential users to adapt this concept. (Cook et al. 2006) In this chapter therefore the term receptivity needs to be understood in relation to this concept.

Manzini & Vezzoli (2003) have stated that PSS needs closer relations with customers due to complex relations between social actors engaged in system. Indeed one of the most important barriers is related to customers. It is stated that consumers do not necessarily see any value in having their needs fulfilled in comparison to owning a product. Indeed this may even be seen as a disadvantage since in many areas there still is status value associated with owning product (Baines et al. 2007), for example, when compar-

ing driving a Ferrari and being able to say that you own a Ferrari. In addition Martinez et al. (2009) have noted that in many cases even though organization sees that some changes would bring greater value for the customer, the customers themselves cannot recognize this. Similarly Kindström (2010) have explained how communicating value of PSS to customers can be difficult task that sometimes needs creativity. Furthermore Kuo et al. (2010) observed the lack of market acceptance as important barrier to adoption of PSS.

One of the other customer related barriers that were found is possible misunderstandings between customer and provider. These were seen to be possible cause for differing expectations and for the increase in customer touch points in the provider organization. This again was seen causing problems since units that never earlier had to deal with customers now needed to adopt this customer oriented culture and acquire new capabilities. It is also stated that with multiple customer touch points it can be problematic to keep communication from all customer touch points consistent. (Martinez et al. 2009)

Another of the biggest challenges then is the needed change in the organizational culture. The PSS requires shift from transaction and product based system to more relationship based value creation and service oriented business since traditional manufacturing culture is found to hinder adoption of PSS. (Martinez et al. 2009; Brady et al. 2005b; Gopalani 2010; Kindström 2010) This needs change in the mindsets of employees and company as whole (Sakao et al. 2009). Also Kuo et al. (2010) have identified internal rejection of change to be central barrier. Thus Martinez et al. (2009) suggest that employees need to be instructed on delivering services and also on service culture.

Another barrier related to these is the needed change in organizational structures. This change is needed so that company can match the product-service offers they are providing (Sakao et al. 2009). It has been stated that firms with instead of hierarchical structures, which are typical and valued in manufacturing industry, more horizontal or matrix type structures are more receptive to PSS implementation (Cook et al. 2006; Martinez et al. 2009). It is also possible that between different parts of the organization there is variation in the alignment (Martinez et al. 2009). For example between parts that have earlier already interacted with customer and those other parts that now have to adapt to changing customer needs. PSSs also tend to be more complex than basic product transaction based business and therefore there is a need to structure organization in order to achieve competitiveness in designing, creating and delivering PSS. To achieve this there is need to do changes both in functional and systemic level. (Baines et al. 2007)

The changes that are needed for the company to be able to provide offerings that integrate products and services are related to organizational changes discussed earlier. For example, Martinez et al. (2009) have stated that companies tend to turn their focus more on product instead of the integrated offering especially under pressure. This might be partly due to the product oriented culture still lingering in the company. It is also recog-

nized that these new types of offerings need new capabilities and competences (Sakao et al. 2009; Tan et al. 2006; Brady et al. 2005b; Kindström 2010). Kuo et al. (2010) have listed several barriers related to these missing capabilities. Among those are for example difficulties in managing different parts of PSS offering delivery or lack of technical support and personnel. Another ability that organization must learn is more rapid response to customer. According to Oliva and Kallenberg (2003) parts of product oriented organizations can be used to have more time to process customers' problems.

When shifting to PSS, problems in product-service offer design, creation, delivery and pricing have also been observed (Boehm & Thomas 2013; Martinez et al. 2009; Baines et al. 2007). This process needs information about the product in its use phase and intensive information exchange between provider and customer but also with suppliers (Martinez et al. 2009). Furthermore Martinez et al. (2009) have named supplier relations to be one of the key barriers. Relationship challenges have also been noted by Boehm & Thomas (2013) in their literature review in which they have analyzed 265 articles. These challenges result from the fact that these complex integrated PSSs usually need broader supply network and in this network there is need for understanding and alignment of mindsets (Martinez et al. 2009). Also Pawar et al. (2009) have stated that managing network and collaboration of various partners is challenging

When shifting to PSS, also the strategy needs changing (Brady et al. 2005b; Kindström 2010). Cook et al. (2006) have found in their study that if the strategy is focused on cost reduction more than on adding value it hinders the willingness to adopt PSS. They also stated that when company was seeking to move from pursuing economies of scale to economies of scope and also when PSS was seen contributing in achievement of the company's strategic intent PSS was found fitting. Gopalani (2010) then again emphasizes the importance of strategic alignment for the success of PSS development and adoption. Therefore problems in strategic planning have been noted as a barrier in PSS adoption by several authors (Martinez et al. 2009; Cook et al. 2006; Kuo et al. 2010).

There are also other factors that might be present in the external environment that can facilitate or hinder the adoption of PSS. Cook et al. (2006; 2012) have regarded legislation as such a factor. Environmental legislation and extended product responsibility can increase interest in PSS since many authors see environmentally friendly policies as a key aspect of PSS (Cook et al. 2012; Mont 2002; Sakao et al. 2009, p.755). Also Kuo et al. (2010) have noted the support from regulations and laws as facilitating factor. Another factor considered in the literature as such is the lack of empirical evidence for performance of PSS. Cook et al. (2006; 2012) found in their studies that companies were not willing to invest in concept that had no sufficient evidence for economic, environmental or social performance. Third this sort of element is the lack of techniques and tools that can be used to design and deliver PSS. For example Martinez et al. (2009) have mentioned this lack in regard to assessing company's internal capabilities and in addition to this the problems in shifting the metrics from measuring product oriented

organization's performance to measure productivity of PSSs. Overview of these problems can be seen in Figure 5.

Organizational culture	Customer	PSS offering	Legislation
<ul style="list-style-type: none"> <li>•change from product centric to service centric</li> <li>•internal rejection</li> </ul>	<ul style="list-style-type: none"> <li>•customer rejection</li> <li>•misunderstandings</li> <li>•increased communication handling</li> </ul>	<ul style="list-style-type: none"> <li>•designing</li> <li>•creating</li> <li>•delivering</li> <li>•new capabilities</li> </ul>	<ul style="list-style-type: none"> <li>•laws</li> <li>•regulations</li> </ul>
Organizational Structure	Strategy	Network Relationships	Others
<ul style="list-style-type: none"> <li>•move to less hierarchical structure</li> <li>•structuring to be able to provide complex PSS offers</li> </ul>	<ul style="list-style-type: none"> <li>•alignment</li> <li>•planning</li> <li>•consistency</li> </ul>	<ul style="list-style-type: none"> <li>•supplier relations</li> <li>•coordination of complex networks</li> </ul>	<ul style="list-style-type: none"> <li>•lack of empirical evidence</li> <li>•lack of tools and methods</li> </ul>

**Figure 5:** Problem areas related to PSS adoption

Cook et al. (2006) observed that when some of these problems mentioned earlier were already faced in company and solutions for them had been created, it increased the receptivity for PSS. In addition, they stated that it is rather the combination and interplay of these attributes that makes it easier or harder for a company to shift into PSS than just some of these. For example, when a certain area of competition has caused need to provide services as a mean of differentiation and therefore caused the company to acquire new capabilities needed in providing these, PSS can be suitable and rather simple to adopt. Cook et al. (2006) So the difficulty in adopting PSS depends greatly on the organization's external environment and its demands as well as on organization's internal attributes (Cook et al. 2006; Martinez et al. 2009).

One of the few articles used in this chapter that had longitudinal research was the one by Brady et al. (2005b). They studied six leading international suppliers of complex products and systems. In the beginning they collected information about their products and systems in 1995 and how they had changed these since. After that they continued with case studies during 2001-2003 and conducted 92 interviews. In addition to Cook et al. (2006) study described earlier this was one of the widest researches in this area where many of the other used sources were literature reviews (e.g. Baines et al. 2007; Boehm & Thomas 2013; Kuo et al. 2010; Sakao et al. 2009) Furthermore, Oliva & Kallenberg (2003) used rather wide sample of 11 capital equipment manufacturers and interviewed one to two management level employees in each company to shed light on the developing of service organization.

## 3 CREATING A BUSINESS MODEL FOR PSS IN CONSTRUCTION INDUSTRY

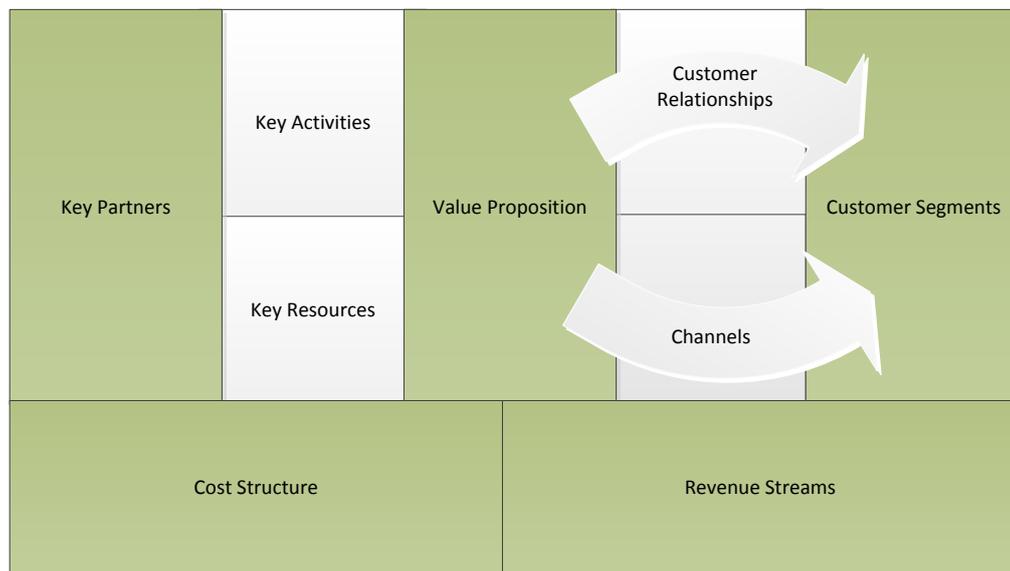
### 3.1 Business models

Business models have been discussed both in offering level and company level in current literature. For example Cavalcante et al. (2011) have described business model in a way that one business model covers the whole company whereas for example Osterwalder & Pigneur (2010) have discussed it so that a company can have more than one business model. Even though Kujala et al. (2010) have noted that research on business models in this level is in exploratory phase, the latter interpretation is used in this work. A business model has been stated to be a tool for management through which they can communicate their strategic choices (Shafer et al. 2005). It has also been noted to be source for competitive advantage and business success (Aurich et al. 2010; Giesen et al. 2010; Shafer et al. 2005; Perätalo 2010). Even though business models have been argued to bring these possibilities for companies there still is lack of consensus about both the definition for business model and the key components it includes (Shafer et al. 2005; Palo & Tähtinen 2011; Kujala et al. 2010; Bask et al. 2010).

According to Mitchell & Coles (2004, p.17) business model is “the combination of “who”, “what”, “when”, “where”, “why”, “how” and “how much” an organization uses to provide its goods and services and develop resources to continue its efforts.” Palo and Tähtinen (2011) then have compared business model to strategy and described it as concrete expression of strategy usually in a strategic business unit level. For one definition they offer that business model describes business logic simplified; the way an organization generates revenues, operates and also creates value for its stakeholders. Also Aurich et al. (2010) have defined business models as a simplified way to explain how companies create value.

When considering business model components there are many similarities but also differences between components included. For example, Kujala et al. (2011) have based on their literature review found six elements: customers, value propositions, position in the value stream, value creation logic, internal organization and capabilities and competitive strategy. Then again Perätalo (2010) has based on her literature review identified offering, customers, value proposition, capabilities and competencies, position in the value network and revenue logic as key elements of business model. One of the key differences between different definitions can be seen in these two listings already. Kujala et al. (2011), Morris et al. (2005) and Cheschbough (2007) see that competition is included in business models but instead e.g. Perätalo (2010) and Giesen et al. (2010) then do not include it. This can also be seen from article of Shafer et al. (2005) where authors have

reviewed multiple business models and identified most common business model elements. They have identified rather many similar elements with Osterwalder & Pigneur (2010). Many other authors have also cited either this or older articles written by Osterwalder when seeking explanation for business models (for example Palo & Tähtinen 2011; Giesen et al. 2010; Nenonen & Storbacka 2009; Kowalkowski & Kindström 2013). This tool by Osterwalder & Pigneur (2010) called business model canvas is the base for business model in this work. It was chosen because the case company described later expressed willingness to use it in the beginning of the project. Business model canvas consists of 9 elements which will be explained here shortly and visualized in Figure 6.



**Figure 6:** Business model canvas (Adapted from Osterwalder & Pigneur 2010, p. 42)

The first element is *customer segments*. It describes different groups of people company seeks to serve, for who the company is creating value and who are its most important customers. The second element represents *value propositions*. This then tells what bundles are used for delivering value for customers and more specifically what value company is providing and what customer problems they can solve with their offering. (Osterwalder & Pigneur 2010, pp. 15-25)

The third element is *channels*. These describe how companies communicate to and get their value proposition for customers. This comprises all channels from creating awareness of company's offerings to after sales customer support provision channels. The next element depicts *customer relationships*. This describes what kind of relationships company has to different customer segments. These relationships can range from dedicated personal assistance to self-service and it is important to consider what kind of relationship company wishes to have with its specific customer segments. The fifth element then represents *revenue streams*. These are the cash flows coming from customer segments. These can be generated in multiple ways, it is not only the traditional asset

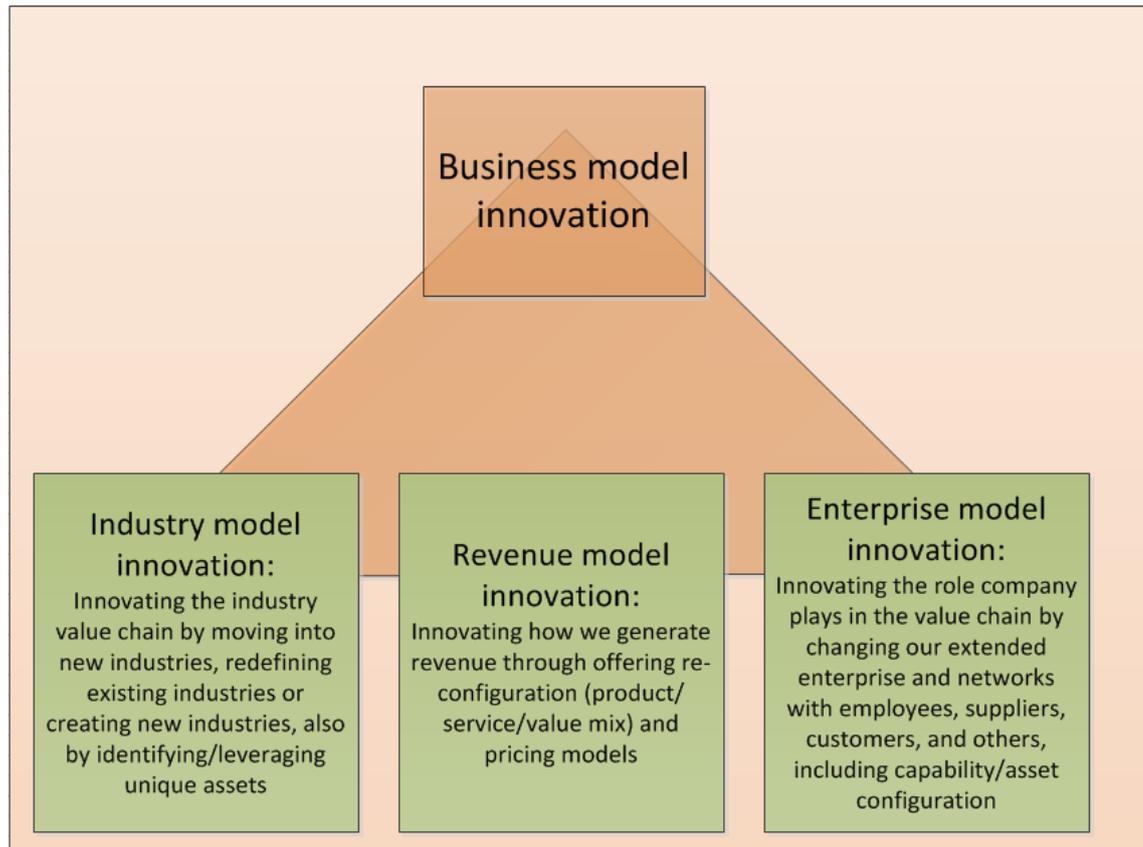
sale but there can be different kind of subscription fees, licensing payments and usage fees for example. (Osterwalder & Pigneur 2010, pp. 25-33)

The next element is the other half of money flows, *cost structure*. It includes all the costs coming from operating a business model. All other elements of business model cause costs and these needs to be taken into account when thinking business models. *Key activities* then are activities necessary to run the business model. Key activities can be derived from the consideration of the first four business model elements and thinking what are the most important activities these need. Similarly eighth element, *key resources*, can be derived from first four elements. These resources are the important assets that are needed to get the business model working. The last element then represents the *key partners*. This describes needed networks of partners and suppliers necessary to create a working business model. There both who these partners and suppliers are and what key resources they bring and what key activities they perform needs to be considered. (Osterwalder & Pigneur 2010, pp. 34-42)

### **3.2 Business model innovation and creation**

Giesen et al. (2010) have emphasized the need for companies to change and develop their business models more frequently than before. According to them the fast changing and increasingly complex business environment causes this need and it is greatest during times of increased industry transformation, fast economic growth and economic turmoil. In addition, they have noted that also internal changes like a new product or service innovations cause need to create a new business model. (Giesen et al. 2010) Indeed it seems that there is almost always need for some business model development.

Palo & Tähtinen (2011) have noted that companies need to develop new capabilities in order to innovate new business models that can take new technologies and ideas into markets. Giesen et al. (2010) have stated that business model innovation is critical for company's success and Mitchell & Coles (2004) emphasized its importance for competitive capabilities. Still, only few authors seemed to define business model innovation. Mitchell & Coles (2004) defined business model innovation as business model replacement through which company can provide product or service offerings for customers that were not available earlier. Giesen et al. (2007) then again provided a framework for business model innovation. According to them it has three main types: industry model innovation, revenue model innovation and enterprise model innovation. These are shortly described in Figure 7.



**Figure 7:** Business model innovation framework (Based on Giesen et al. 2007)

In the literature there has been discussion about changing closed innovation climate to open. Chesbrough (2006; 2007) has brought this open innovation perspective to business model innovation too. He has noted that it brings great opportunities for companies because companies no more need to hire and have all the brightest and most innovative employees in their pay roll. Instead they can use external people in innovation processes. According to him open innovation in business models brings such advantages as sharing risks and decreasing both time to market and innovation costs. Open innovation is innovation that is done together with external resources such as universities and customers. Indeed the innovation is no longer as secret and silent as it used to be. (Osterwalder & Pigneur 2010, pp. 108-115; Bouwman & Fiel 2008; Chesbrough 2006; Chesbrough 2007) Open innovation is important in this work since the case company is using this method in their project.

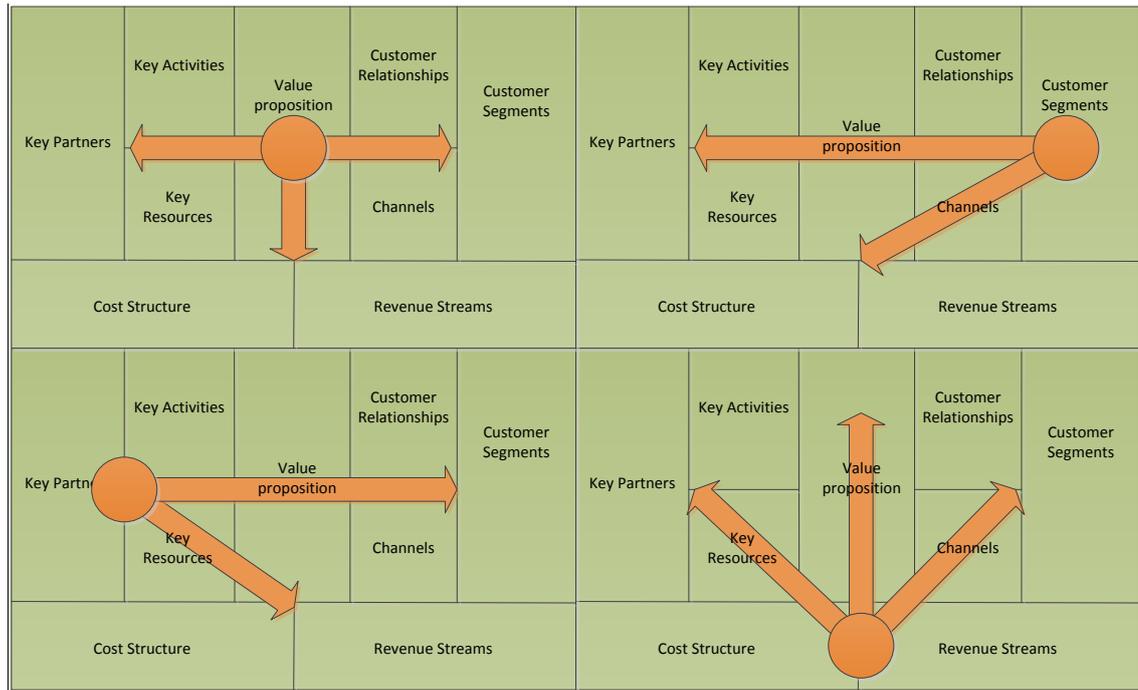
Giesen et al. (2010) have also identified characteristics typical for strong business model innovators. According to them they are aligned so they make sure that the core capabilities and design are both internally and externally consistent through all business model elements. They are also analytical, which means that they use information strategically to be able to prioritize actions and create foresight and that they are measuring and tracking for needed corrections in the ways they are operating continuously. Thirdly they are adaptable; they can link innovative leadership to improve capabilities for ef-

fecting change and institutionalizing flexibility in operations. They also noted that successful business model innovators understand their customers and the value they can create for new segments, through new products and services or new ways of delivery exceptionally well. (Giesen et al. 2010)

The need for frequent business model innovation has been identified in many cases and the need for huge amount of business model ideas has been emphasized in the beginning of business model creation (Osterwalder & Pigneur 2010, p.136). On the other hand, there still is need to carry out thorough selection of which business model ideas to implement. For example, Giesen et al. (2010) emphasizes the need to evaluate thoroughly is the time right for innovations that are considered.

Different authors have had slightly diverging areas of interest when discussing business model development. Perätalo (2010) for example has stated that business model development is especially interesting in markets that do not exist yet. Palo & Tähtinen (2011) then brought up the business model development in networks with multiple actors. According to them, there is need to always link companies' business models together because one cannot do business alone. There are multiple views for where from the business model development can start. (Palo & Tähtinen 2011)

According to Osterwalder & Pigneur (2010, pp. 138-139) there is four epicenters in business model development. The first one of these is resource-driven, which originates from partnerships or company's existing infrastructure and then spreads to other parts of the business model. The second is offer-driven innovation, which begins with new value proposition, which then affects other business model elements. The third option is customer-driven innovation. It can be based on customer convenience or needs or facilitated access and after changing customer segments thinking it affects other elements of business model. The last option is finance-driven innovations. These can originate from reduced costs, new pricing mechanisms or new revenue streams and that way affect other elements. These are visualized in Figure 8. In addition to these there is also a possibility that innovations can be driven by multiple epicenters. (Osterwalder & Pigneur 2010, pp. 138-139)



**Figure 8:** Epicenters of business model innovation, offer-(up left), customer- (up right), resource - (down left) and finance-driven (Adapted from Osterwalder & Pigneur 2010, pp. 138-139)

How different innovations in different parts of business model affect also its other elements can be seen in the earlier descriptions but it has also been noted more clearly in other literature sources. It has been stated that it is important for companies to keep their business model elements fully aligned both internally and externally (Giesen et al. 2010). Also Shafer et al. (2005) have noted that there is need to make sure that choices made in business model are coherent and mutually supportive.

Giesen et al. (2010) have also listed the key questions that need to be answered when taking new kind of product to market. These questions are:

- “How much does the new product or service change the business model in general and, in particular, the customer-value proposition?”
- Does the existing pricing model need to be adjusted?
- What new technology, skills and resources need to be acquired?
- How will the overall operating model change?”

These questions cover rather well all the business model elements and can be useful tool in business model development. (Giesen et al. 2010)

Chesbrough & Rosenbloom (2002) have found out in their research in which they studied six Xerox technology spinoffs that it is important to not only consider potential customers’ needs but also how the offering would fit in with customers’ existing processes and technologies. They also brought up that in most cases the business model intended first proved out to not be suitable and it had to be modified or the business failed with it. Two out of six cases they observed failed and what they found to be in common in these

was that the business model was only slightly modified from the original Xerox business model and Chesbrough & Rosenbloom (2002) have identified this as one reason for the failure of these spinoffs. They saw that technology in these spinoffs had potential but the inertia that makes it difficult to change business models in companies affected these spinoffs. (Chesbrough & Rosenbloom 2002)

Kujala et al. (2010) have found that customer's strategy and long-term business needs as well as supplier's internal capabilities and revenue generation logic have to be taken in consideration when creating business models. These aspects are partly similar to those earlier found important in PSS creation, like customer orientation and supplier capabilities. Indeed, it seems that there are similarities in creating business models and PSSs even when business model creation is not discussed specifically in PSS context.

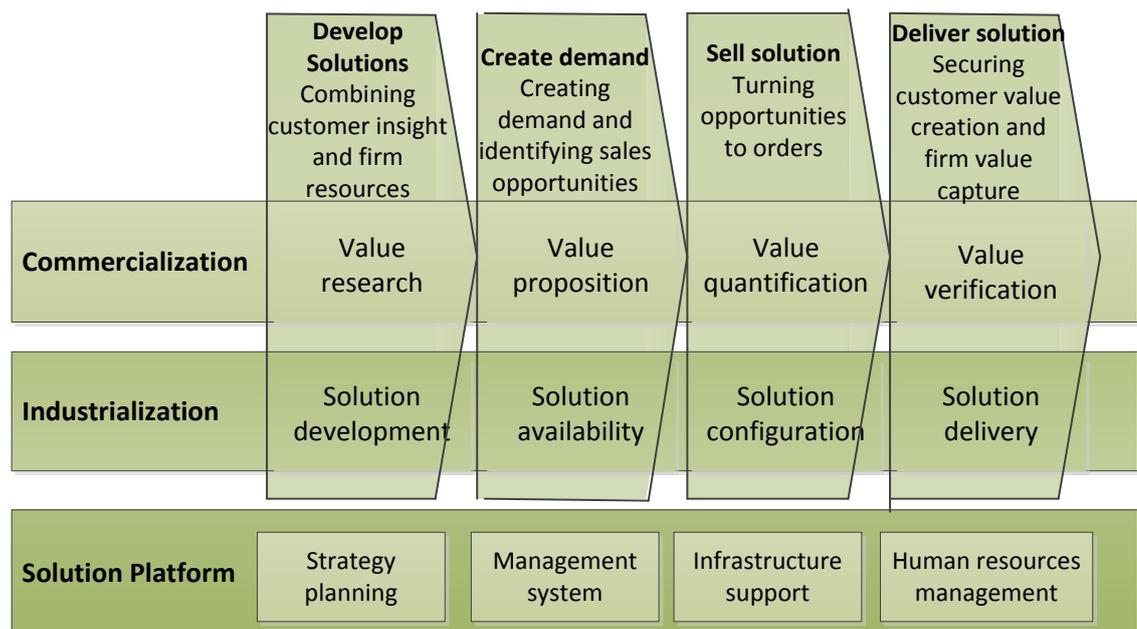
### **3.3 Business models for PSS**

Business models for PSS are a subject that has not yet been studied widely. Thus in this chapter also some points from service centric business models have been brought up in contexts where author saw it fitting to also PSS context.

It has been stated that there is need for business model redesign when moving into PSS. Aurich et al. (2010) have noted that this has to be done in order to align operational and strategic objectives so that PSS can be offered. Still, descriptions for service centric business models are scarce and the area of shifting business model from product centric towards more service centric has received limited attention (Palo & Tähtinen 2011). Kindström (2010) have brought up the competitive advantage that well aligned business model, especially one pertinent in reference to services, brings due to that they are difficult to imitate. According to him when business model elements are well integrated it is harder to separate one element and copy it (Kindström 2010). This shows the similar need for alignment of business model elements, which was found important already in earlier chapter. Aurich et al. (2010) have described it well as a need to consider not only the elements of business model but also the relations between these elements.

In the current literature on business models for PSS or services there are also similar challenges and requirements found as in the literature focused on PSS described in chapter 3. Aurich et al. (2010) for example have noted that there is need for strategic and operational adjustments in external and internal processes when creating new business models. Palo & Tähtinen (2011) and Kindström (2010) have emphasized the importance of business networks. Palo & Tähtinen (2011) have noted that complex networks are typical in service based business models and Kindström (2010) has stated that the coordination of value network is vital for achieving advantages from these relationships.

Palo and Tähtinen (2011) have even suggested that service based business models are different from other business models. According to them the key elements for service based business model are value proposition, revenue mechanisms, value chain, value network, competitive strategy and target market. (Palo and Tähtinen 2011) When comparing this to earlier mentioned business model frameworks the high attention given for value chain and value network in this can be observed. Kujala et al. (2010) have, furthermore, created classification of business models for solutions. They have created four model types: basic installed base services, customer support services, operations and maintenance outsourcing and life-cycle solutions which they divided into delivery of life-cycle solutions and development of life-cycle solutions. They defined these through all six business model blocks they have chosen: customers, value proposition, competitive strategy, position in the value network, internal organization and capabilities and logic of revenue generation. For example when considering four base model types Kujala et al. (2010) defined, that the customer's capabilities and know how decreases in the order of listing and the willingness to cooperate increases, with the exception that in operations and maintenance outsourcing model customers do not necessarily want to cooperate but outsource for flexibility.



**Figure 9:** The solution business model framework (Adapted from Storbacka 2011)

Kujala et al. (2010) also found that life-cycle solutions seem to be more successful than operations and maintenance outsourcing solutions they observed in their study. Reasons they gave for this were the concentration of value proposition to customer's process and the appropriate scope definition in life-cycle solutions. They also recognized solution deliveries concentrating on improving the performance of the solution in customer's value creation process, to be most successful. Furthermore, Storbacka (2011) have created a framework for solution business models. This framework is visualized in Figure

9. In this model the primary dimensions are the solution process phases and the commercialization, industrialization and solution platform and the blocks in the interceptions from needed capability categories. According to Storbacka (2011) these categories include the relevant management practices and capabilities for solutions management. Interestingly this framework seems to have rather practical view on business models, since it is arranged in an order similar to process.

Schuh et al. (2008) have taken a different way to approach this area. They have used business model, which is not specifically designed for solutions or PSSs, but they see that it is important to create additional sub-model. In the business model they adapted from Müller-Stewens & Lechner (2005) the main elements are value proposition, marketing, benefits and production. The needed sub-model they call service delivery model, and according to them through this suppliers value proposition can be linked to production model of the customer. This needs to be shared for both the customer and the supplier, and they should cooperate on this by agreeing on specific ways to exchange information. In addition to this sub-model they emphasize the importance of connecting product design and service provision together. This supports Palo & Tähtinen's (2011) view, presented in earlier chapter, that there is a need to link the customer's and the supplier's business models together.

Schuh et al.'s (2008) study gives a bit differing view point on the area of applying business models for PSS. According to them, the business model in itself does not have to be different from the business models used for products but the role of services and the customers need to be taken into account. Additionally, it is noteworthy that all of the studies used in this chapter used either literature reviews (Aurich et al. 2010) as a base for their material or qualitative studies such as case studies (e.g. Kindström 2010) and in one occasion Delphi method (Palo & Tähtinen 2011). Furthermore, interviews were often used as a main way to obtain data (Kindström 2010; Kujala et al. 2010; Perätalo 2010; Storbacka 2011)

### **3.4 PSS in construction industry**

PSS in construction is an area that has not been researched widely. During this study only few articles that somehow connected PSS and construction were found. For example Morocos & Henshaw (2009) discussed this, but only from the point of view of a certain tool, namely soft systems methodology (SSM), how it can help company moving from product based business to product-service centered business and on the other hand how this tool can be used in construction industry. So the PSS in construction business and the special features it has in this accordance were left out of this article.

Leiringer et al. (2007) then focus their research on certain kind of construction cases called private finance initiative (PFI), which occur in the UK and has been stated to provide construction firms possibilities to move towards integrated solutions. PFIs are

way to move public construction to be funded and implemented by private companies. This way these companies get a chance to operate and create profits from normally publicly handled facilities such as hospitals for a certain period of time. These companies then carry the responsibility for operating and maintaining the system and strives to achieve profits by fees collected from users or from for example local authorities for providing a service. All together these concepts move contractors into wider service and solution provision. (Johnstone et al. 2007; 2008)

Leiringer et al. (2007) even suggest that it might be the best alternative for a construction company to keep products and services separated and just to be ready to combine these when it is necessary to provide integrated solutions. Somewhat similarly Cook et al. (2012) state that it is difficult for a house builder in new housing developments to acquire sufficient competence for PSS. Brady et al. (2005a) and Johnstone et al. (2007; 2008) have also studied the UK specific environment and concluded that the driver for construction companies in the UK to move towards PSS offerings is the increasing number of PFI projects. Goodier et al. (2006) on the other hand are more interested in procurement and its future especially in healthcare construction business than in addressing PSS in construction business. These are aspects that need to be acknowledged when considering following points.

When weighing on differences between construction companies and other traditional goods manufacturing companies following elements have been found. Brady et al. (2005a) pointed out that usually capital goods industries have few large customers and suppliers with high interdependency but that construction industry is highly fragmented with few large companies and several customers and suppliers with low interdependency. In addition, they have noted other differences presented also by Green et al. (2004), which are that capital goods providing companies operate usually in global markets where as construction companies tend to focus on local markets and that construction is typically low-trust industry unlike capital goods industry which usually is regarded as high-trust industry.

Cook et al. (2012) have centered on differences in the willingness to adopt PSS between manufacturing companies and construction companies in the UK. Manufacturers saw a trend in service consumption of customers whereas house builder was not sure that there was demand that could be fulfilled with PSS. Manufacturers viewed long relationships with customers as a good thing but even though perceiving that it could provide information for new product development house builder viewed that it would conflict with strategy of completing sales. So the support for PSS from external environment was greater in manufacturing than in construction environment. (Cook et al. 2012) On the other hand, Johnstone et al. (2008) note that there are not only differences between the industries, but also within the companies among their different divisions.

These internal differences are easily observed in problems that both Johnstone et al. (2008) and Leiringer et al. (2007) have found in their researches. They both noted that their case construction companies were divided into separate divisions that had problems comprising truly integrated solutions for customers and working together. In addition, both cases demonstrated some problems in changing the culture towards more service-minded and customer need oriented. (Johnstone et al. 2008; Leiringer et al. 2007) Leiringer et al. (2007) stated that in their case organization two different cultures existed due to the culture transformation process. This is in line with problems of aligning organization in a new way to be able to construct PSS offerings and cultural difficulties faced in other industries as found out earlier. Johnstone et al. (2007; 2008) have also noted this consistency in general and in their research comparing construction, aerospace and engineering. According to them another problem in common for all three case companies from those different industries was the ambiguity around service strategy (Johnstone et al. 2007; 2008) which other researchers have also noted to be common problem when moving to PSS as noted earlier in chapter 2.5.

Even though differences between construction and other industries have been found it seems that the barriers in transition to PSS provider are rather similar to other industries. In addition, Cook et al. (2012) have found some similarities among manufacturing and construction companies considering PSS as a solution to problems. These are differentiating and achieving competitive advantage in mature aftersales markets. (Cook et al. 2012)

Construction as an industry is a complex area with various players. Even the term customer is not simple in this area. In a single project there are many parties that can be considered as customers and the final user of the building is not necessarily seen as one of them. (Perätalo 2010) For example according to Sariola (2013), when choosing the material and the supplier, there are three actors that have significant interest and influence over this: the architect, the developer and the structural engineer. Also the buyer and the authorities have a lot on influence but their interest in this is smaller. Suppliers, on the other hand, have remarkable interest in this decision but they do not have the influence. End users and contractors then do not have significant influence or interest in affection these decisions. This demonstrates the complexity of construction projects and industry. Multiple actors are affecting decisions and all these need to be taken into consideration when creating something new in this industry. (Sariola 2013) For example, Assaf & Al-Hejji (2006) have considered consultants as a major party in construction business and due to their important role the consultancy processes are discussed in the next chapter.

## 3.5 Consulting, its challenges and success factors

### 3.5.1 Focus and consulting process

This chapter focuses especially on the relationship between company personnel and external consultant. The reason for this is that the relationship plays important role in success of the consultancy effort. Literature focusing specifically on business model consulting was searched but these articles seem to be very rare. These were searched by using “business model” and some form of word consultancy (ie. consult\*) as search words. Articles which had these words in abstract and to which researcher had full paper rights were searched. From Science Direct 15 articles were found and none of these were relevant for this study and from ProQuest 53 articles were found out of which three seemed to be relevant based on abstract but in the end turned out not to be that. Problem seemed to be that many articles dealt with business models of consulting companies or used term business models without really meaning those.

Even though Pellegrinelli (2002) has brought up how important interaction between a client and a consultant, the persuasion and influence, and the consideration of cultural issues are stressed in many best practice books, it has been noted that according to many authors management consulting, even though significant and sizeable industry, lacks empirical data from practices (Appelbaum & Steed 2005). Pellegrinelli (2002) has offered a reason for this; according to him both the consultants and their clients are unwilling to open up about their relationships and the way these affect the interventions. He also described how this impairs both the academic area such as theory development and rigorous analysis and practice where both managers and consultants are left in dark. (Pellegrinelli 2002) In addition to these, Christensen & Klyver (2006) brought up how the gap of mutual understanding and insight is highlighted in many contributions.

Consultancy can be seen in many ways. Pellegrinelli (2002) has described ideal process consultancy to have a kind of a helping role. In this process ideally the consultant and the client seek to identify problems and find solutions to these together and the consultant should facilitate client’s understanding of the problem and about reaching the solution. Solution then is diagnosed and developed together. The reality of the consultancy processes is different. There are multiple different kinds of models for consultation of categories of consultants (Pellegrinelli 2002; Appelbaum & Steed 2005; Edvardsson 1990)

Both Appelbaum & Steed (2005) and Pellegrinelli (2002) have presented Nees & Grenier’s (1985) original categorization, which includes five different types of consultants, namely: mental adventurer, strategic navigator, management physician, system architect and friendly co-pilot. The first one deals with intransigent problems and in addition to leveraging his/her own experience, applies rigorous economic methods. Strategic navigator uses rich quantitative information about the market and competitive dy-

namics and does not concentrate on clients' perspective that much. Management physician then again seeks in-depth understanding about client organization and relationships in it and is ready to lose some objectivity to secure realistic perspective. System architect is specialized to redesign systems processes and routines in close liaison with his or her client. Friendly co-pilot works as facilitator for senior managers and does not seek to provide any new information. (Appelbaum & Steed 2005; Pellegrinelli 2002)

In more task based level Turner (1982) has listed eight fundamental objectives of consulting. According to him these in hierarchical order from lowest to highest level are providing information to client, solving client's problems, diagnosing problems, which might have to be redefined, making recommendations based on the diagnosis, assisting the client with implementation of recommended solutions, creating consensus and commitment around the corrective action, facilitating client's learning i.e. teaching clients to resolve similar problems and permanently improving organizational effectiveness. (Turner 1982)

Nevertheless Pellegrinelli (2002) has noted that central to the consultancy process is not knowledge or techniques used but rather the concept of performance and the relationship created between the consultant and the client. Also Edvardsson (1990) has noted that consultancy is people intensive and the client usually has direct and active role in the production of this service. Thus effective interaction and communication between consultant and client both professionally and socially are required for good results. (Edvardsson 1990)

### **3.5.2 Difficulties in consulting**

There is multitude of problems in consulting identified in the current literature. Some of these are related to the nature of consultancy. For example according to Appelbaum & Steed (2005) the concept of the client is complicated; there are several different contact persons and levels and thus it seems as there is several customers. They also note that these different customers can have different expectations, needs and degrees of participation in the consultancy, which makes it difficult to define the desired outcome. Additionally, Christensen & Klyver (2006) has brought up the difficulty of defining problem and shaping a learning organization, which can be seen to be related to earlier notion.

One of the problems in between of the client and the consultant is called implementation gap. Schaffer (2002, p.xi) has defined it to be the difference between what the client should do to follow consultant's proposition and to be able to benefit from the consultant's work and what the client is actually doing. This hinders the benefits of the consultancy process. (Schaffer 2002, p.xi) Another this kind of problem is the dialogue between the client and the consultant. According to Christensen & Klyver (2006) the dialogue can be stuck between two very different views because the consultant, according

to their study, focus on limits of his or her profession whereas the clients are more focused on the context of their own business. These views differ for example in terms of how what is rational is perceived, degree of abstractness and situation specificity. (Christensen & Klyver 2006)

Then again there are also problems that are more bound on consultants and what clients think of them. One of these is the way customers see consultants. There are lots of negative impressions, and according to Dupree (1999) this makes the task of building a relationship between the client and the customer difficult but even more important. He has also noted that much of this criticism about consultants is not due to bad service or products but more about consultant's violation of behaviors and values, failing in creating a trusting relationship and in sharing their skills. (Dupree 1999) Edvardsson (1990) has noted the problem with letting customer expect too much from the consultancy process. If at the contract making phase the consultant does not explain what can and cannot be done but lets the client expect too much from the project it can result in client perceiving quality or the service itself as a bad. (Edvardsson 1990) Appelbaum & Steed (2005) have found in their research based on survey done in telecommunications organization support for the claim that consultants often already have a solution in mind and that they do not customize their solution enough or that they use cookie cutter approach.

On the other hand Dupree (1999) has noted that not only consultants are to be blamed but also clients contribute on their bad experiences, for example by avoiding responsibility and not considering different aspects enough when hiring a consultant. Edvardsson (1990) has also brought up how the clients might have difficulties in communicating their requirements and expectations in buying phase to the consultant, which again can cause problems with problem definition and in the end in receiving desired outcomes. Another example of client based problem is presented by Linstead (1983). He calls it management's right to manage, which can for example cause restriction of certain areas of investigation or data-gathering or in explicit circumscription. In his example case some questions needed to be deleted from questionnaire and even comments dealing with topic of those questions had to be ignored. (Linstead 1983)

One central problem slightly related to earlier is the external consultant's access to information. There can be problems with clients sharing their knowledge and confidential information during the project, which can be due to for example a poor fit between the consultant and the client (Compatibility Pays Off..., 1989). This makes it more difficult for the consultant to receive realistic understanding about the company's situation and it can hinder the consultants' work. (Compatibility Pays Off..., 1989) In addition to this, Edvardsson (1990) has seen consultant's access to confidential information that results from the project problematic. According to him, one reason for this is that with the consultant information from company can be transferred to the competitors even if consultants do not discuss about their clients. (Edvardsson 1990)

Linstead (1983) has also described problems specific to situations where a student or otherwise inexperienced person is working as a consultant. One of these problems is the credibility. For student consultants it is difficult to establish this credibility since their competence is not tested and can even be questioned, whereas more experienced academics and consultants can establish this with experience, qualifications and publications. (Linstead 1983) This notion is supported by Chalutz Ben-Gal & Tzafrir (2011), who noted that organizational seniority and age are useful for creating credibility. More practical problem from Linstead's (1983) case was the lack of information or knowledge. For example going into a starting meeting the student consultant did not know to expect what was there. There were multiple people representing client at the meeting and they had very strict plan for the meeting. This surprised the consultant and caused him troubles by changing the state of the situation from consultant helping the company to the company kindly letting student do his project. (Linstead 1983) These are some of the problems present in the consultancy processes.

### **3.5.3 Success factors of consulting**

There is rather much discussion in current literature about what is needed for successful consulting process. Many of these aspects can be clearly seen coming from the difficulties discussed in previous chapter, like for example the need to consider not only what consultants do for their clients but also how they work with them (Dupree 1999) and the need to plan the consultancy process properly (Appelbaum & Steed 2005; Edvardsson 1990). In the current literature there are also different listings related to successful consulting presented. For example Appelbaum & Steed (2005) have created list of nine success factors based on their literature review. These are:

- competent consultants;
- an emphasis on client results vs consultant deliverables;
- clear and well communicated expectations and outcomes;
- visible executive support;
- an adaptation to client readiness;
- an investment up front in learning the clients environment;
- defined in terms of incremental successes;
- real partnership with consultants; and
- inclusion of the consultants through the implementation phase. (Appelbaum & Steed 2005)

On the other hand based on their survey study they have identified six variables, with which they were able to predict overall rating for project success. These variables, in order of importance are:

- the solution took into account our internal state of readiness;
- the project included prototyping new solutions;
- the project deliverables were clear;

- the consultant partnered with the project team throughout;
- the consultant was professional; and
- the consultant understood our sense of urgency. (Appelbaum & Steed 2005)

There are clearly some similarities between their listings based on literature and real case, such as the consultant's professionalism, cooperation between the clients and consultants, and the knowledge about the client's environment and taking in into consideration. All these have also been highlighted by Edvardsson (1990). Furthermore, the earlier mentioned need for planning can be seen from both as the need to define outcomes and as a need to have clear deliverables. Also Djavanshir & Agresti (2007) have highlighted the need to make sure both the customer and the consultant understand the problems similarly.

Christensen & Klyver (2006) have noted that also the client's resource engagement affects the performance of the consultancy process. Also Edvardsson (1990) has supported this. He noted that the client should involve members of own organization in the process. According to him this can result in more positive commitment to process, which then again affects process outcomes. (Edvardsson 1990) It has also been presented that the client should place one or several members of their organization into working team of consultants. This lets the client company to monitor what is going on. In addition it helps to transfer expertise from consultants to the client organization and prevents "us versus them attitudes". Another practical advice from Fleming is that formal progress reviews should be held at specified intervals but in addition to that he states that also informal communication between senior members of the consultant team and the client management should exist (Compatibility Pays Off..., 1989).

In addition to previous points, some interesting notions have been presented by Chalutz Ben-Gal & Tzafrir (2011) and Appelbaum & Steed (2005). Latter have in their research observed that in their case organization employees did not feel that the use of consultants would have improved their competitiveness, performance or capabilities. This is one of the few studies that takes stand on this subject and it is, as earlier mentioned, implemented as a survey and thus its results are based on subjective opinions. In addition to this none of the studies presented here considered these factors. Furthermore, the study by Chalutz Ben-Gal & Tzafrir (2011) was another that used any quantitative data. They had another interesting point; they noticed that even though it has been claimed that reputation of consultancy company affects the success of organizational change, in their study they did not find relation between consultancy company's high level of networked reputation and higher levels of commitment to change. As the main focus of this research is in relationships between consultant and client these are discussed in the next chapter.

### 3.5.4 Relationships

The importance of relationships between consultants and clients for the success of the consultancy process has been highlighted by several authors. For example Pellegrinelli (2002) has noted that best practice books deal mostly with the interaction between the client and consultant organizations with central theme of recognizing cultural issues and the importance of persuasion and influence. In addition to organizational level influence on relationship also personal relationships have to be considered (Chalutz Ben-Gal & Tzafrir 2011).

Chalutz Ben-Gal & Tzafrir (2011) have emphasized the role of consultant and his or hers personal rapport in creating commitment. Also Pellegrinelli (2002) sees this consultant client relationship as important because it is central in taking care of tensions and differing views arising during intervention. This relationship and collaboration has also been highlighted by Edvardsson (1990), Christensen & Klyver (2006) and Djavanshir & Agresti (2007). The importance of consultants ability to create good rapport can also be found in Crane & Clarke (1988) observation that because, clients may have a need to evaluate something that cannot be seen, by what the client can see. In this the point is that people delivering the services can be seen and the service can be evaluated based on them, and thus the “people involved in delivering the service are, in essence, the service”. Pellegrinelli (2002) has also explained possible negative effects of a poor relationship and bad fit between the client and the consultant. He has noted for example the possibility that disaffected parties try to marginalize the intervention and reduce its affects. This can cause “not invented here” and “force fit” –attitudes and thus lead to resistance and inertia. This can culminate in formal recommendations being rejected. (Pellegrinelli 2002) Thus the relationship between the consultant and the client is significant for the success of the consultancy processes.

It is important to know how consultant client relationship is described. Djavanshir & Agresti (2007) see that relationships should be based on professional behavior and effective communication. According to Appelbaum & Steed (2005) it is complicated, fluid and characterized by high degree of mutual trust. Pellegrinelli (2002) then again notes that this relationship can be seen as “on-going attempt to secure client’s dependency on the consultant” and that it is characterized by accommodation and mutual influence. He has also stated that clients and consultants “are best characterized as simultaneously dependent and self-assertive, anxious and self-confident, sharing and balancing control of the interaction and primacy of world-view.” According to him there is need to balance the control because if there is lack of balance, the process is unlikely to lead to sustained change within the organization. (Pellegrinelli 2002)

During the consultancy process different exchange episodes modify the interactive atmosphere of the consultancy process, and the client and consultant have to make mutual

adaptations during this process (Christensen & Klyver 2006). Chalutz Ben-Gal & Tzafir (2011) have highlighted the need for having ability, harmony and integrity from client to consultants. According to them, this helps to achieve trust, which then through higher commitment levels affects the success of organizational change process. Trust and commitment are central aspects in creating this relationship and thus those are examined more closely. (Chalutz Ben-Gal & Tzafir 2011)

Trust affects consultant client relationship in two levels: organizational and individual. Chalutz Ben-Gal & Tzafir (2011) have noted that trust in organizational level is of fundamental importance and it is needed, among other things, to achieve contract. In personal level they have noted that according to studies “out of all influencing factors, the success of the consulting interaction is dependent upon the highest levels of trust”. In addition to this, they have listed multiple earlier found ways through which trust has positive effect based on their literature review. It reduces transaction costs, affects managerial problem solving, risk taking and affective commitment. (Chalutz Ben-Gal & Tzafir 2011) Also Fleming has brought up the how the trust between the consultant and the client affects successful implementation (Compatibility Pays Off..., 1989).

Chalutz Ben-Gal & Tzafir (2011) have also noted that at least in two broad researches the positive correlation between trust and affective commitment has been observed (for instance Herscovitch and Meyer 2002). They have also noted that consultants and clients believe that mutual commitment has significant effect to the potential success of the change processes. One reason for commitment’s mediating role is that it integrates organizational level and firm level. Still in their study Chalutz Ben-Gal & Tzafir (2011) observed that even though their results support earlier notions about high level of consultant commitment improving successful implementation, they did not find the same effect with client commitment. (Chalutz Ben-Gal & Tzafir 2011)

In current literature some discussion about how to improve consultant client relationships exists. Djavanshir & Agresti (2007) have in their article, focused on IT consultants, emphasized the meaning of consultant’s communication skills and that these need to be good. Thus these need to be improved where needed. Hiebert and his colleagues have presented practices for creating good rapport (see Djavanshir & Agresti 2007). These practices include using informal conversation and consultant seeking to include topics of interest to client in informal conversations, listening and acquiring understanding of client’s needs, expectations and priorities, respecting people’s sociocultural values and seeking to establish informal communication styles. (Djavanshir & Agresti 2007) Also from this listing the meaning of communication can be observed.

On the other hand, also the negative effects from strong client consultant relationship are observed. Czerniawska (2006) has stated that this can place too great a burden on a single consultant. Consultants can end up with too much work or committed into pro-

jects on areas that they do not have expertise. She has also stated that companies can use consultants as line of defense; they can be blamed when consultancy projects fail. Furthermore there are negative effects also for the consulting company. (Czerniawska 2006) Djavanshir & Agresti (2007) have oppositely to Czerniawska observed in their study that usually negative experiences about consultancy projects are described in organizational level not at personal level. Czerniawska (2006) then has also brought up the problem of company being too much dependent on few people; if these people leave the firm, they will take their clients with them. Another negative effect for the company presented by her is that the positive effects personify in the individual who does the consulting and thus the company will never have more than a supporting role. (Czerniawska 2006)

Relationship between client and consultant	Concept of client	Cooperation with client	Consultant
<ul style="list-style-type: none"> <li>• Good rapport</li> <li>• Taking care of differing views</li> <li>• Trust, in individual level but also company level</li> </ul>	<ul style="list-style-type: none"> <li>• Several contact levels and persons -&gt; several clients</li> <li>• Different customer expectations</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation gap</li> <li>• Dialogue between client &amp; consultant (differing understanding)</li> <li>• Clients perception of consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Considering clients values and behaviours</li> <li>• Use of uncustomized solutions</li> <li>• Letting client expect too much</li> <li>• Communication skills</li> <li>• Need for commitment</li> </ul>
Access	Practical factors	Inexperienced consultant	Client
<ul style="list-style-type: none"> <li>• Access to confidential information resulting from the project and needed during the project</li> </ul>	<ul style="list-style-type: none"> <li>• Problem defining</li> <li>• Need for planning</li> <li>• Need to define outcomes and deliverables</li> <li>• Use of formal progress reviews</li> </ul>	<ul style="list-style-type: none"> <li>• Establishing credibility</li> <li>• Lack of information and knowledge: what to expect etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Avoiding responsibility</li> <li>• Communicating requirements is hard</li> <li>• Management's right to manage</li> <li>• Need for commitment</li> <li>• Resource engagement</li> </ul>

**Figure 10:** Challenges and factors affecting the success of consultancy recognized in the literature

As observed, there are many difficulties in consulting and the role of communication and personal relationships is highlighted. These relationships then again have their own problems and risks which have to be taken into consideration when using or employing consultants. It needs to be noted that due to the limited amount of found articles in academic papers also journals such as Consulting to management (Czerniawska 2006), the Journal for Quality and Participation (Dupre 1999) and IT professional (Djavanshir & Agresti 2007) have been used, which causes some problems with reliability of these notions. As a summary, difficulties and factors that affect the success of consulting are presented in Figure 10.

## **4 RESEARCH METHODOLOGY**

### **4.1 Choices in methodology**

This research was implemented as a qualitative study due to the nature of the research questions and topics. To understand attitudes surrounding services and to analyze the relationship between researcher and clients, qualitative study was seen necessary. In addition, due to the fact that this research was implemented as a single case study the needed volume for reliable quantitative research in determining external researcher's role or companies practices in business model development was not achievable.

Single case study was chosen to be the research method of this study. According to Yin (2009, p.18) a case study is an empirical inquiry, which "investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". Case study as a research method allows the researcher to acquire meaningful and holistic characteristics of real-life events. One reason for choosing a case study can be that researcher has access to knowledge through interviews and observations, but does not have the possibility to manipulate relevant behaviors. (Yin 2009, pp. 11-12) This was the situation in this case. In addition, this study focused clearly on contemporary events, which was other aspect that made the choosing of case study methodology possible (Yin 2009, pp.11-12).

Literature in this study has been used as supporting material. The study was inductive, it was implemented in a manner that taking the field observations was started and during the progress of the study more ways to acquire information were created and the implementation evolved. Even though in order to meet the aims of this study in some points current literature was studied before starting the project, it did not clearly guide the project. The role of the literature was merely to enlighten background and the phenomena under research. In addition, literature was used to compare results achieved in this study to what already is known.

### **4.2 The case company**

The case company, from here on called CompanyCo, provides raw material for the construction and mechanical engineering industries. Furthermore it provides building solutions such as frames and roofings. It is a large company with wide markets through Europe, Russia and emerging markets.

CompanyCo, like many other companies in construction business, is a product centered company with a willingness to adopt product-service systems to answer to the increasing competition. This competition is most intensive in bulk products that are now produced with necessary quality also in low cost countries and in Eastern Europe with lesser expenses and thus these can be sold with affordable prices. CompanyCo is not only creating more variety by adding more services into their offerings but also seeking for new business opportunities through new products. They are also actively seeking growth opportunities that can secure the profitability of company in the future.

To achieve aforementioned goals CompanyCo wants to take the traditional material they have been providing for long time for construction industry and bring the enhanced version of this material to construction industry. They have already provided this enhanced material for other industries where the use of it is significantly more economical than using the traditional versions of it. Still bringing it to conservative construction market is not an easy task and it needs a carefully considered business model. This study centers on the process of creating this business model.

### **4.3 Empirical information gathering**

The research was conducted as a multi-method qualitative study, which combines more than one qualitative data gathering techniques (Saunders et al. 2009, p. 152). The information used in this study was partly acquired by observation and partly by interviews. Some of the reasons for choosing interviews in our case were that those enabled covering several themes, some of which were of interest to our study and some to our case company and the need to acquire knowledge in different levels for different subjects. In addition, face-to-face interviews made it possible to interpret the reactions of interviewee in order to acquire realistic understanding of the current situation in the company.

Interviews were carried out in workshops specialized in steel construction. Interviewed companies were selected with purposive sampling due to the need to acquire information important for the case company. Thus interviewed companies were chosen from the case company's customers. From four companies eight employees were interviewed in six interviews. Thus in two interviews there were two interviewees present and in rest of the interviews only one. The interviewees were chosen so that they would represent employees responsible for procurement and production, because those were the people who were suspected to know most about the subjects in focus of this research. The interviews varied from 20 minutes in minimum to 50 minutes maximum depending more about the amount of opinions interviewees had than about the amount of interviewees present. In addition to these, formal interviews in four out of five factories of these four companies tour of the production facilities were also arranged and during this some additional information was acquired and later written up. Information about interviewees and interviews are presented in Table 2.

**Table 2: Interview information**

Title	Amount
Head of supplies	3
Production manager	2
Chief executive officer	1
Job planner	1
Head of product development	1
Duration	
20-29 min	2
30-39 min	2
40-49 min	2

The interviews were implemented as semi-structured interviews, which according to Saunders et al. (2009 pp. 323-325) are better than structured for example when there is need to ask open ended or complex questions, large number of questions or when there can be need to vary the order or the logic of the questions. Then again there were multiple themes that had to be covered and thus completely open in-depth interview was not an option. All the interviews were conducted face-to-face in companies' offices and also recorded. These recordings were then transcribed by transcription professional outside university. This was done to achieve better possibilities for analyzing the interviews. This way there was no need to write exact notes during interviews, which made it possible for interviewer to create better connection with interviewees and to better lead the conversation during interviews.

The interview dealt with topics that were in interest of the case company and also with topics useful for this thesis and for the project under which this thesis was written. In addition to these, some metadata was acquired about the interviewees and also the company and its customers were shortly described by the interviewees. Of the topics covered by these interviews, in the interest of this thesis is mostly the role of solutions and services in the companies' business and the attitudes expressed towards these. In results section names from I1 to I6 are used for these interviews and the interview structure can be found from Appendix 2.

In addition to workshop interviews two different more informal interviews took place at the end of this project. These interviews were held in order to acquire knowledge of the business model creation process from the parts that researcher were not involved in. Thus the two persons that worked with this project full time in the case company were interviewed. First of these interviews took about 35 minutes and the other one 75 minutes. First interview was conducted as a semi-structured whereas the other one was in-depth interview where course of the discussion was not determined. This was due to the need for questions in the first one, whereas during the other interview the questions

were not needed but the conversation took its own course which was informative enough. The first interview was recorded and transcribed but during the other one only notes were taken and filled after the interview. These interviews are marked by I7 and I8 in results section and the themes used in I7 can be found from Appendix 3.

In addition to interviews, another method used for acquiring information was participant observations. According to Saunders et al. (2009, pp. 288-289) this qualitative data collection technique emphasizes the meanings that people attach to their actions. It enables the researcher to also feel what is happening, not only observe it (Saunders et al. 2009 pp. 288-289). This observation was implemented with the researcher's role of participant as observer. In this role subjects are aware of researcher's role as an observer, which enables asking questions in order to achieve better understanding of the area under observation. In extreme case researchers role in this study could also be interpreted as complete participant in which case the subjects do not know the true purpose of the researcher's participation. (Saunders et al. 2009, pp. 293-294) This is because even though in this study subjects knew that researcher were conducting study they were not explicitly told that significant amount of the data gathered for this study would be observations.

Observations were chosen as a method because working in the case company's project enabled this method and was seen as a valuable way to acquire deep information about the project. Through this method the external researcher's role was examined and the process of business model creation was documented. These observations were mostly made in meetings with the case company's employees, but some notes were also made when other communication, such as phone calls or e-mail conversations with company's representatives, took place. There were a total of six meetings, two of which had at least four company's representatives present and the rest four meetings were held one-on-one with the company's representative. In addition, observations were made also from two interviews with company's representatives described in the earlier chapter. These observations were written up by hand after each meeting, at the latest the day after the meeting. Both primary and secondary observations were written but mostly the notes were experiential data, which describes researcher's experience, the views and feelings, of the process she was studying (Saunders et al. 2009, p. 296). Markings from O1 to O12 are used for observations in the rest of this work. A list of interviews, observations and documents is presented in Appendix 1.

#### **4.4 Analyzing the data**

The analysis strategy of this case study was to rely on theoretical propositions (Yin 2009, p. 130). For example, the research questions were used in organizing discussion and the interview frame for the interviews implemented in workshops were used in organizing the data. In addition, literature was used to achieve understanding about phenomena related to topics of the research, and these identified phenomena created certain

expectations for the researcher. This affected the interview frame, the research questions and the implementation of this study. It also had a role in the analyzing of the data because these images provided perspective into what to bring up from the data. Thus, even though these propositions were not made clear with hypotheses, those remained significant for the study.

Transcriptions enabled the use of Atlas.ti in analyzing the interviews, which made it easier to carry out the analysis of the interviews systematically. The term computer-assisted qualitative data analysis software (CAQDAS) is often used in this subject. These tools offer help to reliably process one's data but these do not do the analysis for the researcher. (Yin 2009, pp. 127-129) Organizing the information was implemented by using codes. Codes are way to categorize data before giving meaning for the information. It makes it easier to check whether interviewees have answered similar questions in similar manner. (Creswell, 2009, pp. 186-188) In this study the interview themes and bigger questions were used as codes and these were then defined more precisely to achieve needed precision, while coding the interviews. As codes were changed or new were added also previously given codes were checked. After this, coding between interviews was revised and brought into line. After this quotations with similar codes from different interviews were grouped and studied. The common themes and both differences and similarities were looked for, information under different codes were combined and meanings were searched. These quotations were also searched for possible attitudes toward services.

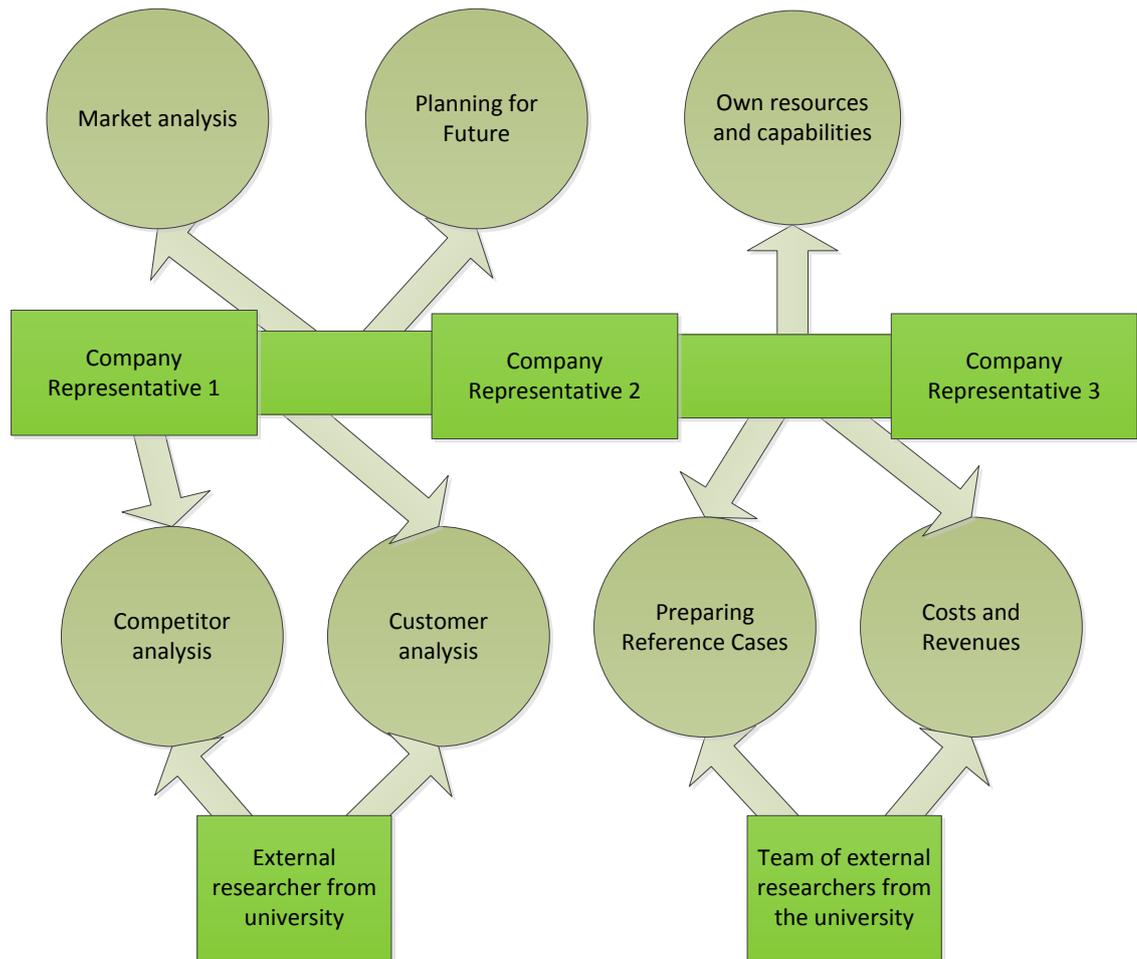
Observation data were used as they are in explaining the process of business model creation. All this data gathered from observations and some materials attached to those were combined to create chronological story as the results of this thesis. This narrative did not focus on comparing specific hypothesis or presenting causal propositions and thus it can be seen as chronicle (Yin 2009, pp. 148-149). These observation notes were searched for those that considered business model creation process and its difficulties and these were collected. In addition, the observation data were searched for material that was related to the cooperation between CompanyCo's representatives and external researcher. Themes that occurred often were then collected from these and challenges and advantages were mapped through this method. Through these methods some themes were brought into discussion section.

## 5 RESULTS

### 5.1 Background

At the beginning of business model development process, CompanyCo had an idea of using a certain material with new features in an area it had not been used widely before; this is construction. This idea was the starting point for this process. To understand this creation process, it is important to know that this material is difficult to define. There is a term for this enhanced material but this term includes several variations of this enhanced material. Furthermore, it is important to know which variation is meant because there is ambiguity in use of this term in current literature and there is need to know exactly which version has been used to make reliable comparisons.

The project was implemented in cooperation with Tampere University of Technology. It was executed by combining meetings and working separately. From CompanyCo there were three people who held the main responsibility about the business model development (I7) and a few people from the university helping through different parts of the project (I8). In Figure 11 these parties and the tasks they were involved in are described. Different parties are illustrated in rectangles and different tasks in circles. Arrows describe which party was involved in which task and the arrows from continuing rectangle combining the company's representatives describes the tasks in which multiple members from the company were involved in. These tasks are a single listing of things done during the project and it is not exclusive, instead there might also be other tasks not mentioned in this figure. This represents researcher's understanding about main tasks done during the process.



**Figure 11:** People involved in business model creation project and tasks they took part in

Through chapter 5 it can be observed that areas of business model development that the researcher was studying are covered more in detail than other areas due to the fact that the researcher had more knowledge about these. In addition, it is important to note that the word workshop in this study is used for companies that machine raw materials to produce elements not for interactive seminars. The rest of the results are arranged chronologically to open up the progress of business model creation process. Also aspects that were found during it with observations and interviews are brought up to give view into the implementation. Information acquired through workshop interviews is presented in its own chapter 5.3.

## 5.2 Researcher's view on new business model creation process in CompanyCo

At the beginning of the project CompanyCo had listed four tasks that needed to be done; these were market-/customer analyses, competitive analyses, identification and development of strategic options for future business designs and the identification of need for action and plan for implementation. (D1) In the kick off-meeting these tasks were allo-

cated also for the external researcher and the course of the business model planning was determined. There was a clear vision about what the researcher would do. Market and its segmenting and development remained inside company but competitive analysis was given for the external researcher. Certain questions concerning competitors were given for the researcher to study. These were such as to what extent competitors have used materials with rather similar features in construction purpose, what kind of services they offer and what kind of cooperation they are doing. (D2; O1)

There was also discussion about some materials that should be given for the researcher. One source for materials that was meant to be given for the researcher was CompanyCo's intranet. It was considered that somebody should go through materials in there and see what could be of use for the researcher and thus should be given for her. Another material that was supposed to be sent to the researcher was an earlier study done by the company concerning the area under inspection. Furthermore, some other materials were considered but towards the end of the meeting when the researcher asked about the materials, those were not listed anymore as something that should be given for her. In addition, the background and the situation in general was discussed and the company shared some knowledge that they had about how the material could be used and where it might be useful. In this context one challenge that the company had identified was the regulations, such as those linked to the Eurocodes, which change slowly in the construction industry and give limitations to how well the features of new materials can be used. (O1)

This was the researcher's first contact with the company and the first meeting as a researcher. It affected the meeting because she did not know what to expect or what was expected of her. She also did not have previous experience about the company or the industry. Furthermore, the company representatives did not seem to know much about the researcher either. This was also observed in the challenges related to knowing what the other party knew and in understanding others' point of view and capabilities. As an example it was difficult for the researcher to follow part of the discussion at the beginning due to the complex professional terms. It also made it challenging for the researcher to take part in discussions. (O1)

After the first meeting, the researcher worked on finding the information to answer the questions given by CompanyCo and to achieve sufficient understanding about the industry and specially this material and how it is used in construction. Creating competitor analysis required lots of background material searching and determining terms. It required going through websites of multiple companies and searching for news or other sources that discuss the use of this material in construction. In addition, it required doing searches for journal articles about the use of this special material and the difficulties and advantages the usage of it could cause. (D2) About a week after the kick off-meeting the researcher had not received materials discussed in the meeting. Thus she

asked CompanyCo's representative for those. Instead, she received an example slideshow and an advice to look for that kind of material from competitors' website. (O2) This was already discussed in the first meeting and thus the researcher had already been looking for this kind of material.

Searching for the needed information was not easy. In the literature, there was ambiguity around specific terms that were central for this analysis, which then affected the interpretation that was made from different websites and news. For example, what was meant with one central term differed depending on when the article it was used in was written, because of the progression in using and creating this material and different versions of it becoming more common. Of course this was not clear at the beginning and even realizing this took time. (D2)

After reading and working on this analysis for some time the researcher sent a short version about what she had found to the company's representative with several questions about content and the way it should be reported. This was discussed on phone, where the problems with specific terms were again noticed. Translations from dictionaries can have very different meanings when compared to the word in Finnish and without proper understanding of the industry this is impossible to know. Additionally, the researcher sought to establish an idea about what could be done after the competitor research but that was left open. Furthermore, some questions presented in email or otherwise were not discussed but a meeting with other company representative was arranged. (O3)

The next meeting, a week after the phone call, was very useful from the researcher's point of view. Some terms were discussed and it was found out that terms, which were extremely central for the project, were not that clear for the company either. These were then discussed and some common understanding was created, not only about key terms but about interests of CompanyCo and the subject in general. In the meeting the external researcher and the company's representative together went through the material found by researcher which gave better understanding about what was of interest for CompanyCo. There were moments when while showing some material for completely different reason the company's representative was excited that this other information in the same material was extremely good and the researcher had not even thought that it could be in the focus of the company. (O4) In addition, during the discussion it was found out that the questions that were given to the researcher in the first meeting were only partly of interest to CompanyCo and some completely new questions were made. These questions differed from the earlier ones significantly because the nature of those was not as competitor centered but more focused on the enhanced material and its use around the world. In other words, there were almost three weeks seeking information that was only partly usable. (O1; O4)

After this meeting one-on-one –meetings were held more often during the creation of competitor analysis. Also other communication was increased with the one representative from the company. For example, e-mails were exchanged when the researcher was asking whether the company had rights for certain articles or when the company's representative needed help with a presentation (O5; O8). Furthermore, other questions were discussed both in e-mails and phone calls. This enhanced the information flow and less useless work was done due to not knowing what the company really wanted. (O5)

The researcher continued to do different searches to acquire the needed information to answer the new questions. Additionally, the articles already found and read needed to be studied again to find out whether those could help with these different questions. Furthermore, more publications were looked for. Difficult part here was that the kind of information needed was not available; figuring out whether certain material was used in some buildings somewhere in the world was difficult. Even if a building was found that was said to use this enhanced material, to specifically know which variation of this material it was was difficult and in some cases with the current resources impossible. (O4; D2)

At the second one-on-one –meeting two weeks later, it was found important that the researcher understood what company wanted. In this meeting the basic understanding created on the earlier meeting helped and thus challenges related to this were not significant but still had an effect. Discussing better about exactly what this information was wanted for, made it easier for the researcher to understand what was needed. Furthermore, during this meeting the researcher really understood the importance of close cooperation between an external researcher and the company's representatives. It needs to be made sure that both parties understand things similarly and are in consensus about what needs to be done and what is meant to achieve. Also, some new questions were raised in this meeting again for example about how a certain property of this material had evolved in history. (O6) Thus the researcher went through the material she had already found for the third time and looked for more from the internet.

After this the next one-on-one –meeting was held rather soon, a week later. Again a new question related to pricing was formed and the material gathered had to be looked through again for the fourth time. Additionally, some new searches were made. This time it was done during the meeting, which ended up being rather long. According to the company's representative this search was enough for this question due to the nature of the question. Even though the meeting was long it was useful because in that meeting both parties got to do searches and both used different kind of logic to find the needed information from different sources. This in turn clearly showed how parties had different ways to see things and thus they looked the information about the same subject a bit differently. The researcher noticed that this kind of meeting at the beginning of the process could have been useful. After familiarizing shortly with the subject, this kind of

meeting would have given the researcher clearer idea about what to look for and how the company sees things. (O7)

Different ways to see and interpret things evoked discussion and differing views were expressed. On the other hand, views were not radically different and at some cases they were due to misunderstandings, thus these were easily dealt with. In addition, the one article, discussed earlier in the e-mails and to which the company had rights was also shortly discussed. At the end of this meeting the main themes to be included in the presentation were decided. Furthermore, the way in which parts of the information were to be presented was discussed and even on this subject there were some differing views. In addition, it was agreed that the researcher would create the first draft of the presentation. (O7)

After this, the researcher created the first draft of the presentation. This draft was then improved by both the company representative and the researcher during a one week. It was sent back and forth in e-mails and some modifications were made to it. The researcher was even a little surprised about how much time and effort were put into finalizing the presentation. It gave the researcher an idea about how important it was that the slide set would be extremely good and furthermore about the importance of the task. As a whole in the competitive analysis competitors and their offerings in the area of interest were studied and by studying the current literature and different websites the usage of this kind of enhanced material in buildings in different parts of the world was also mapped. In addition, some price information from different years was gathered and the development of this material was examined. (O8; D2)

The competitor analysis process was finished for the intermediate meeting which took place two weeks after the third one-on-one –meeting. In this meeting there were four representatives from the company present and two external researchers: the researcher who had been working for this project and a second researcher who had not this far participated in the process but was at Tampere University of Technology overseeing the project as part of which this cooperation was done. In this meeting the main elements of the project so far were presented and discussed. Only part of the competitor analysis presentation was included but there was also conversation about markets and potential of this material. This then opened up a bit what the others had been doing during this time. Before that external researcher had not known what else was happening in the company but had rather blindly just done the competitor analysis. (O9)

After discussing what was already done there was a conversation about what should be done next. At this point the second researcher took a facilitating role. She made the company representatives think their potential customers and even further customers of their customers and what those might want from buildings, what could be the thing that they were willing to pay for. This way some classifications were made and fresh view

was brought into the discussion. In addition, some concrete decisions about what should be done next were made. Especially the customer view, which until this point was not discussed, was now under examination. Some points were brought up about different customer groups and the challenging structure of industry where demand is not just defined by those who pay but where there are different parties who can affect the success of a project. (O9)

One challenge that was discussed was that customers might not be willing to choose the enhanced material if there is not enough providers to choose from. Thus there is a great deal of work to be done to assure different parties to use these materials. Furthermore, it was acknowledged that there will be a need to be able to support and direct different parties in complex network in order to help the adoption of this material to the construction industry (O9)

The two mostly discussed parties were structural designers and workshops operating in construction business. These two parties have significant role when bringing this enhanced material to markets. Structural engineers need to be taken into account because if there is no one who is willing to design building structures with this material, it cannot be taken to the market. On the other hand, customers are probably not willing to choose this material for their buildings if there is only one party who can provide frames and other parts made of it since those could not be invited to tender. Thus it is important to make sure that workshops are able and willing to use this material too. Due to this it was decided that these parties need to be taken into account during business model planning.

CompanyCo decided to use their existing communication lines to figure out attitudes of structural designers. Then again, it was decided that the external researcher should implement interviews with workshops. One reason for this was that the workshops would probably be more open to discuss with a researcher than with CompanyCo representative because these companies are both their customers and competitors. (O9) Before this meeting the researcher was completely in the dark about what she would do after it and what kind of research possibilities she would have because the company representative had few times noted that there were no need for certain tasks, such as internal interviews or interviews with customers, even though the researcher had suggested these (O3).

Interviews were carried out to determine the readiness and willingness of workshops to move into using this enhanced material. Furthermore, these interviews were implemented to figure out what kind of services workshops might need in order to accept this material into their production and what kind of boundary conditions workshops have for adopting this material. In addition, these interviews were used to map how these traditionally very product centered companies use services or PSSs in their operations. Also, their purchasing practices were discussed shortly. When preparing these interviews

some of the questions were already made by CompanyCo representative but the researcher got to complement and modify these. Thus a wider and more thoroughly thought question set was made. (D3; O9; D4)

From CompanyCo the researcher received list of 10 companies out of which one was later on dropped out by CompanyCo. These companies were chosen so that they were or had been CompanyCo's customers. The researcher contacted these nine companies, three of which were not interested in this research due to unknown reasons and two answered that they did not see this relevant to them, since they did not have interest to use this enhanced material now or in the future. This already gave was usable information about companies attitudes. In the end there were four companies, which were willing to participate in the study. (D4)

The usefulness of the external researcher was also observed during the interviews; mostly the interviewees were open and discussed rather freely about things that one can reasonably suspect they would not have discussed if the interviewer was their competitor, for example what they think about CompanyCo and how they see their services. This made it possible to ask questions that could have been difficult for CompanyCo personnel. (D3; D4)

After the interviews were implemented the researcher analyzed these as described previously in chapter 4.4. During this analysis the material was divided into different parts. First of these considered the enhanced material and thus things that were of interest for CompanyCo. Second part covered workshops' attitudes towards services. These parts were analyzed with rather similar pattern but separately. In the next chapter 5.3 the results from the analysis of second part are described more thoroughly. Results from the first part are shortly described here because only the nature of the knowledge acquired is in the scope of this study, whereas specific information about what was found is not relevant for this study.

Through interviews information about what kind of changes the workshops would need in order to be able to use this enhanced material was acquired. In addition, knowledge about how many of the interviewees saw that this material had potential now or in the future and how many interviewees saw that their company could start using this material was gathered. Furthermore, possibilities for different services related to the adoption of this material in workshops were identified and aspects that would increase the workshops' interest in using these materials were searched. The interviewed companies had diverging views on the use of this enhanced material. Some saw it as a source for competitive advantage and were interested in its possibilities whereas others saw it as something they will not even bother thinking, because they saw that they will not be using it in the future either. On the other hand, what became very clear through these interviews

was that certain services would be needed in order to get the workshops to use this material. (D4)

These results were then discussed with the company's representative in the last one-on-one meeting. Rather much of the acquired information was as they had suspected it would be but this study provided needed confirmation. Some parts of the results evoked conversation and all of the results were discussed rather thoroughly. In addition, in this meeting the researcher was provided with very general understanding about what was the situation of the project. In this point the knowledge sharing was found important. There was some discussion about some calculations but these were not presented because it was regarded as confidential information, which therefore could not be shared with the researcher. Similarly only very shallow picture about what was happening now was provided. (O10).

In addition to the tasks that the external researcher did, CompanyCo was studying other areas needed in the creation of the business models. Information about what these areas were was mostly acquired through the last two interviews and some notes from the earlier meetings that described what else were happening during the project. Thus this information cannot be represented with the same precision used with presenting tasks done by the researcher.

One of the tasks that CompanyCo was doing was creating a market analysis. It concentrated largely on the analysis of the current market situation and potential market value of possible new products made of this enhanced material. Additionally, CompanyCo saw how the customer could benefit from using this new offering and then again what the company would achieve by providing this offering as important factors to be determined. (I7) In addition, CompanyCo's own resource and knowledge base was evaluated and CompanyCo's representatives have, for example, visited their own workshops in order to do this. Furthermore, they have seen it extremely important to study the handling and machining of this enhanced material, for example determining how fast it is compared to the traditional version of this material. CompanyCo has also started to prototype the use of this material in a few projects; they have calculated the offerings and are now testing the use of material. They wish to get good reference projects from these. They have also created implementation plan based on information acquired in these different analyses (I7). (I8)

The last part of this information acquiring process was the two interviews implemented for the two persons in CompanyCo responsible for this project and who the researcher had not worked closely with. When interviewing the CompanyCo personnel they did not perceive problems in the process of business model creation at this point. However, one challenge that was observed was the fact that one cannot acquire all the information they wish to have and there is always a need to make own deductions but this was re-

garded as common in most of this kind of projects (I7). The other interviewee even noted that this project had gone perhaps even a bit too well and that it can cause them to be maybe even too excited about the idea, which then can affect the ability to be critical enough (I8).

Furthermore, the nature of this process was discussed with one of the interviewees. He explained that to his knowledge this was rather similar with other this kind of projects in the company, though there can be some differences between the processes. He, additionally, explained how they have guidelines for this kind of processes, but those are merely used as a checklist for the areas that need to be covered in the process. Due to this there can be variance in the different development projects in the company. Furthermore, he explained how the individuals involved in the project always shape the project, which again creates variance between the development projects due to the fact that people involved in these vary as well. (I7)

One big difference between the two interviews was in how much information was received. In the first interview a rather restricted view on the project was given. For example, when there was discussion about the future of the project and the direction that it was going to take the information was not shared with the researcher (I7; O11). On the other hand in the second interview this was opened up a bit by interviewee showing a slide describing the road map for this project. However, when the interviewee shared this it was presented shortly and among abundance of other information but nevertheless, it helped the researcher to achieve a better big picture. (I8; O12) In addition, in second interview some tasks that company had done were mentioned that did not come up in the first interview. Such tasks were for example the studying of their own resources and readiness to use this enhanced material and the active seeking for reference projects. (I7; I8; O11; O12)

### **5.3 The role of services in companies' business and the attitudes towards these in the workshops**

In this chapter the information related to the role of services and the attitudes towards those acquired in interviews is presented for the part that is clearly in the scope of this study. This part discusses the role that services have in the business of workshops and the attitudes expressed by the interviewees. The workshop interviews included one section that considered services or solutions offered by the workshops and to them by their suppliers. This included questions such as "What kind of services or solutions your company provides now?", "Have customers requested services that have not previously been in your offering?" and "What kind of services the supplier companies have offered to you?" a full question frame for these interviews is presented in Appendix 2.

Some quotations are taken from interviews and because interviews were carried out in Finnish, these are naturally translated. Thus the used words and expressions are not exactly the ones used by interviewees. However, in these translations the author has aimed at maintaining the original meaning of statement. In the quotations taken from different interviews, in brackets some clarifying information is presented about what the interviewee meant by what she or he said or by unspecified words. Hyphen then again has been used to express parts where part of speech has been left out from the citation, due to long, redundant or unclear explanations.

All four companies that were interviewed produce some kind of services to their customers (I1; I3; I4; I5). Mostly these are traditional services associated with steel construction, such as planning and assembly, which all of the companies provide (I1; I3; I4; I5; I6). For example when one interviewee was asked to describe their company's products and services he had a clear answer: "Particularly, those are planning, manufacturing and assembly". Still, none of the companies does the structural design themselves; instead they use large specialized engineering design bureaus to do this (I1; I3; I4; I5). One interviewee described it so that: "We do not wish to start competing with engineering design bureaus. Rather we collaborate with them". (I5) As an exception one of the companies designs certain products always by themselves because those are their own specialized product (I5).

Two companies, on the other hand, do facade design and covering design in-house (I1; I4): "We do covering dimensioning ourselves and then also in facade projects we have almost completely our own design" (I1). In addition, one company also has their own architect (I1). Furthermore, assembly is done both in-house and by subcontractors. One interviewee noted that they use both own assemblers and subcontractors (I6) and two others explained that in their company it is done solely by subcontractors (I3; I5). As I3 explained: "So planning comes from subcontractors, surface handling from subcontractors, assembly from subcontractors, so that our own operation is the assembling that is done in here (at workshop)."

According to the interviewed companies, customers do not usually ask for new kind of services (I1; I5; I6). This might be due to the conservativeness of the construction industry or it might indicate that the interviewees have trouble perceiving services or differentiating the origin of service idea. Still the interviewees identified differences when comparing service needs of divergent customers (I1; I2): "Of course it depends on who the customer is, is it - a building firm, developer, someone like this" (I1) and "Yeah, well, the customers, they differ significantly" (I2). Furthermore, I2 brought up interesting views about the future of the industry. He noted that there seems to be decrease in the demand for their basic products and competition with price seems to be increasing due to importing products from low-cost countries. This had affected their strategy, which can be observed on their stance towards services.

The stance towards services or PSSs varied between companies. One interviewee identified that in their company there was a clear trend towards more service oriented business: “Actually we have set up a unit that actively looks up for this kind of (turn-key) project possibilities and we are seeking to enter the markets also as a turn-key supplier” (I2). He also described how they always seek to broaden the offers; when asked for an offer of frame, they ask the customer whether they can give an offer with for example other shell materials, doors and windows. Their company, furthermore, is broadening away from basic construction: “During last years, we have offered the most curious projects, one of the most exceptional competitive biddings we have been involved in - included hydraulics, guidance systems, everything – We have answered almost all challenges that even slightly have to do with – our main branch” (I2). This interviewee, in addition, perceived that they were using this way to broaden their offering and service addition as a way to differentiate from low cost companies and, thus, saw it as a competitive advantage: “The more we get the width to it (our offering), the less there is competition” (I2).

Another one of the interviewed companies’ had services in an important role as I1 saw that services have their own role in the company. For example, the hiring of own an architect was seen important because it was a way to offer customers wider services and make implementing a construction project easier for the customer: “There is no need to contact an architect studio, where the architect draws one line and it costs money for the customer, in our company it does not cost anything yet” (I1). On the other hand, the architect was hired with the idea that when they make the drawings for a building they get to construct it. Still the interviewee added that it does not feel too bad if after the drawings are made the construction goes to another company, in that case they just charge the architect’s hours. I1 also noted that they have one or two turn-key -projects in a year but these are still rare.

The interviewees from one company then noted that moving towards turn-key projects is not something they see their company doing in the near future. They too talked about complete solutions but for them these are mostly limited to the frame, its planning and assembling. Additionally, some parts outside the supporting structure are supplied, such as stairs and railings. (I5) The interviewees from the last company then noted that they absolutely are not moving into turn-key projects and that the company is completely concentrated on the steel structures. When asking about them signing wider more turn-key like projects, they had clear vision: “In no circumstances, then (if doing turn-key projects) we would have to take this comprehensive role, and rotate all the contractors from different fields – Our recourses aren’t sufficient.” Interestingly they too discuss about complete solutions. With that they mean planning, production and assembly of steel constructs. They are very focused on their own production and the assembling they

can make in their workshop. Then the planning and the assembling made at the construction site are outsourced to subcontractors. (I3)

All of the interviewed companies collaborate closely with different parties. Engineering design bureaus were the most often mentioned partner, only one interviewee from one company did not mention them (I1; I2; I3; I5; I6) but also companies implementing assembly were mentioned by some interviewees from all workshops (I1; I3; I5; I6). In addition other parties, such as VTT (Technical Research Centre of Finland) (I5), were mentioned but only by one interviewee. This gives perspective on what kind of services companies offer to their customers, what kind of services they implement themselves and who are important parties in addition to suppliers and customers to take into consideration in this context.

Services offered to the interviewed companies were also perceived as rather traditional and closely related to products by most of the interviewees. Drilling, cutting, sawing and different preprocessing services were recognized most often by the interviewees (I1; I3; I5; I6): “Many would like to offer cutting, readily pieced products –” (I5). As an exception one head of supplies described how one supplier had offered a possibility to integrate systems to make ordering easier. After consideration this was rejected with justified reasons: “Production defines the purchasing operations greatly. And then the productions, internal working methods are diverging – so even though we strive for routine we can’t, internal working methods are different.” Furthermore, the differences between materials that need to be purchased for different projects are really significant and cannot be bought similarly. (I4)

Another interviewee explained how one supplier had given them training when they started using a new version of a certain material. This was also perceived as unsuccessful because there were some conflicts between different instructions from different parties: “They came and gave their own – at least slightly commercial view but there were contradictions with the specialists (instructions)” (I3). Furthermore, also these traditional product centric services, such as drilling, were usually not seen as useful because workshops are able and willing to do these tasks themselves; it is part of their core competences (I1; I3; I5; I6). For example when asking from one interviewee whether they use these services the answer was determined: “No, we do those ourselves.” (I3)

*Table 3: Services in the interviewed companies*

<b>Companies</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Structural designing	External	External/internal	External	External
Other design (shell dimensioning etc.)	No	No	Yes	Yes
Assembly on site	External	External	External/Internal	External/Internal
Other services	No	Some	Yes	Yes
Turn-key projects	No	No	Some	Yes

In Table 3 some information acquired in the interviews about the companies is presented in a simplified form. In this table one can clearly see differences between the companies' use of services and how they provide these. In the table the companies are arranged so that the one with the most narrow service offering is on the left and the one with most broad is placed on the right. Letter codes used in this table for each company will be used similarly in rest of the thesis.

## **5.4 Summary of previous results**

In previous chapters 5.2 and 5.3 the area of results is tackled rather widely and thus the information is scattered. In this chapter some compilations that are made based on previous subsections are presented to provide clearer idea about some subjects. These subjects were clear and well distinguished from the progress of the project in the results. For example what was done during the project is spread in fragments in the chapter 5.2 and thus here it has been collected to Figure 12. In addition, during the project some challenges were identified for the implementation phase and these might not be that clearly presented in the earlier chapters. Thus the Figure 13 seeks to summarize and clarify these elements.

Market analysis	Competitor analysis	Own resources and capabilities	Value propositions
<ul style="list-style-type: none"> <li>•Demand</li> <li>•Market segmentation</li> </ul>	<ul style="list-style-type: none"> <li>•Do competitors use and how much</li> <li>•Where is used</li> <li>•How is priced</li> </ul>	<ul style="list-style-type: none"> <li>•Amount of know-how</li> <li>•Needed resources vs. own resources?</li> </ul>	<ul style="list-style-type: none"> <li>•Why customer should choose this</li> <li>•What can be promised</li> </ul>
Customer analysis	Costs	Revenues	Others
<ul style="list-style-type: none"> <li>•Different customer groups</li> <li>•Willingness and ability to adopt in workshops</li> </ul>	<ul style="list-style-type: none"> <li>•Services needed to create demand</li> <li>•Testing machining</li> <li>•Material itself</li> </ul>	<ul style="list-style-type: none"> <li>•Revenues from selling material</li> </ul>	<ul style="list-style-type: none"> <li>•Future planning</li> <li>•Structural engineers as effecting party</li> </ul>

**Figure 12:** Aspects that were studied in business model creation process.

In Figure 12 the themes that were examined during business model creation process are compiled. Also some examples about what these themes included are presented. For example when considering revenues there is a need to critically assess what kind of increase in the amounts of sold materials there would be and what kind of margins could be charged. On the other hand, when inspecting the value proposition the main questions for the company to answer were why the customers would choose this enhanced material over some others in the markets, what could increase their interest in this material and what the company can really promise for the customers so that they are able to fulfill these promises. These themes of what was done during the project are gathered using comprehensively all the material, observations, interviews and the documents related to these.

Structural designers	Investors/ developers	Regulations
<ul style="list-style-type: none"> <li>•Need to learn to use material</li> <li>•Willing to use material?</li> <li>•Need to increase interest</li> </ul>	<ul style="list-style-type: none"> <li>•Customer rejection (competitive pricing, enough providers?)</li> <li>•Need to increase interest</li> </ul>	<ul style="list-style-type: none"> <li>•Linked to eurocodes, which causes difficulties in fully utilizing properties, which causes challenges elsewhere i.e in pricing</li> </ul>
Workshops	Reference projects	Pricing
<ul style="list-style-type: none"> <li>•Knowledge and know-how to use material?</li> <li>•Needs investing?</li> <li>•Willing to use material?</li> <li>•Need to increase interest</li> </ul>	<ul style="list-style-type: none"> <li>•Need for Successful reference projects</li> </ul>	<ul style="list-style-type: none"> <li>•How to price to get revenues but also so that customers and workshops get some benefits too</li> </ul>

**Figure 13:** Challenges that were anticipated for the implementation phase.

In Figure 13 the identified challenges that were anticipated for implementation during the business model creation process are listed. These challenges are combined from the observation field notes and interviews. These challenges are identified in the company and thus these are something that are strived to avoid with preventive measures. In this figure some of the challenges are further defined from the texts above. This is done to provide better understanding of the subject. For example, in the text in chapter 5.2 structural designers were presented as one of the key parties affecting the success of this enhanced material. In this table some challenges related to them are opened up, such as using this enhanced material would need structural designers to be motivated to learn new guidelines for designing and in addition there are worries about the willingness of designers to use this enhanced material due to, for example, problems that have occurred in its availability. Thus, there is a distinct need to increase their interest in this material through different activities.

In Figure 12 the challenges are presented so that the ones in left are somehow related to each other, the ones in the middle are related and the ones in right are also related. Structural designers and workshops are related due that they both are external parties that have significant impact on whether this material can make it to market. Investors/ developers and reference projects are related because the need to convince investors and developers creates the need for reference projects and these projects have to be successful. On the other hand, to get a reference project there is a need to convince some developer or investor to use these materials. Regulations and pricing then are related due to that slowly changing regulations causes the pricing to be difficult. However, it needs to be realized that the regulations are not the sole reason for challenges related to pricing.

## 6 DISCUSSION

### 6.1 Developing the business model

The process used in developing the business model in the case company includes rather similar phases as the processes in the current literature do but does not follow any of these clearly. When comparing the development process of CompanyCo to PSS development processes described in the literature, it began similarly with process described by Kuo et al. (2010), with idea generation and selection. Although in CompanyCo's project this one idea emerged and it was selected for further consideration instead of purposefully creating multiple ideas and then selecting one from these. This early selection of an idea separates CompanyCo's process from the other two presented in Figure 14. In these other two models, the idea generation and selection is performed later after some analyzing or planning. In addition to processes found in the literature, in the Figure 14 the parts that were present in CompanyCo's process are circled and given an ordinal number. When CompanyCo had an idea the external analysis was carried out. This was the second phase like in Clayton et al.'s (2012) model.

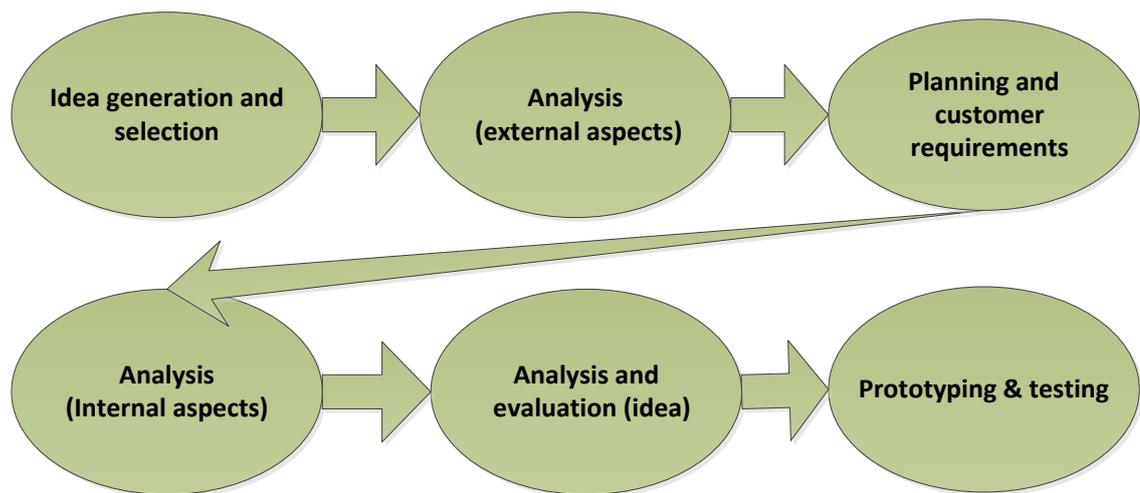
Clayton et al. 2012	Marques et al. 2013	Kuo et al. 2010
<ul style="list-style-type: none"> <li>•Project initiation</li> <li><b>2</b> •Analysis (external aspects)</li> </ul>	<ul style="list-style-type: none"> <li>•Organisation preparedness</li> <li><b>3</b> •planning and customer requirements</li> </ul>	
<ul style="list-style-type: none"> <li>•Idea generation and selection</li> </ul>	<ul style="list-style-type: none"> <li>•Planning               <ul style="list-style-type: none"> <li>•planning and customer requirements</li> </ul> </li> <li>•needs and ideas</li> <li>•Design               <ul style="list-style-type: none"> <li>•planning and customer requirements</li> <li>•concept development</li> <li>•preliminary &amp; detailed design</li> </ul> </li> <li><b>5</b> •prototyping &amp; testing</li> <li>•Post-processing               <ul style="list-style-type: none"> <li>•prototyping &amp; testing</li> </ul> </li> <li>•implementation</li> </ul>	<ul style="list-style-type: none"> <li><b>1</b> •Idea generation and selection</li> </ul>
<ul style="list-style-type: none"> <li>•Detailed design</li> <li>•Prototyping</li> </ul>		<ul style="list-style-type: none"> <li><b>4</b> •Analysis and evaluation (idea)</li> </ul>
<ul style="list-style-type: none"> <li>•Implementation</li> </ul>		<ul style="list-style-type: none"> <li>•Implementation</li> </ul>

*Figure 14: Phases of CompanyCo's creation process compared to literature on PSS creation*

After this, the planning and analyzing customer requirements began. This phase was implemented throughout the rest of the project. Only Marques et al. (2013) have given this phase its own place in their model. After these deeper analyses on external aspects and planning, the idea was evaluated again to determine whether the project should be

continued. After positive decision on continuing the project, CompanyCo was initiating the reference projects, which could be considered equal to prototyping and testing phase which is present in both of the processes described by Clayton et al. (2012) and Marques et al. (2013). As of the time of writing CompanyCo's project did not yet make it to implementation phase.

One phase that was clear in CompanyCo's process was the analyzing of internal aspects, which did not receive its own phase in any of the above presented processes. Nevertheless, it had a significant role in CompanyCo's process. There was a need to know what they can do and how they should handle the new material. This could be added to the process after the third phase. Other than that, even though not following any particular presented PSS process clearly, the process is rather well composed from pieces existing in these three processes presented in Figure 14. Figure 15 then visualizes CompanyCo's process, where planning, although placed in third phase, continues through the rest of the project. This figure does not consider tasks after Prototyping and testing phase since reference projects are not yet implemented.



**Figure 15:** Development process in CompanyCo

The earlier identified challenges anticipated for implementation phase in CompanyCo's process can be categorized rather well into the challenge groups identified from the literature in chapter 2.3. Still, these anticipated difficulties do not cover all of identified categories. Clearly some of the categories are empty, which can suggest that there are differences between the categories and that some of the problems might be more difficult to anticipate than the others before those are faced. Another reason for this might be that in the case company the services were in rather limited role and when the role of services would increase these difficulties might also be more clearly observable. In Figure 16 challenges listed in Figure 13 are divided into categories identified in Figure 5. Where Kuo et al. (2010) and Cook et al. (2012) had recognized that laws and regula-

tions can be a facilitating factors for use of PSS, here the regulations created more difficulty in using this specific material. Thus, even though these two fall into the same category they have rather different meaning. On the other hand, it may also be argued that these challenges in using this material create more need for carefully designed PSS in order to be able to take these materials into market.

Organizational culture	Customer	PSS offering	Legislation
•--	•Customer rejection	•Designing •Pricing	•Regulations
Organizational Structure	Strategy	Network Relationships	Others
•--	•--	•Relationships and cooperation with structural engineers and workshops	•--

**Figure 16:** Problems anticipated for CompanyCo project implementation phase categorized in groups found in the PSS literature

Challenges with the PSS offering and specifically with pricing, which was observed in process of CompanyCo, were identified also by Baines et al. (2007). They saw that inexperience in absorbing some risks from customers cause these problems. On the other hand, in CompanyCo the offering is not yet determined with the needed precision to know whether the risks will be absorbed, but the inexperience about pricing this enhanced material and using it is naturally challenging and important reason for them to anticipate challenges in this. Furthermore, uncertainty in costs of handling the material is complicating the pricing. Then again, they are ready to try these in few reference projects, which corresponds well the situation described by Oliva & Kallenberg (2003) about how companies they studied were ready to take risks in some contracts in order to acquire knowledge about the costs and through these about the correct pricing of the offering.

In the literature for example Boehm & Thomas (2013) have stressed the difficulties in especially supplier relations because according to them PSS offerings usually require broader supply network. In this case there is also a need to control broad network of actors but it is partly due to the offering and partly it is due to the complex structure of the industry. Baines et al. (2007) have noted that customers do not necessarily see value in new offering. For them, though, it again is due to the nature of the PSS offerings and

for CompanyCo it is more due to the customers not necessarily realizing the value of the new material. Some differences can be observed in all these problems when compared to the ones found in literature. This might be due to the fact that in CompanyCo their offering had not yet taken clear form of PSS with distinctive service components. Furthermore, in CompanyCo the role of the services with this offering is still unclear.

Another difference when comparing these anticipated problems in CompanyCo to the ones found in the literature are the internal problems. In CompanyCo any problems related to culture, organizational structure or strategy were not discussed during the meetings. Then again, it may be claimed that these problems are of different nature, when compared to problems clearly related to the offering and its rejection by different external parties. Thus these could be more difficult to anticipate before the implementation. This may suggest that internal challenges might be more difficult for companies to foresee than challenges related to external factors.

**Table 4:** *How much different elements of business canvas were studied in CompanyCo's process when this research ended*

Value Proposition	Rather Widely
Cost Structure	Rather Widely
Revenue Structure	Rather Widely
Customer Segments	Rather Widely
Key Resources	Some
Key Activities	Slightly
Channels	Slightly
Customer Relationships	Slightly
Key Partners	Starting

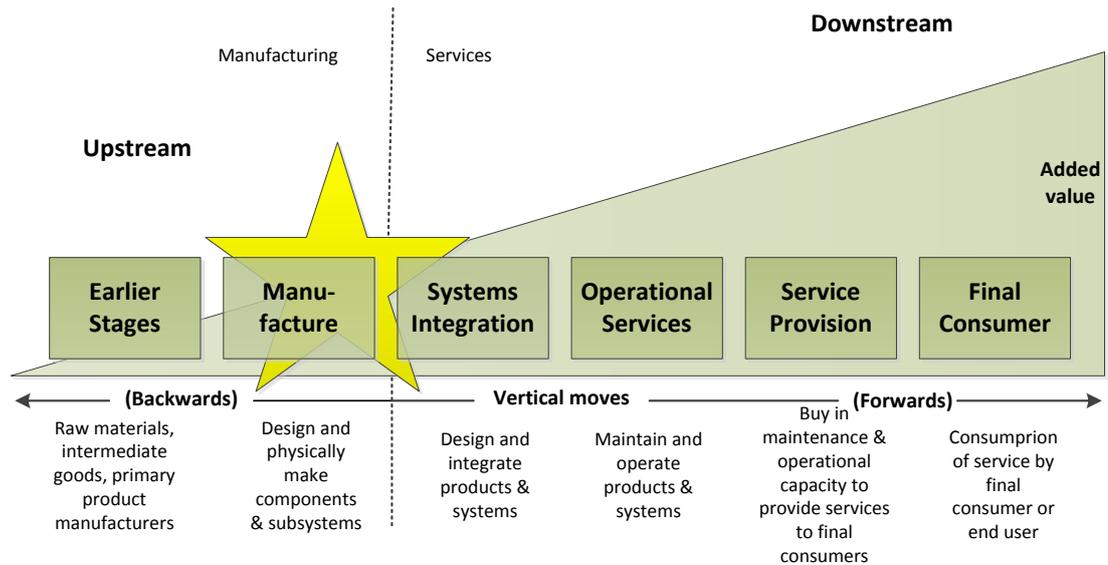
When considering the creation process from business model's point of view there are clear differences in how much each of the business model elements have been considered in the CompanyCo's project. When comparing this process to business model canvas (Osterwalder & Pigneur 2010) some differences in considered elements can be found. Partly these might be due to that this process was not finished when the data gathering for this thesis was ended. The first four business model elements listed in Table 4 had a central role in business model development process. For example considering value proposition was one task that I7 recognized they had done and saw as an important one. Additionally, cost and revenue structures have received significant consideration. Customer segments have, furthermore, been under scrutiny. On the other hand key resources have been less in focus. CompanyCo has started to consider their own resources but has not yet specifically identified the key resources. Key activities have also been left with less attention.

Key activities and key resources both were deemed as something that should be identified based on customer segments, value proposition, channels and customer relationships by Osterwalder & Pigneur (2010) as explained earlier in the literature review. Thus these are difficult to fully determine before considering the other business model building blocks. Two of these blocks needed for deciding key activities and resources have received only limited consideration. Channels and customer relationships have been left for very limited attention at this point of process (I7). Key partners, on the other hand, are something which importance CompanyCo has noticed and has started to consider at least in some areas. Thus it can be concluded that the business model development process is not yet complete in the company.

When, furthermore, considering this business model development, it can be seen as offer driven innovation. This category created by Osterwalder & Pigneur (2010) acknowledged four epicenters from which innovation can begin, in addition to multiple-epicenter driven innovations. This process falls nicely into the category of offer driven innovation since it clearly had a starting point in an idea about what could be offered to customers and this idea has determined how the other business model elements are formed. When considering this process as whole, even though it was meant to create a new business model it did not quite reach this level yet. Rather it stayed more in business planning level. One of the key differences between business model in this project and the one created by Osterwalder & Pigneur (2010) was that in CompanyCo's business model creation process analyzing of competitors had an important role and effect in business model development. This role has been acknowledged in several other business model frameworks (Morris 2005; Kujala 2010; Chesbrough 2007) and this study support the need for this it. So some differences exist between the company's business model creation and the business model canvas which was used as comparison.

## **6.2 Attitudes towards PSS and services**

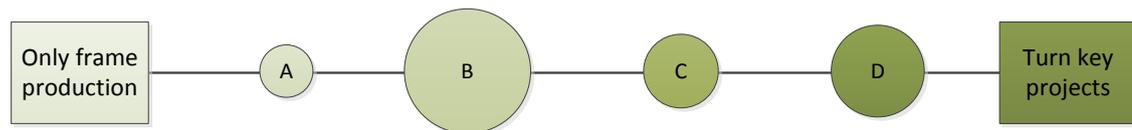
With information acquired in interviews it can be noted that mostly the interviewed companies are on manufacturing level when comparing to Davies's (2004) categorization. This is visualized in Figure 17 where the yellow star presents the position where the companies are placed in this continuum. All the interviewed companies have clear focus on manufacturing and some of those are solely centered on manufacturing frames. On the other hand one of the companies had clear willingness to become systems integrator. They offer different kind of ensembles combined of products and services that are not part of their core competences. This one company could even be called more a system integrator than plainly manufacturer. The other three companies were mostly interested in providing their products with few supporting services for contractors. So it seems that even in this narrow area of Davies's (2004) continuum there can be clear differences between companies.



**Figure 17:** How interviewed companies are placed in the capital goods value stream by Davies (2004)

Clear differences can be perceived when looking more closely the differences these four companies have in the role that services have in their business. As presented in Table 3 the amount and variety of different services varies between the companies. Company A was clearly the most product oriented company. They were solely focused on producing frames and in addition to those they provided basic services such as structural design and assembly, which both they acquired through subcontracting. Company B was also mostly concerned about manufacturing of their products, but in addition to those two basic services they offered some technical support and few other services. Furthermore, they did part of the structural design themselves. Company C, on the other hand, was much more service oriented in comparison to earlier two. They had also shell dimensioning services, which they did in-house and, furthermore, they noted having few projects starting from foundations in a year. Company D then had, for example, the shell dimensioning and such services, but, furthermore, they were focusing on turn-key projects too.

This difference between companies is visualized in Figure 18, in which the companies are placed in a line from only basic production to turn key projects, which presents how much the companies are focused only on their core product or how much they are willing to complement it with services and other products that might even be far from their core competences. The distance between companies is not significant in the figure; it merely demonstrates the order of companies. The companies are described with circles and the size of the circles demonstrate the size of the companies and again the difference between these sizes is not measured by the difference between the amounts of employees in each company but are merely providing an idea about how the companies compare when considering their sizes.



**Figure 18:** Use of services in interviewed companies compared to each other

From the empirical evidence it can be stated that the attitudes towards services in different companies reflected rather well the amount of services in use in those. When considering Company A, the attitude towards services was rather negative and discussing about broadening their business with services and towards turn-key projects invoked strong opposition, which can be seen, for example, in a citation that considered turn-key projects from I3. This could also be observed in a way which interviewee answered during interviews. This demonstrates well the problem of deep manufacturing culture Leiringer et al. (2007) and Johnstone et al. (2008) found in their researches that hinders the adoption of PSSs. On the other hand, interviewee also expressed negative attitude towards earlier areas discussed in the interview, which may have affected the tone also during these questions. Still the clear message was that they are happy with their focus on frames and they are absolutely not broadening their offering away from those.

The representatives in Company B saw that their main interests was in their products but that certain services are needed to support these. They also were looking for an employee to coordinate assembly that is done by subcontractors. Furthermore, they had technical support which they saw as creating value for customers. Thus, they clearly brought up how they had invested in services and seemed more open-minded towards services than the Company A. Company C then had clearly invested in services, acquiring an architect into their firm and evolving the architect's role from designing buildings for their production to a situation where they now were also okay with having the architect designing buildings and someone else then constructing those. Furthermore, the way I1 described their manner to handle services gave an impression about a company in which offering services had integrated nicely, although those were still seen mostly as supporting services.

Company D demonstrated exceptional interest in services. The way I2 discussed services their meaning and how those have acquired an important role in their offering, was exceptional. Additionally, they were the only company that described having their own department for trying to find turn-key projects and otherwise broader jobs. In addition, how they have this responsibility to always ask whether they can offer more than only frame, if they are asked for a tender for frame, describes their emphasis on services and broadening their offerings to integrate products from several suppliers. Furthermore, Company D had seen these services and broadening their offerings as a way to differentiate from low cost companies and as a competitive advantage, because they were able to respond to customers' needs from wider area and thus customers need to

contact and coordinate fewer suppliers. This is similar to Cook et al.'s (2012) findings about PSS use in both construction and manufacturing companies, although, they had focus more on mature aftersales markets whereas Company D found these in their basic offerings. Based on this it can be noted that there seems to be clear differences between companies in both how they use services and in what kind of attitudes they show towards these, even though in the big picture provided by Davies (2004) they all seemed to be rather close to each other.

When considering the kind of PSSs these workshops provide Company D's PSSs in their widest are a good example of integration-oriented PSS from Neely's (2008) classification. Neely (2008) discusses just about such service addition by moving downstream and there integrating vertically. Also, Company C could be seen partly using this kind of services but their offering still falls better into the class of product-oriented PSS, in which additional services such as design, installation and consulting services are offered with the product. Company D provides this kind of PSS's as well. Company A and B then can be seen solely providing only these product-oriented PSSs. However, the role of the services in companies varies, when using Neely's (2008) categorization all of these companies can be seen providing different PSS's. While transferring the ownership of the products to customer's the third option of PSS systems is service-oriented PSS. However, in this case none of the companies had sufficient focus on the services in their offerings to be included in this category. Furthermore, use-oriented and result-oriented PSSs were not options due to the fact that these companies transferred the ownership of the product to customers.

For many authors the interest in PSS is especially in the two last classifications where provider retains ownership of the product (Sakao et al. 2009; Tan et al. 2006). It does seem rather unlikely to the author that construction companies would be interested in broadening their business to, for example, renting apartments. This study, furthermore, implicates that use of these PSSs is rare in construction and it partly explains the rarity of construction related PSS literature. Additionally, how great deal of the construction related PSS literature is concentrated on PFIs (Leiringer et al. 2007; Brady et al. 2005a; Johnstone et al. 2007; 2008) which is exceptional in this context due to the usual retaining of the ownership in these projects, seems to support this too. Thus this is one of the few studies explaining PSS in traditional construction industry and based on this study it seems that the retaining of ownership and thus the use of result-oriented and use-oriented PSSs is rare in workshops focused on construction. Furthermore, this study finds lack of service-oriented PSSs in these workshops.

### **6.3 Use of an external researcher**

In the Figure 19 some challenges and advantages of using external researcher in CompanyCo's process have been gathered. These are important in order to be able to com-

pare this process to traditional consulting processes. Challenges and advantages have been identified from narrative in chapter 5. For example importance of information flow was well demonstrated at the beginning of the project when for two weeks the task the external researcher was doing was a bit off-course. The challenges in gaining access to information was also well observable for example when discussing material CompanyCo had in their own systems and when discussing the project's future.

Importance of the planning phase can be seen for example from how the definitions for key terms were not clear for the company either and from how much the focus of competitor analysis evolved over time. Part of these challenges might have been possible to avoid by having a clear planning meeting where the key terms and what really was important to know would have been discussed. Additionally, this kind of meeting could have been used to map different knowledge and capabilities people had, which again could have improved cooperation and information flow. The researcher, in addition, was rather inexperienced in this area of work. As observed, she did not know what to expect or what kind of role she should take in the project, which caused a bit of a movement at the beginning while seeking fitting ways to work.

<b>Information flow</b>	<b>Different background knowledge</b>	<b>Different background knowledge</b>	<b>External party involved</b>
<ul style="list-style-type: none"> <li>•Working in different places, not sure what the other party has done</li> <li>•Challenges in figuring out what is important</li> </ul>	<ul style="list-style-type: none"> <li>•Knowledge and capabilities of the other one not known -&gt; challenges in communicating</li> </ul>	<ul style="list-style-type: none"> <li>•Different views in creating interview questions, making searches etc. complemented each others</li> </ul>	<ul style="list-style-type: none"> <li>•External person implementing interviews with workshops</li> </ul>
<b>Access on information</b>	<b>Inexperienced researcher</b>	<b>Facilitating role</b>	<b>Acquiring knowledge</b>
<ul style="list-style-type: none"> <li>•Information considered confidential and researcher seen as external person</li> </ul>	<ul style="list-style-type: none"> <li>•Not knowing what to expect and what is expected of researcher</li> <li>•Not knowing what role researcher has</li> </ul>	<ul style="list-style-type: none"> <li>•Finding new viewpoints from which to look the questions</li> </ul>	<ul style="list-style-type: none"> <li>•Different knowledge available for different peoples</li> </ul>
<b>Planning</b>	<b>Management's right to manage</b>		
<ul style="list-style-type: none"> <li>•Problem defining</li> <li>•Planning what needs to be studied</li> </ul>	<ul style="list-style-type: none"> <li>•Some challenges when looking for access to research customers, employees etc.</li> </ul>		

**Figure 19:** Challenges and advantages of using external researcher in CompanyCo's process

Furthermore, gaining access to gather information for the research was observed to be important. It was central for example when seeking to do customer interviews. This is a

phenomenon Linstead (1983) calls Management's right to manage. Although in this case process this challenge was overcome and the possibility for interviews was gained. Different background knowledge took an interesting role in this project. It was observed to be both a challenge and an advantage. Due to the differing backgrounds the parties had different capabilities and knowledge, and it was not always clear what the other person thought or understood. This challenge was emphasized in the beginning of the project when the parties did not know each other. Later, as observed, this came less of a problem when one company representative and the external researcher did more work together and this way learned to know each other's knowledge and capabilities better. Communication and understanding the other person's perspective was thus observed to be very important in this project.

On the other hand, different background knowledge caused the parties to have diverging views on things. For example, when creating competitor analysis this was observed positively through different kind of ways to do searches and different kind of interpretations on the material. This made it possible to have more thorough understanding since many views were expressed and, furthermore, discussed. In addition, more covering competitor analysis was created since when working separately on the same subject and combining knowledge at some point naturally more extensive area was covered due to for example different views. This clearly affected the results of the competitor analysis. Furthermore, when creating questions for workshop interviews this was useful. Based on what they wanted to know CompanyCo's representative created the first version of questions, which then were modified and grouped by researcher based on her knowledge about interviews.

Purely having an external party was also observed to be useful. Especially this was when implementing the customer interviews. As explained earlier, the workshop employees were probably more forthcoming with a person external to CompanyCo, because they are not only suppliers but also competitors for them. Additionally, in one meeting the more experienced researcher was able to take a facilitating role, which opened diverging views. However, this role was observed only in one meeting and thus was not that advantageous for this cooperation. The access to different information was, furthermore, seen as useful. The researcher had access to information through the university and her colleagues whereas the company had their own ways to gather information. This was observed most clearly when the researcher had found the article which she did not have the rights but CompanyCo was able to check it.

Some similarities and differences can be observed between factors affecting the success of consultancy process found in the literature (presented in Figure 10) and the challenges and advantages of using an external researcher in this project. These common success factors are presented in Figure 20, in which the original themes identified from consultancy literature are presented and those parts which were observed important in this

project are circled. Dashed line is used for factors that were not clearly observed but could be implied. Although, the process studied was rather different from the traditional consulting process, the challenges and advantages in the study fall rather nicely into categories found in the current literature and thus supports existing research to some extent.

Relationship between client and consultant	Concept of client	Cooperation with client	Consultant
<ul style="list-style-type: none"> <li>• Good rapport</li> <li>• Taking care of differing views</li> <li>• Trust, in individual level but also company level</li> </ul>	<ul style="list-style-type: none"> <li>• Several contact levels and persons -&gt; several clients</li> <li>• Different customer expectations</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation gap</li> <li>• Dialogue between client &amp; consultant (differing understanding)</li> <li>• Clients perception of consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Considering clients values and behaviours</li> <li>• Use of uncustomized solutions</li> <li>• Letting client expect too much</li> <li>• Communication skills</li> <li>• Need for commitment</li> </ul>
Access	Practical factors	Inexperienced consultant	Client
<ul style="list-style-type: none"> <li>• Access to confidential information resulting from the project and needed during the project</li> </ul>	<ul style="list-style-type: none"> <li>• Problem defining</li> <li>• Need for planning</li> <li>• Need to define outcomes and deliverables</li> <li>• Use of formal progress reviews</li> </ul>	<ul style="list-style-type: none"> <li>• Establishing credibility</li> <li>• Lack of information and knowledge: what to expect etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Avoiding responsibility</li> <li>• Communicating requirements is hard</li> <li>• Management's right to manage</li> <li>• Need for commitment</li> <li>• Resource engagement</li> </ul>

**Figure 20:** Factors affecting the success of consultancy common for literature and CompanyCo's process

As, for example Edvardsson (1990) has observed in his study, also in this project the access to information was important and challenging as explained earlier. Christensen & Klyver (2006) then have discussed the importance of defining the problem and Edvardsson (1990) has emphasized the difficulties of clients to communicate their requirements. These both were observed as described earlier in the planning phase challenges which were explained above. Furthermore, Christensen & Klyver (2006) have described how due to differences in focus points the dialogue between the consultant and the client can be difficult. This was observed in this process too and is partly classified under information flow and partly under different background knowledge in Figure 19.

Linstead (1983) has similarly discussed about inexperienced researcher's challenges when not knowing what to expect as it was noticed in this study. He has also brought up the term management's right to manage, which he also had observed in his research when trying to gain access to study employees of his case company. Trust, which was emphasized as extremely important factor for success of consulting by many authors, such as Chalutz Ben-Gal & Tzafrir (2011), is another interesting factor. There were no clear signals about mistrust between parties in this study but, on the other hand, the se-

creteness about confidential information and challenges in gaining access to materials could be interpreted as a signal of this.

Differences between the challenges in the literature and the case study can be partly due to the fact that this process was not a traditional consulting process but rather a researcher helping company in their own development process. Thus there were no chance or no reason for the client to avoid responsibility and the client's resources were the main resource used in the project. Furthermore, CompanyCo representatives' commitment came naturally, since this was their idea and it was important for them. Similarly the researcher did not have a normal consultant role and thus, she was not in a deciding position and could not let the client expect too much or offer ready-made solutions. Due to not offering any clear solution or suggestion, furthermore, implementation gap could not be observed. The researcher's communication skills could be improved but these were not perceived as a problem during the project either. Additionally, the researcher had only few contact persons on rather same level of the organization and thus there were no problems considering different client expectations.

Furthermore, any significant differing views were not experienced during the project and thus there were no conflicts that would have needed to be taken care of. The few differing views in this project were small and mostly about some misunderstanding. Additionally, there are also some factors in which the researcher did not observe problems during the process but due to the subjectivity of those and the researcher being the one observed these cannot be that surely stated. For example, from the researcher's point of view of good rapport was established, client's values and behaviors were not violated and researcher was committed to the task in hand. Furthermore, the researcher did not find out that there would have been negative impressions about her in the case company or that there would have been a need to somehow work on creating credibility. Thus all of the factors found in the literature were not present in the case study, but aspects that were found important in the CompanyCo's case could also be found from the literature. So this study seems to support earlier studies on the subject rather well.

From discussion above it can be seen how in this project the process remained on the first level of Turner's (1982) category. In this cooperation the researcher provided information to the client but was not able to solve the client's problems or diagnose problems. Thus, this was rather a low level project when comparing to consultancy projects in general. On the other hand, this project, as explained earlier, was not a normal consultancy project, which can affect this.

When considering the role that the researcher had in business model development process, it can clearly be seen that she had rather restricted selection of areas that she was studying and that to the other areas the access was very limited. Certainly, in this process the researcher was merely one pair of hands for who some tasks could be delegat-

ed. This explains why in this project only the first level of Turner's category was achieved. When considering this category further, in order to achieve higher and more advantageous levels in cooperation, some changes would have been needed. In order to be able to, for example, solve problems, diagnose those or help in implementation of solutions more access and closer cooperation would be needed. Without proper knowledge and comprehensive understanding about problems, the external researcher cannot create solutions that would fit into organization's needs or diagnose problems in the organization.

In summary, the most important improvement identified in this study to increase the advantages that can be achieved through usage of an external researcher was the need to increase and deepen the cooperation and information flow. This would create a solid foundation for collaboration and thus enable more profitable projects. Furthermore, it can be said that the advantages and the challenges fall rather nicely into the categories found in the literature review, even though reasons underlying these seemed to differ. One reason for this can be the nature of the project, which was not similar to the typical consulting process. This, additionally, partly explains some of the challenges in literature not being present in this project.

## 7 CONCLUSIONS

### 7.1 Answers to research questions

This chapter seeks to answer the research questions based on the literature review and research done during this project. First of the questions was: *How do companies create business models for product service systems in practice?* For this question the material used was observations of the one case company and their business model development project. In this project it was found that CompanyCo's process did not quite follow any of the processes gleaned from the literature, although it consisted of very similar phases. The process CompanyCo used can be compiled of the phases used in literature, though analysis of internal aspects was added to these. Clearest difference to models in the literature was perhaps the starting point. In the process of this case study the idea was the starting point where as from the literature sources only Kuo et al. (2010) saw this as a starting point for the process.

Furthermore, it was found that even internally development processes had variance; the company has guidelines for what should be studied but how and in which order depended on the project and the people involved in it. In the literature also several different ways to create business model have been presented, so it may be concluded that there is much variance in these development processes in genera. In CompanyCo the explored process the phases can be arranged in following way: idea generation (and selection), analysis of external aspects, planning and finding customer requirements, analysis of internal aspects, analysis and evaluation of idea, prototyping and testing. However, it needs to be remembered that some of these tasks were simultaneous and that the project is still unfinished. Thus there might be some additional phases after the prototyping, which in this case were reference projects. In the business model theory then again, this project supports the need for competition element in the framework since it had a significant role in this project, even though it was not included in the framework that was originally planned to be applied.

The second question was formulated as follows: *How do product centric organizations see product-service system ideas, what kind of attitudes companies have towards those and how services are used in these organizations?* In this the interviews of customers of CompanyCo were used as the main empirical data. This study supported the traditional view that workshops, focused on construction, are clearly product-oriented. In this research, though, it was found that there are clear differences in the attitudes towards PSSs in different workshops. These attitudes varied from focusing completely on the

main product and additionally providing some essential services to perceiving PSSs and broadening of offering a possible competitive advantage. Furthermore, it was found that the attitudes in the workshops somewhat correlated with the amount of services in use in those.

Even though there are clear differences in the attitudes still when looking at the big picture in for example Davies's (2004) capital goods value stream, all of the interviewed companies are rather close to each other at the manufacturing level while some strive to be systems integrators. Furthermore, these companies had varying attitudes, for example, towards turn-key projects. Some saw those as an impossible idea whereas others were already doing those. Overall, it can be stated that even though workshops can be seen as product-oriented companies, there are significant differences in how they use and see services between the companies. The industry may be facing some changes due to the need to answer the increasing competition and the low demand expected for future, which can affect the attitudes towards services in the companies in the future.

The third research question was formed as: *What is the role of an external researcher in business model creation process and what kind of advantages and difficulties are related to working as an external researcher?* For this question mostly the observations made during the project were used as material. It was found that the improving the cooperation and involving the researcher more closely to the project could have resulted in more profitable collaboration. Furthermore some factors that clearly hindered the usefulness of cooperation were identified. These were the challenges in information flow, planning and accessing information. Furthermore, management's right to manage was observed, inexperienced researcher caused some inconveniences and different background knowledge was observed to cause challenges. On the other hand different background knowledge was identified also as an advantage together with the facilitating role of the researcher, usefulness in acquiring knowledge and in having the advantages of an external person, for example, implementing the interviews. It was also found that these were rather well in line with the factors that have been found in the current literature. However, it was acknowledged that due to the different natures of this project and traditional consultancy projects some of the factors identified in the literature were not applicable in this process.

## **7.2 Contributions and implications for future research**

This work contributes to the current academic research by providing more understanding about the ways companies do their business model and provision for PSSs. This area has not been researched commonly, and this study sheds light on the subject through a case study. Furthermore, this study provides important information about how in practice company sees business model and which elements they perceive as important. This can provide information that helps academics in creating more unified concept of busi-

ness models, for example through supporting some elements existence in business model framework. In addition this study provides academics with understanding about the position of services in offerings of workshops in construction industry.

The practical contribution this work offers is threefold. Firstly, it provides practitioners an example about what kind of process they can use when seeking to create a PSS or what kind of elements they should consider if they seek to do this through using business model as help. Secondly, it provides important information about what kind of challenges other organizations might face during this process and gives them possibility to prepare for these. Thirdly, this thesis gives advice on what aspects need to be considered if using an external researcher or a consultant and gives an idea about the challenges in this kind of cooperation, which again enables practitioners to address these problems before they are an issue.

In the future, there is need to research this kind of process throughout. This work gives only a partial picture due to the fact that the process was not yet finished in the company and thus there is need to achieve big picture and see what kind of problems and challenges there lies in the rest of the process for both business model creation for PSS and the cooperation with an external researcher. Additionally, this research highlights the problematic and ambiguous nature of both terms PSS and business model. Thus, there is need in future research to address these issues and strive towards unified concepts. This would enable more reliable comparisons and create basis for more accurate research in the future. Furthermore, there is need to do research so that tools that enable companies to create PSSs more efficiently can be provided.

### **7.3 Limitations**

This work had some clear limitations. In the reviewed literature for example PSS as a term has variance in how it is used and there is ambiguity around themes surrounding it. This may cause the literature review to include very differing offers for which all the word PSS has still been used. Furthermore, business models for PSS and the use of PSS in construction industry were scarcely studied and thus the base in the literature for these can be less certain. In the literature review, additionally, some less academic the sources had to be used when discussing consulting, which may decrease the reliability of literature study.

The research was implemented as a single case study, which decreases the generalizability of the results. Additionally, the case study as a method can be highly subjective, which increases the possible errors caused by researcher and her interpretations. Furthermore, the interviews were also carried out only in four companies, and there were clear variation between all the companies. This can indicate that the sample was not

saturated and thus there might be need for more research to provide reliable view on the subject. On the other hand there is only a small group of companies in this business in Finland and thus the results can be seen as rather covering. Interviews as a technique to acquire information are also prone to subjectivity from both the interviewer and interviewee. There is a possibility that the interviewee may have misunderstood the question or the phenomena in their context, or the interviewer might have misunderstood something interviewee said, which can affect the results.

Observations as a method then are extremely subjective because the data provided is the researcher's interpretations and the observer bias has significant effects. Furthermore, in this study one source of limitation can be the notes kept by the researcher. Due to inexperience, the researcher did not quite understand the meaning of clear systematic way to keep the observations and thus something important might have been forgotten to write down. Additionally, the researcher should have at the beginning of the project thought more thoroughly how the observations will be used. This would have provided her with a better understanding about what needs to be written down and provided a possibility to do some additional questioning around subjects that could be of importance. Because this was not done some of the observations were not in the focus and thus this may be problem in validity.

Another problem for validity is that the research was focused on PSSs and business models for them but the case example did not yet reach either of these. The offering was not yet determined clearly but rather the case company still was merely seeking understanding about what should be offered, though, this seems to include both products and services. Furthermore, the process in the company did not yet create ready business model but was still incomplete when the data acquisition was completed. Thus there might be a possibility that the offering that will be created will not fulfill the description of PSS or that the company will not in the end create full business model. Additionally, since the project in the company was still unfinished there might be additional phases to business model creation process or there might be more challenges and advantages than reported here. Thus this work might not be fully covering the subject.

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## **APPENDICES**

**Appendix 1: List of interviews, observations and documents**

**Appendix 2: Question frame for workshop interviews**

**Appendix 3: Question frame for CompanyCo interview**

## Appendix 1: List of interviews, observations and documents

### Interviews:

- I1 = Customer interview 1, medium enterprise, head of supplies
- I2 = Customer interview 2, large enterprise, production manager
- I3 = Customer interview 3, small enterprise, job planner & chief executive officer
- I4 = Customer interview 4, large enterprise, head of supplies
- I5 = Customer interview 5, large enterprise, head of supplies & head of PD
- I6 = Customer interview 6, large enterprise, production manager
- I7 = CompanyCo personell interview 1
- I8 = CompanyCo personell interview 2

### Observations:

Observations are named by the meeting or communication after which they are written

- O1 = Kick off meeting
- O2 = E-Mail conversation about materials
- O3 = Phone call about tasks
- O4 = One-on-one –meeting for competitor analysis
- O5 = E-mail conversation for competitor analysis
- O6 = One-on-one –meeting for competitor analysis
- O7 = One-on-one –meeting for competitor analysis
- O8 = E-mail conversation about competitor analysis
- O9 = Intermediate meeting
- O10 = One-on-one –meeting about customer interview results
- O11 = Interview meeting with CompanyCo personnel
- O12 = Interview meeting with CompanyCo personnel

### Documets:

- D1: Material from Kick off meeting
- D2: Material about competitor analysis
- D3: Question materials for workshop interviews
- D4: Material about workshops for interviews

## Appendix 2: Question frame used in workshop interviews

### Questions for workshops

#### A) Interviewee

1. Work description?
2. Daily tasks?
3. How long you have been working
  - for this employee
  - in the industry/ in similar tasks

#### B) Company and its customers

1. Tell about your company's products services and solutions shortly
2. How would you describe your company's strategy and the future/outlook?
3. Your customers?
4. What do they expect from the company?
  - What do they value
  - what kind of demands/needs they have

#### C) Material X (includes only the main themes)

1. What do you know about material X and its use in construction
2. How these are used in your company
3. How prepared you are to take this material into your production
4. How would you describe the challenges in adopting this material
5. What is your company's take on adopting this material?
6. What is your own view?

#### D1) Solutions/services

1. What kind of services/solutions you provide now?
2. What kind of services customers have asked from you
  - a. Have you provided requested services for customers/have these lead to broadening your offering?
    - if yes, then for only the customer in question or for all?
3. What is the general opinion in your company about services? Do employees like to do these?
  - a. Are there differences in this within the company?
4. Are you creating new solutions now?
5. Do you provide services/solutions on your own or with partners?
6. What kind of services the suppliers have offered you?
  - a. If you would start using Material X would you have need for different services?
    - what kind of services you think would be needed?

**D2) Purchasing process (includes only the main themes)**

1. Describe your purchasing process
2. Purchasing from material supplier
3. Variance in purchasing process

Any more to add or comments related to interview? Any questions?

## **Appendix 3: Themes used when interviewing CompanyCo's representative**

### **Questions for representatives**

1. What is the situation now, what plan/model have you created for material X?
  - Subjects, elements, what have you considered?
2. How the process progressed, step by step
3. What tasks were done and who were involved in the process and in different tasks?
4. Why the people involved in the project were chosen for it?
5. Were there any challenges/successes/surprises in the project?
6. What are the next tasks?
7. Did you have some framework or model in the beginning of the project?
8. Was the project typical? Standard?