CHALMERS

Business Modeling for Increased Profitability

A mapping of current business model and suggestions for an improved one

Master of Science Thesis in the Master Degree Programme, Management and Economies of Innovation

MARIA CARDESJÖ

JOSEFINE LINDH

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2011
Report No. E 2011:08

MASTER'S THESIS E 2011:087

Business Modeling for Increased Profitability

- A mapping of current business model and suggestions for an improved one

MARIA CARDESJÖ

JOSEFINE LINDH

Tutor, Chalmers: Christian Sandström

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2011

Business Modeling for Increased Profitability - A mapping of current business model and suggestions for an improved one

Master's Thesis E 2011: 087

Department of Technology Management and Economics
Division of Innovation Engineering and Management
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
Telephone: + 46 (0)31-772 1000

Chalmers Reproservice
Göteborg, Sweden 201

Acknowledgements

This master thesis has been the last academic project finalizing our education within the field of Industrial Engineering and Management at Chalmers University of Technology. We are therefore very grateful that we have been given the opportunity to spend our last semester with the interesting subject business models. The execution of this master thesis has been fun, challenging, as well as inspiring and we would like to thank the following people that have contributed to our personal development and learning.

First and foremost we would like to thank our supervisor at company X, who has provided us with a positive attitude, support, feedback and valuable contacts for data collection. Without our supervisor this thesis would not have been possible to perform. Also, special thanks to all key people involved in product portfolio Y who have taken part in the interviews and contributed with valuable input and deep knowledge.

Finally, we would like to thank our supervisor at Chalmers University of Technology, Christian Sandström, for his support throughout this thesis.

Gothenburg, June 2011

Maria Cardesjö

Josefine Lindh

Abstract

The concept business model is a relatively new, but yet well-discussed topic among the business world. Business models describe how firms create, deliver and capture value and play a vital role for companies regarding their business strategy. This master thesis has been commissioned in collaboration with company X that lacks a well-defined business model for a given product portfolio. Therefore, the overall objective of the thesis is to map and analyze the present business model within the given product portfolio, as well as develop suggestions for an improved business model aiming to increase the product profitability.

The empirical findings indicate that at present the company holds one business model for this product portfolio. Six key activities have been identified with an identical logic affecting streams of cost and revenue. The business model involves high level of customer adaptation in order to create customer value and increase the customer satisfaction. This result in uncommon and unstructured way of working regarding the six identified key activities involving a huge amount of labour hours spent, which affects the company's internal costs.

To conclude, company X needs to be more efficient and improve productivity concerning the business model in order to increase the product profitability. The company is therefore recommended to implement a renewed business model based upon modular design and platform solutions that is shared among the three products within the investigated product portfolio. In order to successfully implement the suggested renewed business model, the company needs to change its corporate culture.

Table of Content

List of Figures

List of Tables

1. Introduction

The following chapter will introduce the background of the thesis including the case, as well as the purpose of the thesis, the research questions and delimitations. Also, the structure of the thesis will be presented.

1.1 Background

Business models have gained increased attention over the last decades and play a vital role for companies regarding their business strategy. (Sandström and Osborne, 2010) The concept business model is relatively new, thus several similar definitions of the business model can be found. However, none of them are totally alike. Zott and Amit (2009, p.4) describe the business model as:

> "…the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities."

Whereas another definition of the business model is:

> "…business models stand as cognitive structures providing a theory of how to set boundaries to the firm, of how to create value, and how to organise its internal structure and governance" (Prahalad and Doz, 2000 see Doz and Kosonen, 2010, p. 371).

The main purpose of business models is to describe how firms create, deliver and capture value. The models are used in order to explain the design of the value creation and deliver an overall picture of the firm and its activities, stretching from raw materials to end consumers. (Teece, 2009)

1.2 The Case

Company X was founded in 2000 and is a technology intensive company that operates within the manufacturing industry. Today, company X lacks a well-defined business model for a given high volume product portfolio, henceforth called product portfolio Y, in order to create value for the company and its stakeholders.

Due to the fact that company X is a technology intensive company a lot of time, resources and efforts are put on research and development, henceforth called R&D. Consequently, company X needs to increase its profitability in order to sufficiently finance future technology, as well as business development. Therefore, company X is interested in increasing the product portfolio profitability by releasing capital and therefore wants to investigate whether the business model can help the firm to achieve this.

In order to create more efficient activities and increase the profitability it is vital for company X to adopt a well-defined business model regarding its financial activities.

Therefore, this thesis aims to map and analyze company X's current business model, as well as propose suggestions for an improved one for product portfolio Y.

1.3 Purpose

The overall objective of the thesis is to map and analyze the present business model within product portfolio Y, as well as develop suggestions for an improved one in order to increase the product profitability.

1.4 Research Questions

In order to facilitate the investigation, the purpose will be divided into two main research questions:

I. How is the present business model within product portfolio Y designed today?
II. How can company X change its business model in order to improve the product profitability?

1.5 Delimitations

The thesis will be focused on one particular product portfolio, namely product portfolio Y, which consists of three similar products; product A, product B and product C. This portfolio was chosen to be investigated, since it is believable that it will have a promising future with rising demand and increased sales.

The thesis will be limited to only investigate the economical and financial aspects of the business model, which include observing streams of costs and revenues. This is done in order to reduce the complexity of business models, as well as keep focus on the purpose of the thesis due to time constraints. Thus, this limitation was considered to be relevant, since the scope of the thesis is to increase the product profitability.

In addition, the investigation will only be based in Sweden, since that is the only market where the company is present. All interviews will be held internally at company X.

1.6 Structure of the Thesis

The following section aims to provide the reader with a guide to the thesis' different chapters, as well as to provide the logic regarding how the thesis has been structured, see Figure 1 below.

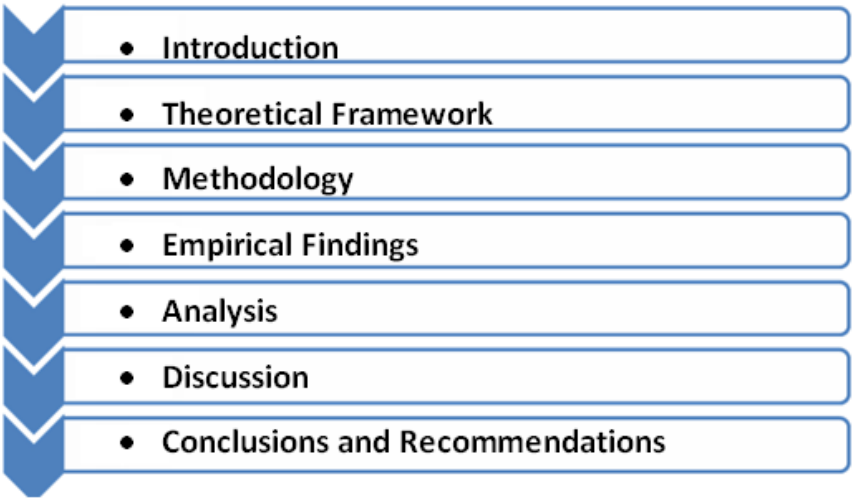

Figure 1 – An overview of the thesis's chapters.

The thesis starts with an introduction. This chapter is supposed to provide the background to the topic of business models, as well as provide information about the case. The chapter ends up with the purpose of the thesis, the research questions and delimitations. The second chapter aims to provide the reader with a theoretical framework and in the third chapter the methodology is presented. In the next chapter, the empirical findings based upon interviews with key people involved in the investigated product portfolio are outlined.

The empirical findings combined with theory are analyzed in the fifth chapter of the thesis. This chapter visualizes the current business model for the investigated product portfolio, as well as suggestions for an improved model. In the next coming chapter, a discussion regarding potential risks is presented. Closing conclusions, recommendations and stepwise actions are suggested, finalizing the thesis in Chapter 7.

2. Theoretical Framework

This chapter is dedicated towards providing the reader with a deeper description of business models, business model renewal and the linkage between business models and business strategy. Also, this chapter will highlight the advantages and disadvantages for a firm to utilize standardization versus customization.

2.1 Business Models

Over the last years, business models have gained increased attention and play a vital role for companies regarding their business strategy. (Sandström and Osborne, 2010) Even in traditional and established industries it has become important to question and improve one's business model in order to reach and maintain sustainable competitive advantage in today's well competitive and global business environment. Still, business models lack theoretical grounding in business and economics research, since the concept is relatively new and thus, several similar definitions of business model can be found. However, none of the definitions are totally alike. According to Zott and Amit (2009, p.4), a business model can be described as:

> "…the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities."

Whereas another definition of a business model is:

> "…business models stand as cognitive structures providing a theory of how to set boundaries to the firm, of how to create value, and how to organize its internal structure and governance" (Prahalad and Doz, 2000 see Doz and Kosonen, 2010, p. 371).

In general, a business model is a simplified representation of a company's business logic and the main purpose is to describe the rationale of how firms create, deliver and capture value. According to Osterwalder (Alex Osterwalder, 2011-03-21), a business model can easily and best be described by mapping nine basic building blocks that draw all the aspects of it and show the logic of how a firm tends to be profitable, see Figure 2.

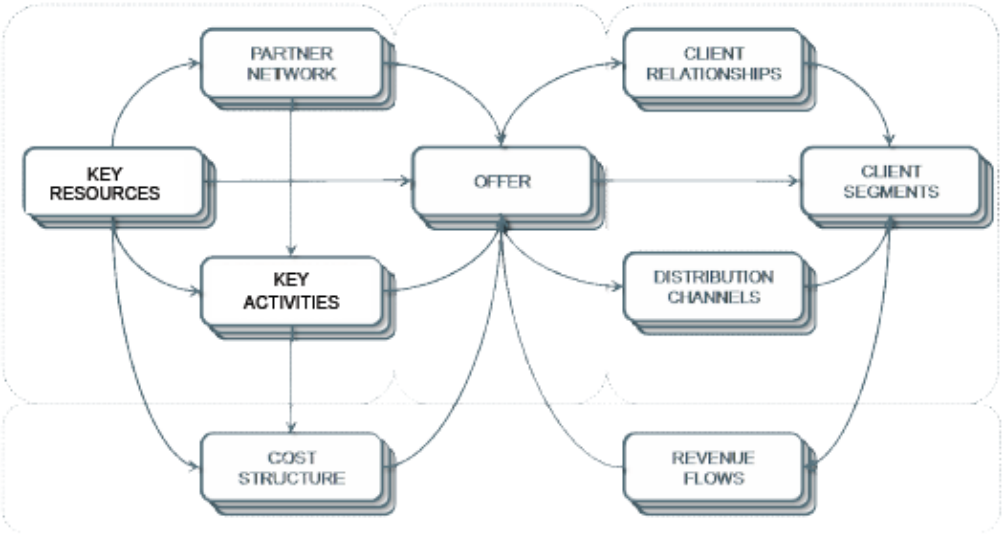

Figure 2 -Osterwalder's nine building blocks of a business model. (Alex Osterwalder, 2011-03-21)

Osterwalder's framework of a business model brings up the four main areas of an organization, which are: the offer, customers, infrastructure and financial capability, as well as work as a plan for an implemented strategy through a firm's processes, systems and structures. Osterwalder (Alex Osterwalder, 2011-03-21) explains that the nine building blocks composing this framework are:

1. *Client segments:* the different groups of customers that the organization serves.
2. *Offer:* the products and services that satisfy customer needs.
3. *Distribution channels:* the different types of channels through which the firm communicates and delivers the offer to the customers.
4. *Client relationships:* the established and maintained relationships with each client segment.
5. *Revenue flows:* the revenue streams earned from successfully creating customer value out of the offer.
6. *Key resources:* the assets required to offer and deliver the firm's products and services.
7. *Key activities:* the activities required to perform the business model.
8. *Partner network:* the company's partners and suppliers that perform some of the activities.
9. *Cost structure:* the result of running the business model.

Zott and Amit (2009) prefer to describe a business model from an activity system perspective and argue that this perspective allows firms, when designing their business model, to think in a systematic and holistic manner instead of a more concentrated manner based on individual and isolated options. They conceptualize a business model as a system of mutually dependent activities exceeding the company and spanning its boundaries. An activity refers to "the engagement of human, physical and/or capital resources of any party to the business model to serve a specific purpose toward the fulfillment of the overall objective" (Zott and Amit, 2009, p.2). Thus, an activity system can be viewed as a set of mutually dependent

activities concentrated on the company including those activities performed by the company itself, its partners, retailers, customers etc. The activity system is the key to understanding the enterprise's business model and enables the company not only to create value in collaboration with its partners, but to appropriate a share of that value created itself. (Zott and Amit, 2009)

When designing a business model, there are two sets of parameters that activity system designers have to consider in order to capture the valuable of this perspective: design elements and design themes. The design elements characterize the activity system, thus capture the core of a business model and describe how a company does business, referring to content, structure and governance. The activity system content explains what activities should be performed whereas the activity system structure describes how they should be linked and sequenced and finally, the activity system governance outlines who should perform these activities and where. Zott and Amit (2009) claim that often mangers have to make decisions on all these parameters concurrently. Concerning the design themes, all of them explain the source of the system's dominant value creation, which include novelty, lock-in, complementarities and efficiency. Novelty is when a firm adapts new content, structure and/or governance of the activity system, whereas lock-in refers to its power to build in elements that attract and, more importantly, keep stakeholders as business model participants. An enterprise can make use of complementarities whenever separately running activities result in less value created than bundling those activities together and the meaning of efficiency-focused design is to reorganize activities in order to reach greater efficiency by lowering transaction costs. (Zott and Amit, 2009)

Teece (2009) discusses the changes and developments in the global economy including globalization, more demanding customer needs, increased transparent supply alternatives, evolving technology as well as new communication channels and explains the importance of a well-developed business model. He claims that firms lacking a well-developed business model will not succeed to either deliver or to capture value from their business. The meaning of a good and well-developed business model is one that provides customer attractive value propositions and captures major value to the company in turn by achieving advantageous cost and risk structures. (Teece, 2009) Itami and Nishino (2010) also highlight the importance of a firm to consider the economical situation and claim that a business model can be referred as composed of two different elements: a business system and a profit model. A business system is the system of operations, for example the supply and distribution system, which the organization designs to actually manufacture and deliver its products and/or services. In addition, the business system is also a learning system. Employees can gain deeper knowledge about the firm's operations, technology and behavior of customers and suppliers if they do a big amount of the information-rich work by themselves and/or if the firm has the possibility to closely observe how its outside stakeholders act and behave. Doing the work involves learning about the work. This learning can result in significant competitive advantage and become very vital for a company's long-term survival. (Itami and Nishino, 2010).

The business system is the real "system of operations" of the business model whereas the profit model is the element that organizations often pay highest attention to because of its direct link to the organization's end result, hence it is more visible. A profit model provides a consistent logic of profit generation and describes how a firm plans to, for example, reduce costs and/or increase sales in its certain business. The model includes relevant decision variables such as revenue sources, expected volumes, pricing methodologies, cost structures, as well as margins and it also states how an enterprise will manage to sustain its profit stream in the long run. In order to develop a successful business model, Itami and Nishino (2010) argue that it has to aim for both these elements, where the profit model earns revenues in a short-term perspective and the business system provides organizational learning in a long-term perspective. (Itami and Nishino, 2010).

According to Johnson et al. (2008), another approach for companies to map and understand their business model is to divide it into four distinct elements; customer value proposition, key recourses, key processes and profit formula, that all taken together create and deliver value. The customer value proposition refers to target customers, identify their specific needs and problems in order to provide an offering, including both what is sold and how it is sold, that satisfies those target customers' needs and problems. Key recourses are assets needed in order to deliver the value proposition to customers including a firm's equipment, people, products, technology, channels, brand etc, whereas key processes enable organizations to deliver that value in a scalable and repeatable manner. Key processes include norms and rules, but may also contain product development, manufacturing, planning, budgeting, marketing and so on. The last element for executives and managers to consider when mapping and identifying a business model in order to understand their core business in a successful way is the profit formula, which is the most visible of all the four elements. The profit formula outlines how value is created for both the firm, as well as its customers. It comprises a revenue model, cost structure, margin model and resource velocity. The revenue model explains how much money a company can earn by multiply the price of a product or service with volume sold. The cost structure illustrates how costs are allocated between direct and indirect costs, and is foremost driven by the key resources required to run a business. Also, it illustrates potential economies of scale. The margin model is used to indicate to which extent each transaction should net in order to realize a firm's desired profit level, while resource velocity includes lead times, throughput etc., which is used as measurement variables in order for a firm to recognize how fast resources need to be utilized to sustain target volume and desired profit. (Johnson *et al.,* 2008)

All of the above presented frameworks related to a business model might seem simple, but Johnson *et al*. (2008) expresses that the power lies in the complex interdependencies of all the different parts composing the whole business model. Consequently, a major change in one part will influence the other parts, thus the whole business model will be affected. Nowadays, many companies lack an understanding of their existing business model well enough to recognize the strategic advantage of it and knowing when success obliges a new one. Companies are seldom neither aware of the background behind their business model and its

correlation between the different elements, nor its strengths and weaknesses. (Johnson et al, 2008)

2.1.1 Business Model Renewal

The importance of a good and reliable business model is that the company gains increased knowledge regarding "deep truth" concerning fundamental facts about customers wants and needs, how to most successfully meet those needs and how to get paid in order to make a profit. (Teece, 2009) Chesbrough (2010) also addresses the importance of a good business model and argues that an innovative new business model can provide at least as much value as gained from an innovative technology. There exist two separate ways when designing a business model; business model innovation or business model renewal. Business model innovation refers to searching for and developing an entirely new business model, thus it is tough to achieve for an organization due to conflicts in understanding barriers between existing assets and business models (Chesbrough, 2010). According to Sandström and Osborne (2010), reshaping an established business model is also a challenge, since the whole value chain with its actors is influenced by the change, thus the firm only holds a limited control.

The importance of renewing an established business model has gained increased attention during the last years among scholars, however, enterprises still face resistance when dealing with this change. As previously mentioned, business model renewal is a complicated process that often involves iterative design processes. The increased global competition causes a high number of bankruptcy firms as a consequence of the rigidity of their business model. The failure is due to the fact that firms rarely transform their business model, instead they keep running the business in a way that used to be the right manner for too long. In addition, as a business model presents a theory of how an organization creates value, how it organizes its internal structure with all complex interdependencies and routines that follows, over time and naturally, a business model becomes stable and difficult to change. (Doz and Kosonen, 2010) However, if a company succeeds in renewing their established business model it normally results in increased customer value and/or decreased costs. (Teece, 2009)

Before experimenting with and adopting new business models, all managers of a firm need a share understanding of what a business model really is and how it is designed today. A common, simple and relevant business model concept that facilitates description and discussion, but does not generalize the complexity of how an organization functions too much, is needed in order for everyone to talk about the same thing. (Alex Osterwalder, 2011-03-21) According to Chesbrough, the starting point is to construct a map of the current business model, for example by applying Osterwalder's previously mentioned framework, which allows the enterprise to experiment by alternate various combinations of all processes before committing to specific in real life investments. However, even if business model renewal is very important, yet it is very difficult to realize due to the fact that organizational processes also must change, but these are not mapped in the

mapping tools of business models. Knowing when to shift resources and processes from the old business model to the new one requires a balancing effort, as often a period of co-existence between the former and latter business model is needed while searching for and experimenting with the new one and succeeding in maintaining the effectiveness of the present business model. Thus, organizational leadership and especially the process of leading change in the firm are vital when renewing a business model. The organization must have internal leaders and knowing who is responsible for the business model renewal in order to manage the change in a desirable way and the result of these processes. (Chesbrough, 2010)

Doz and Kosonen (2010) also highlight the importance of leadership team unity when renewing business models. In order to increase the chances to successfully manage to reshape the business model and maintain value creation and strategic advantage, firms need to have a strategic agility driven by top management that leads the change in the organization. The strategic agility demands unity in the leadership team, which implies that members of the top management team have to reach collective commitment in order to trust and understand each other, as well as daring to take risks connected to the new business model. Also, the strategic agility requires strategic sensitivity of both the organization's internal activity system, as well as external ecosystem to be aware and pay attention to strategic developments. Finally, resource fluidity, which is a firm's internal capability to reallocate resources, in particular people, to new opportunities that support the transformed business model, is included in the strategic agility in order to successfully manage business model renewal. (Doz and Kosonen, 2010)

2.1.2 Business Models and Business Strategy

Due to the lack of an explicit definition of business model, the concept is sometimes connected with fuzziness. Magretta (2002) argues that companies must clear up the fuzziness associated with the buzzword business model before applying it in order to reach the desired results. However, all companies are in some way built upon a sound business model, whether or not it is clear and understood by the mangers and the employees. The problem lies in the fact that many companies use the concept business model and business strategy interchangeable, which is not correct. A business model is more generic than a business strategy and describes how the different parts of the firm fit together in a more holistic perspective, whereas a strategy is correlated to competition and how the company can perform better than its nearest competitors, by means of being different. In order for companies to grow and prosper it is vital that they both have a reliable business model, as well as a competitive strategy concerning how to differentiate from the rivals. (Magretta, 2002) Teece (2009) also discusses the importance of coupling business model analysis with strategy analysis when an organization designs and implements a new business model to protect the results of the transformed business model in terms of competitive advantage. This coupling includes to segment the market, create value propositions for each segment and develop diverse "isolating mechanisms", which help to prevent the business model/business strategy from being imitated by competitors. In order to establish and sustain competitive advantage, having a

differentiated and hard-to-imitate, while simultaneously an efficient, design for a firm's business model is essential. (Teece, 2009)

2.2 Standardization versus Customization

As mentioned in previous section, companies strive to hold a differentiated and at the same time efficient design of their business model in order to increase competitive advantage. However, there exists a trade-off among several manufacturing companies between cost effectiveness and customer satisfaction by being different. A company can chose between focusing on standardization, thus enhance cost effectiveness, or focus on customization in order to fulfill the customer's specific need. Standardization was introduced by Henry Ford and allows mass production and mass distribution through using a large set of standardized components, which controls costs, as well as price and facilitates productivity. Consequently, standardization implies reduction of variety. Customization, on the other hand, considers a customer's unique and specific needs, thus affecting customer satisfaction by being different. However, customization has often a negative impact on the total costs that tends to increase in proportion to the number of product changes. (Lampel and Mintzberg, 1996)

One way of partly solving the contradiction between cost effectiveness and customer satisfaction is to introduce modules of components to the production and design processes, which eases the customization of a large variety of high demanded products, but still allows standardization of certain components. (Jose and Tollenaere, 2005) This way of working is also called modularization. Figure 3 below shows the relationship between standardization and modularization and how it influences the cost and level of diversity concerning the final product.

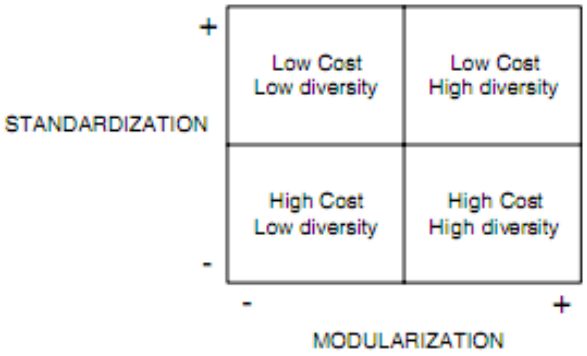

Figure 3 -A matrix showing the relationship between standardization and modularization and how it affects cost and diversity. (Jose and Tollenaere, 2005)

2.2.1 Modularization

According to Fredriksson (2006), modularization is referred to a design strategy utilized in order to divide a complicated and complex whole into smaller and more manageable units, also called modules. This statement is also supported by Ernst and Kamrad (2000) who defines modularization as a product design approach where a

final product is composed by several standardized modules, thus also affecting the manufacturing. The modules composing the final product should be able to be separated and recombined into new configurations. By combining, matching and assemble the standard modules in various ways, different end-products and models with diverse modular product design and sometimes dissimilar function will be shaped. Therefore, there will be a large range of products with minor variances. The only limit regarding new and innovative combinations of modules and components is interface constraints that might not allow and accept all variations and the fact that some modules may not fit together. (Hsuan, 1999) Consequently, modularity increases the flexibility of a system since it support new configurations and systems from a given set of modules. It also provides opportunities for the company to investigate both economies of scope as well as economies of scale. (Ernst and Kamrad, 2000) Economies of scope refer to a firm not specializing in manufacturing one product; instead jointly manufacture several similar or related products through a joint utilization of input, which will result in cost savings. This might, for instance, connote that some products are build upon same modules. Economies of scale involves the cost saving a company can obtain through expansion, thus decreasing the cost per unit for a product as the output increases. This is correlated to manufacture the same module simultaneously, thus reaching volume benefits and economies of scale. (Murray and White, 1983)

Advantages of Modularization

Modular design of a system can provide major benefits regarding several aspects occurring in a product's life cycle. The following list is presented by Gu and Sosale (1999) and explains the benefits that modular design can provide during different phases of the product's life cycle.

1. *Dividing design task for parallel development:* modularization will facilitate division of complicated product design into sub-tasks. These sub-tasks can be performed in parallel, thus reduce the development and design time.
2. *Production and assembly improvement:* the modules can be manufactured separately, hence simplify the production process and optimize equipment utilization.
3. *Standardization:* several products may have identical functions that can be standardized into one common module. Those standardized modules can be mass-produced, which will increase the production efficiency and quality and at the same time reduce costs.
4. *Services:* by using modules the preventive maintenance and recovery repairs will be facilitated since it will be easy to disassembly the system and it is only the faulty module that needs to be temporary replaced.
5. *Upgrading:* the rapid changes in technology, demand and competition force introduction of new models of system in a short time frame. One way of introducing new models fast is to perform small changes to existing designs and production processes, thus reduce both effort and time in developing a new model. The re-use of old designs will be facilitated by using modules.

6. *Reconfiguration:* by refurnish or add more modules to an existing system a new desired function might emerge. This is a cheap way of introducing a new function.
7. *Recycling, reuse and disposal:* some of the modules and components that build the system might have dissimilar life duration. Modular design of the components facilitates easy re-use of the modules.
8. *Product variety and customization:* generally, it is hard to develop and produce a product that satisfies all customers' needs. Often, products are introduced in the market as different models, but they have the same main function. The variety of models is often offered by the manufacturers, i.e. the customer can choose if they want a van or sedan when buying a car. A modular design of the product can give the customer the opportunity to chose and create their own model by re-arranging and/or adding optional modules to the final product.
   (Gu and Sosale, 1999)

Further, modularization will impact the competitive situation as it is a part of the company's manufacturing strategy. Modularization will, among other things, influence the efficiency of assembly, where the different modules are put together, through repetition of the process, which results in short lead times, as well as enable pre-assembly of standardized modules. (Hsuan 1999) Figure 4 illustrates a comparison of assembly time through utilizing modules or not at an assembly station. The grey bars include standard activities, whereas the white bars on top on the grey ones symbolize a specific and unique assembly activity. When the assembly time exceeds the assembly line cycle, extra personnel are needed, which can be followed by varying assemble times, thus resulting in increased labour costs and balancing losses. The right part of the figure shows a reduction of assembly time for product model B, since the specific and unique assembly activities have been allocated to a module flow. (Wild, 1977 and Bennet, 1986 see Fredriksson 2006, p. 171)

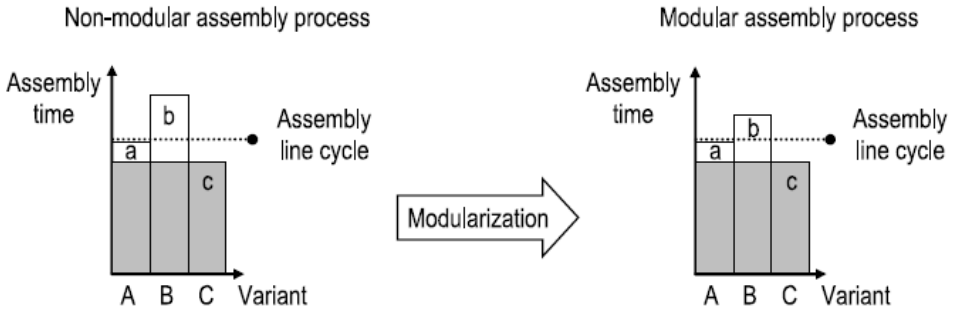

Figure 4 -The tables illustrate improved work balance achieved at the assembly station through introducing modularization. (Fredriksson, 2006)

The higher levels of modular design a product hold, the easier it is to outsource the manufacturing of particular components and thus, the company does not need to perform all critical activities in-house. Also, a modular design and assembly process facilitates mass customization, as well as enables technology position strategies,

which will contribute to a competitive advantage. Modularization will also benefit the customer. The prices will be more affordable due to larger volumes produced and cheaper manufacturing as a result of commonality, extra product models to choose between with high or low variance, increased quality and higher availability. (Hsuan, 1999)

Disadvantages of Modularization

It is important to realize that modularization of a product design does not only bring benefits, some disadvantages may also occur. For a company it is vital to consider the complexity and effort needed to design modular products. Problems of imperfect modularization often appear after assembly of the finished modules where the result shows that the modules perform poor as a whole. (Baldwin and Clark, 1997) By using common modules to design several products, a careful analysis and investigation is needed, since an update or change in design will influence future manufacturing and other activities correlated to the product and its modules. This is turn will affect the effectiveness of a firm, since modular design is not optimized for performance. For instance, the way a module is manufactured, as well as the way a product is repaired, upgraded and recycled might change due to modification in modular design. (Jose and Tollenaere, 2003)

2.2.2 Platform and Product Family

Modularization together with standardization is helpful tools when developing a product family, since they enables design and manufacturing of various products by using the same modules consisting of different components called platforms. A product family is a group of products sharing the same platform. Consequently, a platform can be described as a set of standard modules that form a common structure, which can be applied on several products and thus, facilitating and accelerating the production and development phases. By sharing the same platform, minor differentiations of components can result in several similar products. Figure 5 explains how usage of the same platform with common modules can result in four similar products. (Jose and Tollenaere, 2003)

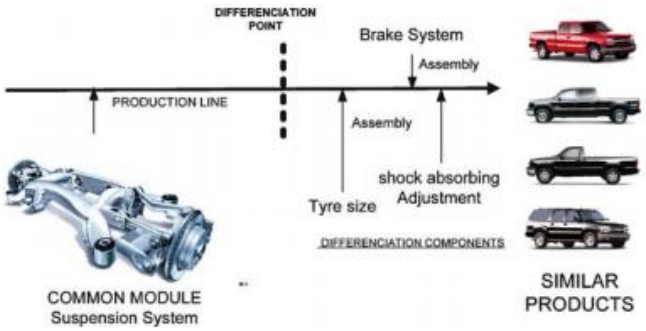

Figure 5 -The four similar products share the same platform consisting of common modules. (Jose and Tollenaere, 2003)

Firms that successfully have introduced platforms have experienced many benefits. For instance, the platform approach simplifies, and reduces the costs correlated to the process of meeting unique demands from specific market segments. The manufacturing and assembly process developed for one product will be used by all products included in the product family, thus reducing manufacturing cost. Also, the cost of machinery, equipment and specific tools, as well as risks will also be shared among the products using the same platform. The risks will be limited due to lower investments per product in the platform. The benefits for platform approach will increase as the production volume increases. (Robertson and Ulrich, 1998)

Further, when using platforms in manufacturing and product design, there must exist a balance between number of common modules and number of unique modules. This balance is important in regard to whether the firm chose to optimize and customize with unique components and modules or if the firm rather use standard components to satisfy the diverse needs in the market. In order to decide which modules that will be common and which that will be unique, the firm need to perform and obey a complex cost analysis. This cost analysis should not only contain the easy platform adaptation to develop new products form, more important, it should include the maximization of economic benefits through reducing the number of unique modules and other assets. (Jose and Tollenaere, 2003)

When designing a product family it is vital to consider whether or not the variety of the products in the family will be low or high. If the variation is low, it can be more profitable to develop the family in the traditional way. However, if the variety among the products is high it will be both cheaper and faster to design the products by means of modules contributing to the common platform, thus spending more time on matching different modules. (Jose and Tollenaere, 2003) Figure 6 shows a comparison including management effort and organizational learning between developing a product family in the old regular way or by utilizing modules and a platform solution. The creation process of a platform consists of cross-functional activities involving managers, design functions, as well as line-managers and manufacturing functions. (Robertson and Ulrich, 1998)

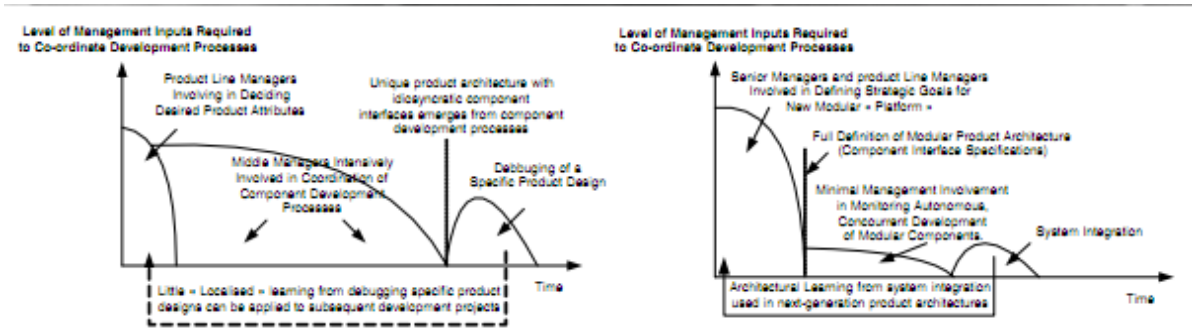

Figure 6 -Comparison of management effort and organizational learning when developing a product family. The right figure shows time spent using modular design and platform solution, whereas the other symbolizes the old way of developing product families. (Jose and Tollenaere, 2003)

A platform approach is often a successful way to achieve and manage mass customization, thus meeting the customer's specific demand through utilizing customized standardization. Modularization can be a crucial factor and is sometimes seen as a main enabler for mass customization. (Lampel and Mintzberg, 1996)

2.2.3 Mass Customization

Nowadays, mass customization is gaining more attention and is predicted to be the new frontier in future business competition. The concept mass customization refers to a firm's ability to offer customized products and solutions to every customer delivered in a short time frame and at the same time produce high volumes through flexible processes. A result of mass customization is not only unique and individually designed products, but also low costs. Mass customization enables the firm to meet the customers in a mass market economy, but treat them all individually and separated in order to fulfill customer's special needs that cannot be fulfilled by standard products. (Silveira *et.al.* 2000)

One way for a company to achieve mass customization is by utilizing modules, which will result in a design that facilitates customer adapted solution of a large variety of products. (Jose and Tollenaere, 2003) The modules will provide the flexibility needed in order to meet the customer's requirements fast and inexpensive by adjusting the modules in regard to the customer's need. (Feitzinger and Lee, 1997) The modular design has, according to Feitzinger and Lee (1997), three major benefits that influence a firm's ability to perform mass customization:

1. Modular design allows maximization of standard modules and components that is used for all product combinations, thus all product models. Those modules should be managed early in the assembly process and all specific adjustments and unique differentiations should be postponed until the latest possible point in the manufacture and assembly process.
2. The different modules can be manufactured separately and simultaneous, which will decrease total manufacturing time.
3. Modular design facilitates diagnosis of manufacturing problems and has the ability to isolate quality problems to the modules rather than the finished product. (Feitzinger and Lee, 1997)

3. Methodology

In the following chapter, the research strategy will be presented along with research approach and research design. Validity and reliability will also be outlined. Finally, this chapter will assess methods for collecting and analyzing data.

3.1 Research Strategy

The research questions for the thesis are as follows;

I. How is the present business model within product portfolio Y designed today?
II. How can company X change its business model in order to improve the product profitability?

These questions were continuously kept in mind and served as a basis throughout the whole investigation. The two research questions can be described as two different stages in the work process when fulfilling and approaching the purpose of the thesis.

The first stage was to review relevant literature in order to gain increased knowledge about the subject in question. Further, intensive interviews with internal key people involved in product portfolio Y were held in order to map and analyze company X's current business model. In the next and last stage, further detailed interviews with some of the same key people as in stage one was conducted to address critical issues related to research question number two. The outcome from the first round of interviews was utilized in order to map the current business model, whereas the outcome gained from the second round of interviews was compared and analyzed with relevant literature, which enabled a discussion for a potential improved business model.

There are three different theories that can be utilized when approaching the research questions in order to unite empirical material with theory, namely the deductive, inductive and abductive theory. According to Patel and Davidsson (2003), deductive theory tests already existing theory through a hypothesis that must be subjected to empirical findings. The objectivity is strengthened due to the researcher's inability to attach own values to the results. On the other hand, the inductive theory is reversed to the deductive theory. This implies that the researcher through observations and findings builds and formulates theory, hence the objectivity is weakened since the researcher's own values can be reflected in the results when applying this approach. Abductive theory alternates to proceed from already existing theories to formulation of a preliminary theory and perceptions that can be analyzed and developed. Hence, ideas are often developed simultaneously as the research is conducted (Patel and Davidsson, 2003).

In this investigation, an inductive theory was utilized when approaching the research questions, since the outcome involved drawing general inferences out of observations. The inductive approach was also chosen due to its ability to stepwise

create and justify theories, thus there was no need for subsequent empirical testing. Further, the research strategy was a part of an iterative process, where planning, execution and documentation occurred in parallel. This was done due to the fact that the researchers wanted to collect further data while simultaneously conducting intense literature studies. (Bryman and Bell, 2007)

A research can be quantitative or qualitative depending on how data is collected and analyzed. According to Bryman and Bell (2007), an inductive theory is often associated with a qualitative research approach when connecting theory and data. This was the case for this research, since smaller interview-samples were needed in order to get a deeper understanding to fulfill the purpose. Words, rather than numbers, gained most attention when collecting and analyzing data.

3.2 Research Approach

The research process was conducted during 21 weeks and was divided into seven main steps, which can be seen in Figure 7. These main steps were set up in order to provide guidance and easily be able to follow the progress of the research. However, these steps were not followed strictly, as the research was of an iterative nature.

Figure 7 -An illustration of the research process containing seven main steps.

In the planning process, meetings with the supervisor at company X and at Chalmers University of Technology (Christian Sandström, PhD Student at the Division of Innovation Engineering and Management) were held in order to narrow down the research and formulate the objectives. Also, a planning report was written with a preliminary time frame, see Gantt schedule in Appendix 2, as well as a preliminary structure of the research. The Gantt schedule was established to clarify milestones and easily be able to follow progress of the research. Due to the preliminary nature, the activities as well as the Gantt schedule could be changed. When changes and progress of research occurred, these were continuously reported to the supervisors in order to obtain valuable input and constructive feedback.

Intense literature reviews related to the research were continuously done throughout the research in order to focus on the scope and gain increased knowledge about the subject. To fulfill the purpose, an empirical investigation was performed. The empirical investigation included interviews with 25 key people at company X. The interviews were divided into four distinct phases depending on the key people's knowledge and responsibility at the company. The split of key people into different phases was done in order to structure the research process, keep the time frame as well as gain several point of views regarding the concerned subject.

Report writing was continuously done throughout the whole research. In the end of each month a meeting with the supervisor at company X was held. During the monthly meetings, status of the project, next steps of the project and findings of the investigation so far were presented together with a discussion of how to continue with the investigation. In addition, a daily notebook was written in order to gather and document important thoughts and the progress of the research.

When the empirical study was conducted, data was proceeded and analyzed in order to map company X's current business model for the investigated portfolio. A business model evaluation tool, see Figure 8 below, was compiled by the researchers to facilitate the investigation and mapping of the current business model. Every single square of the business model evaluation tool including each business offer for each product was studied in detail.

	Product A	Product B	Product C
System			
Service			

Figure 8 -The business model evaluation tool.

The analysis of the current business model resulted in suggestions for an improved business model with recommendations including stepwise actions on how to increase the product profitability. Before the final presentation of the proposed improved business model, feedback from the supervisors was given to enable further progress of the result. Furthermore, the researchers evaluated the quality of the result by considering the validity and reliability of the research. The second and last step of the research process included the evaluation part where opponents provided constructive criticism. This criticism helped the researchers to strengthen the result of the research even further before presenting the final result for the company.

3.3 Research Design

A case study design was chosen for the research. This entails a detailed and intensive analysis of a single case, which in this research was company X. A case study is a contemporary phenomenon of interest in its own right and complexity, where the researchers strive to gain knowledge and clarification about the specific phenomenon. Hence, this design was suitable for this specific research. Also, the case study aims to set the investigated phenomenon in relation to a theoretical analysis. The quality of the theoretical analysis is of major concern, since this engages the researchers. (Bryman and Bell, 2007) As mentioned before, this research has an inductive approach where the researchers are allowed to be subjective in the results, which also corresponds to the case study design.

3.3.1 Validity and Reliability

The research is build upon qualitative data, hence issues related to both validity and reliability might occur. The validity of the research concerns whether the researchers are observing, identifying and measuring what they are intended to do. The validity is distinguished into four different types; internal-, external-, measurement- and ecological validity. (Bryman and Bell, 2007) However, the measurement validity and ecological validity are not present, since those types of validity do not belong to the criterion for the research.

The internal validity of the research was high due to the good match between empirical findings and theoretical ideas from the researchers. (Bryman and Bell, 2007) The empirical findings were based on extensive interviews where one standard interview template with clear defined questions connected to the research subject was used. This was done in order to receive proper and easily comparable data, which facilitated the analysis of the research. All interviews were documented in written notes by both researchers and were compiled immediately after each interview. The compiled document was then sent to, and confirmed by, the interviewee in order to monitor and capture all valuable information given by correcting possible misunderstandings. All above mentioned steps ensured high internal validity of the research. Furthermore, the monthly meetings with the supervisor at company X helped the researchers to stay in focus and provide guidance on what they were intended to do. However, it is important to mention that the external validity is weak due to the inability to generalize the results between different social settings, since the research only focused on one case (Bryman, 2004). The external validity could be increased by using a representative sample of companies across different industries, thus indicating the generalization.

The reliability concerns whether the research can be replicated with the same outcome. However, high reliability is hard to achieve due to the qualitative nature of the research. In this case study the human behavior plays a vital role and in the long run the interviewees' opinions might change, which inhibits the replication of the research. Also, changes in the organizational culture might affect the interviewees' view on the concerned subject. Thus, it is impossible to keep a social setting and its circumstances in the same terms as the initial study to make it replicable. (Bryman and Bell, 2007)

To increase the trustworthiness of the research, several sources of data were used, thus enabling triangulation. The several interviews with different key people, as well as the large amount of theoretical perspectives, served as multiple reference points in order to fulfill the purpose of the research and ensure quality of the result. (Bryman and Bell, 2007)

3.4 Research Method

The case study was based on primary data. Primary source constitutes by the researcher's own observations and first person reports, whereas secondary source is an interpretation of primary data (Patel and Davidson, 2003). Primary data

constituted of the main data source and was collected through qualitative interviews with key people that were used in order to gain an understanding of company X's current business model.

According to Lantz (2007), interviews are an effective method of collecting qualitative data. The information gained from the interviewees provided important parameters, which were integrated in the mapping of the current business model. However, there are limitations when conducting interviews. Interviews are time-consuming, hence costly. In addition, it is hard to control the honesty of the interviews answers, since they might favor their own business area of company X. Another limitation is correlated to the inability to interview all employees at company X due to time constraints. This might affect the outcome and results of the research, due to difficulties in generalizing data.

3.4.1 Interview Design

The first round of interviews was divided into four distinct phases based on the interviewees' belonging business area and responsibilities. All phases included semi-structured interviewing using one standard interview template, see Appendix 3. The standard interview template contained fairly specific topics that needed to be covered in order to fulfill the purpose of the research. All questions in the standard interview template were asked, but the semi-structured interviews also allowed the researchers to be flexible, permitting new questions to be brought up depending on the interviewees answer. In addition, the pre-formulated questions did not need to follow an exactly order. (Bryman and Bell, 2007) This outline provided the researchers with additional significant information that could be of great importance for the research, and also contributed with an increased gained insight of the subject and company X. The second round of interviews was only held with some of the same key people in order to get in-depth knowledge regarding specific areas and issues that were brought up after completion of first round of interviews. No standard interview template was used, rather the concerned key people were interviewed if needed during a short session including a discussion of the relevant area or issue in question.

The standard interview template consisted of ten main questions, see Appendix 3. The templates were developed by relating the questions to the purpose of the research. The questions were formulated in comprehensible language in order to avoid fuzzy language with multiple interpretations. Furthermore, the questions were designed short and only contained positive language to encourage the interviewees.[1] In order to strengthen the quality of the interviews and develop the templates further, a pilot interview was performed on a fellow student. The result of the pilot interview was an evaluation of the template including clarification of some questions.

[1] Magnus Holmén, Associate Professor at the Department of Technology Management and Economics, Chalmers University of Technology. Lecture 3: surveys and questionnaires expost, 27th of March 2010.

To set the interview scene, an introduction presentation containing the researchers background, as well as mission at company X was together with the interview template sent out by e-mail two weeks in advance to the interviewees. This allowed the interviewees to prepare the answers, which increased the quality of the interviews.

Interviewees

In the following section, a brief presentation of the interviewees consulted in the empirical study will be introduced. As mentioned earlier, the first round of interviews was divided into four phases. The interviewed employees were selected by the supervisor at company X due to their experience, knowledge and involvement in product portfolio Y. The employees interviewed at company X are shown in Table 1.

Phase	Interviewed employees	Number of interviews
Phase 0	Person 1	**1**
Phase 1	Person 2	**2**
	Person 3	**3**
	Person 4	**2**
Phase 2	Person 5	**1**
	Person 6	**2**
	Person 7	**2**
	Person 8	**2**
	Person 9	**4**
Phase 3	Person 10	**1**
	Person 11	**1**
	Person 12	**2**
	Person 13	**1**
	Person 14	**1**
	Person 15	**1**
	Person 16	**1**
	Person 17	**1**
	Person 18	**1**
	Person 19	**1**
	Person 20	**2**
	Person 21	**3**
	Person 22	**1**
	Person 23	**1**
	Person 24	**2**
	Person 25	**1**

Table 1 - Presentation of the 25 interviewed people at company X.

In phase 0, Person 1 was interviewed in order to get an overall picture of the organization, as well as product portfolio Y. The purpose with phase 1 was to gain an understanding of vital terminology. In phase 2, the purpose was to get specific and increased knowledge about the products in portfolio Y. Besides, a meeting with Person 6 was arranged to get an even broader perspective of the different business

areas at company X and the subject of the research. Finally, phase 3 consisted of interviews with key people from different business areas involved in product portfolio Y.

4. Empirical Findings

The following chapter will contain information gained from the interview sessions held with key people involved in product portfolio Y at company X in order to present the identified business model.

4.1 Business Model at Company X

The interviews held with 25 key people at company X in order to map present business model within product portfolio Y, thus fulfilling the first research question of the thesis, generated different perspectives concerning how the organization performs business today. More importantly, the interviews contributed to gained knowledge regarding the internal cost structures and risks included in the product contribution calculation and how these influence the product profitability. The investigated product portfolio Y includes, as mentioned before, three products where each product's profitability is calculated according to the same product contribution calculation, see a simplified version in Figure 9. The most important result from the interviews is that product A, product B and product C share the same business model. This conclusion can be drawn after having investigated in detail every single square of the business model evaluation tool from a product contribution perspective, see Figure 8 in section 3.2. The identified business model will be further described in section 4.3. Another important finding is that company X lacks a common way of working regarding several main activities affecting the product contribution calculation within the company.

4.3 Current Business Model for Product A, Product B and Product C

The logic regarding several main activities influencing streams of cost and revenue, which in turn affect the product contribution calculation is identical for product A, product B and product C, thus the products share the same business model.

In the next coming sections, the business model for product A, product B and product C will in detail be outlined in terms of the product contribution calculation, see Figure 9.

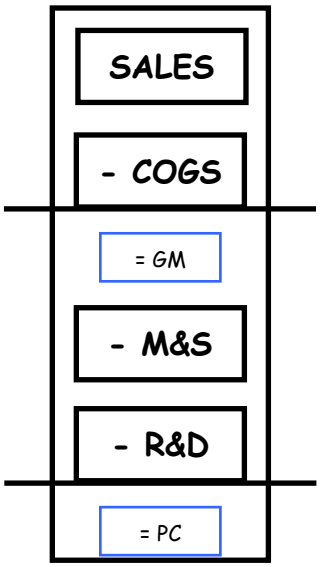

Figure 9 -A simplified explanation of the product contribution calculation outlining the relationship between sales and cost of goods sold (COGS) which results in a gross margin (GM). Further, the cost of marketing and sales (M&S) and the cost of R&D, subtracted from the gross margin result in the product contribution (PC).

4.3.1 SALES

Company X offers two different businesses that generate sales; system business and service business. Figure 10 shows the different businesses available for each product. The generated yearly profit must cover expenses for M&S and R&D in order to sufficiently finance company X's future technology and business development.

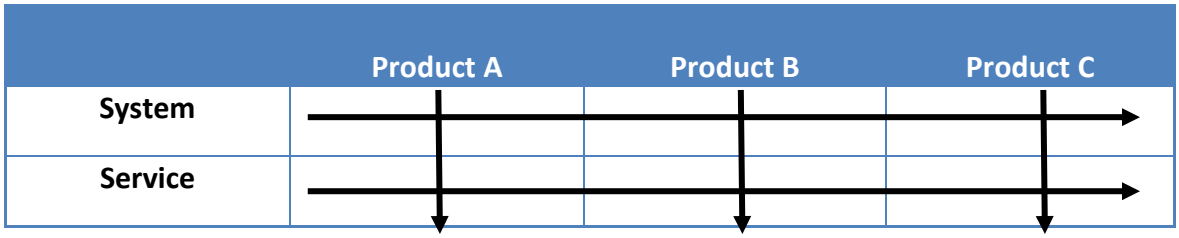

Figure 10 -The two businesses offered for product A, product B and product C. The black arrows imply which business offering that is available for each product.

System Business

Today, company X is able to match the customers' requirements in best possible way by adapting the products according to their specific needs, hence all final products are unique and customer adapted. Many of the interviewed key people believe that the customer adaptation is the company's main competitive advantage. Company X's products are based upon approximately 30 percent platform solutions and 70 percent customer adapted solutions. The three products share some parts, with exactly the same article number, but the products also consist of individual various parts. Due to the high level of customer adaptation, company X is not able to utilize prognosis regarding future demand, which makes it hard to estimate upcoming costs.

The strengths and characteristics of product portfolio Y are the systems' high performance and attractive price in relation to its technology. Also, compared to the competitors, company X's products have high availability due to well-developed support contracts. Product A, product B and product C face different levels of competition, which affect the pricing of the products. Product A meets the lowest level of direct competition compared to the other products in product portfolio Y, however the product is still competing with similar solutions. Product A has a good position in the market, but the competition is today increasing, which might affect the current position and company X believes that the price cannot be set any higher. Product B is top three among the competitors, whereas product C faces the highest level of competition. Thus, product C is price sensitive and can sometimes be hard to sell due to similar competitors.

Today, the company utilizes a bottom-up pricing strategy when selling the products. This means that a desired gross margin is set to which all direct and indirect expenses are added in order to compute a market price. The pricing of a product depends on the costs, but a potential risk margin is also added, which provide a market price. If the entire estimated risk falls out, it will be included in cost of goods sold, henceforth called COGS. In best case, the risk margin does not fall out, which means that the gross margin increases. Consequently, COGS establishes the market price, see Figure 11.

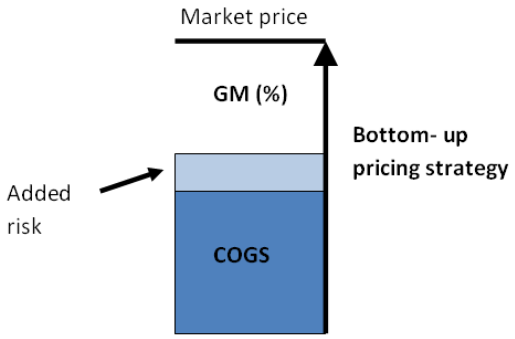

Figure 11- The bottom-up pricing strategy for product A, product B and product C, where COGS establishes the market price. GM = Gross Margin.

The potential added risk is however not related to the system itself, rather it is related to the projects and will be further described in section 4.3.2.

Service Business

The service business that company X offers does not begin until the support contract that follows with the purchasing of a product ends, which is after 12 months of the product's length of life. The reason for the company to offer service is to provide support and fulfill the customers' requirements and needs in a short-term perspective. The service business includes among others: service agreement, spare parts, repairs and upgrades.

Today, the service business, as well as the system business, is customized to a great extent due to diverse customer needs including customer adapted service and support solutions. When a customer buys a product, a support contract is included in the offer. The support contract is however standardized to a certain amount regarding scope and guidelines and converts the customer's specific requirements regarding the product towards more construction-friendly solutions. This means that the contract contains calculated availability and maintenance for the system, as well as customer documentation.

The concept of company X's service business is to try to sell long-term solutions including an agreement that covers two years at the time where the customer pays a fixed price. The company offers a base level of service where the customer has the option to add different levels of "service packages". The base level, as well as the "packages", are customized depending on the product's operating hours and need of spare parts. The "packages" are contractual seen pre-determined and highly priced. Today, the service business plays a vital role for company X, since it is the most profitable business. In general, the service business provides a very high gross margin. The high gross margin can be explained by the unique products that company X offers, the lack of need to invest in developing products and the fact that a lot of support, spare parts and repairs are needed in order to extend the length of the products' life. Normally, a product is usable between 5 to 10 years.

Company X has the same costs for product A, product B and product C related to the service business. The highest cost for the company is to provide support and handle contracts, which affect the labour hours in a negative manner. There are also some risks connected to the service business. One of the risks is the fixed price commitment, which means that the company must sometimes provide higher level of service than the customer originally has paid for. However company X's large amount of customers gives a wider distribution of this risk. The pool of spare parts is another risk that ties up capital in the company's large warehouse, nevertheless it is necessary in order to maintain the support contracts.

4.3.2 COGS

Customer project, sourcing and supply, all affecting the streams of COGS, will be outlined in detail in the next coming subsections.

Customer Project

Today, when company X manufactures a product, for example a new product A, a previous project for the same product is used as a template. This results in the fact that the new customer project inherits characteristics and errors from the previous project, which contributes to a lot of re-work, since the errors needs to be corrected over and over again. The process is illustrated in Figure 12 below.

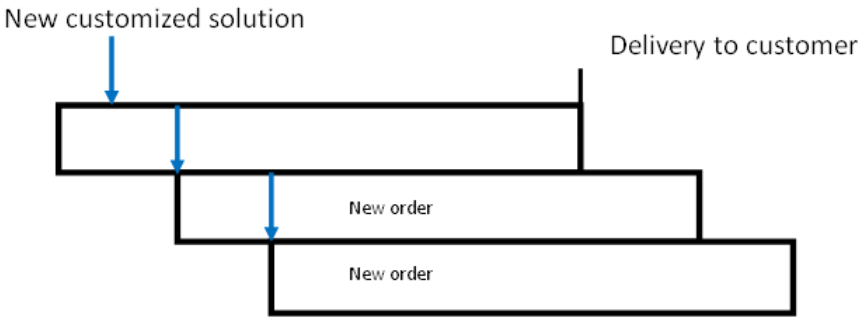

Figure 12 - When a previous "project model" is used as a template for next projects it results in inherited errors from the first project to the next coming projects. The blue arrows illustrate how the errors are inherited.

Due to the high level of customer adaptation in each customer project, company X seldom utilizes standard document/product descriptions. At the order intake, the company does not often know how the structure of the project realization will look like, which provides unclear foundations for supply that has to adapt a partly new way of working for each customer project. Many labour hours are spent on the project management, decision making and planning, which provide high administration costs and increased lead times.

As previous mentioned, the products' profitability is calculated according to the product contribution calculation. Company X decides the price of the product and a pre-determined required gross margin in percent, as well as delivery time to customer. The determined gross margin will permeate the whole project management and affect all activities related to the customer project. However, it is vital to consider the risk management and the fact that company X does not always realize the projects in time. This is due to the high level of customer adaptation that affects time for the customer driven technology development, thus the predicted delivery time might overdue and decrease the gross margin. The profit generated from the project realization must cover administration costs and expenses for R&D, as well as marketing and sales, henceforth called M&S.

The total cost for example a product A project to another product A project varies between weeks. The important thing is that the pre-determined gross margin is reached and similar between the projects. However, it is vital to mention that the products in product portfolio Y also share the cost of M&S and R&D. As mentioned earlier, the money invested in M&S and R&D depends on the profit, thus the gross margin is critical for future technology and business development and success for product portfolio Y. The cost of M&S and R&D will be further explained in section 4.3.3 and 4.3.4.

Sourcing

The high level of customer adaptation in company X's business offerings also affects the sourcing process. Today, the company buys material for every single project and has a limited amount of coordination of sourcing between different projects. Due to the high level of customer adaptation, the company orders material depending on what products that have to be delivered without any deeper considerations of its

effects. There exists almost no clear frameworks, methods and processes related to how sourcing should be managed.

All the different single article numbers that together build the final products are bought from various suppliers where the contract time often is short and no fixed price models are utilized. In 2010, company X used hundreds of different suppliers. Company X lacks clear roles and responsibilities for each supplier, which is due to the fact that several classes of goods can share the same suppliers. Hence, a number of employees can be responsible for the same supplier. The suppliers are divided into strategic and non-strategic suppliers, where the strategic are the system suppliers and critical ones, as well as different classes of goods. The strategic suppliers are critical, since it takes long time to replace them. Today, all suppliers are to a great extent treated in the same way, thus there is no major difference in supplier relationship management.

The cost of sourcing is composed of internal and external costs for goods and services, as well as labour hours spent in the sourcing process. These costs taken together represent the total warehouse cost for a project. The internal goods and services are added to manufacturing costs when used in a project, whereas the external goods and services constitutes of finished manufactured parts purchased from suppliers, thus referred as direct material. Planning of the sourcing process is a complex issue today, due to the high level of customer adapted products, as well as service contracts, which limits company X's ability to work according to principles of just in time. The consequence of the service business and customers' need of available spare parts is that the company has a large warehouse, which inhibits the principles of just in time and ties up a large amount of capital.

Supply

At present, company X does not utilize the same supply process for product A, product B and product C. The technology development necessary to fit customer adaptation starts early in the supply process, which sometimes hinders recycling of old constructions. A lot of the work considering the procurement and supply entities is to plan in order to fulfill the customers' requirements. Today, the supply department often lacks clear foundations regarding the manufacturing process, because at the order intake company X does seldom know how the structure of the realization of the product will look like. Figure 13 shows the relationship between technology development of customer adaptation and supply.

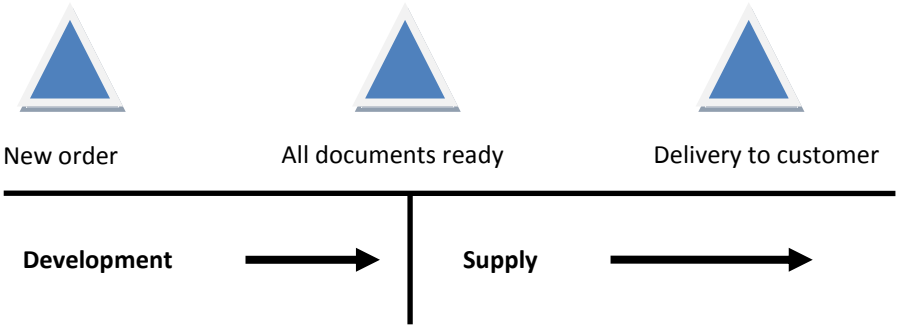

Figure 13 -The relationship between customer driven technology development and supply of a product, where supply begins when development of the product is finished.

As can be seen in Figure 13, the customer driven technology development and supply of an order does not occur in parallel, rather the supply follows the development process. There is often delay between the time when the development of customer adaptation should be fully finished and when it really is.

4.3.3 M&S

The purpose of M&S is to capture new business and being responsible for decision-making in the sales process. The product managers are involved in the whole process, foremost when M&S tries to affect the customer's specifications in order to fit the product's characteristics. Today, the salesmen accept almost all the customers' demands and requirements in order to make them feel unique and fulfill their needs. This is the way company X always has been doing business. The company's most valuable competitive advantage is, as mentioned earlier, to offer fully customer adaptation.

M&S is funded by the yearly result for company X. The M&S expense is not related to the customer projects, thus it is impossible for the company to now the exactly M&S cost for each project. Today, the salesmen tries to sell all products simultaneously when meeting customers, which makes it hard to refer the accurately amount of M&S expense connected to each customer project. This is due to the fact that the M&S expense merely can charge one single product at time. The costs related to M&S mainly consists of internal labour hours for M&S, the management team and operations. The potential risk associated to M&S is that the customer contracts contain customer adapted specifications that can be tough and costly for the company to manage.

4.3.4 R&D

The role of R&D is to perform futurological studies in order to develop new strategic products for the company. R&D is a process that continuously occurs at company X, hence it is not always related to a specific customer project. R&D is a developing project that starts after an idea generation and study, proceeds in the actual development and ends with maintenance. Several developing projects can be performed simultaneously and are funded by company X. As for M&S, the invested capital from the company in R&D comes from company X's yearly result. The

company secures a certain amount of capital for short-term investments in order to enable long-term strategic investments.

Today, it is hard to estimate the cost of R&D for each product in product portfolio Y, often this cost is underestimated due to uncertainties regarding future circumstances. Those circumstances could for instance be technological issues, as well as difficulties in keeping the time frame. The cost structure for R&D mainly includes labour hours for the management team who are in the forefront of next steps and decides what should be invested in or not. There exist three possible risks associated with R&D. There is always a potential development and technical risk. The products can be hard to develop and manufacture, which might result in increased labour hours for the developing project and difficulties in keeping the budget. In addition, company X might lack knowledge and experience concerning the market, which can result in cancelled investments.

5. Analysis

Based on the empirical findings presented in previous chapter supported by the literature on business models, as well as standardization versus customization, this chapter will map and analyze the current business model for product portfolio Y in order to suggest an improved business model to increase the product profitability, thus fulfilling the purpose of the thesis.

5.1 Current Business Model for Product Portfolio Y

As mentioned earlier, the mission of this thesis is to release capital by increase the product profitability, as well as decrease tied-up capital and costs in order for company X to sufficiently invest in future technology and business development. This section aims to answer the first research question of the thesis, thus map how the present business model is designed today. In current time, there are two ways for the company to increase the product profitability. This is either by decreasing costs or by selling more products at a higher price. However, the interviews demonstrate that the price for all three products cannot be set any higher due to the fact that product A already has a maximized price and the rest of the products face hard competition, thus they are price sensitive. Therefore, a conclusion that company X has to handle its available capital in a new and better way by decreasing costs can be drawn, hence increasing the product profitability.

Teece claims in the article "Business Models, Business Strategy and Innovation" (2009) that a firm lacking a well-developed business model will neither succeed to deliver, nor capture, value from its business. Further, Teece explains that a well-developed business model helps a firm to achieve beneficial cost and risk structures. This strengthens the importance of having a well-functioned business model and implies that if company X does not have a successful business model the company will most likely not manage to decrease costs for product portfolio Y.

5.1.1 Presentation of Current Business Model

In order to describe the rationale of how company X creates, delivers and captures value, Osterwalder (Alex Osterwalder, 2011-03-21) suggests that the best way to describe a business model is to map nine building blocks that draw all aspects of it, see Figure 2 in chapter 2. However, the first research question of this thesis is to map the business model in regard to financial and economical aspects, which is in line with Itami and Nishimo (2010) who highlight the importance for a firm to consider the economical situation and claim that a business model can be divided into two elements; a business system and a profit model. Also, the profit model is seen as suitable when mapping company X's business models, since it provides a direct link to the organizations bottom line. In order to relate the profit model and the business system to the view of Osterwalder's framework (Alex Osterwalder, 2011-03-21) three building blocks have been included in the mapping of company X's business model. These building blocks are as follows;

- *Revenue flows:* The identified streams of revenue earned from successfully creating value out of the two businesses offered
- *Cost structure:* The identified streams of cost as a result of running necessary activities to create value out of the two businesses offered
- *Key activities:* The identified six critical value adding activities required to run the businesses

The first two building blocks presented above are included in the profit model, whereas the last building block, key activities, refers to the business system. Itami and Nishino (2010) argue that the business system is the real "system of operations", but it is often the profit model that gains the most attention among firms due to its visibility. The importance for an organization to consider the profit model when designing a business model is strengthen by Johnson *et al.* (2008) who in his approach divides a business model into four elements where the profit formula is one of them. Johnson *et al.* (2008) argues that the profit formula outlines, among others, a revenue model, cost structure and margin model, which also indirect can be referred to the building blocks revenue flows and cost structure in Osterwalder's framework.

However, Itami and Nishino (2010) state that in order to map a successful business model it has to aim for both the profit model and the business system. Thus, both these elements have been considered when describing and mapping company X's current business model. The key activities referring to the business system play a vital role when identifying and tracking the sources of costs affecting the product contribution calculation, see Figure 9 in chapter 4. The identification and mapping of company X's current business model might seem simple, but in reality it was a complex issue involving interdependencies among the three chosen building blocks of Osterwalder, which made the business model hard to grasp. The complexity of a business model is similar to the findings of Johnson *et al.* (2008) who also discusses this problem. However, in order to easily describe company X's current business model the product contribution calculation has been used as a template to visualize the relationship between the key activities, as well as streams of cost and revenue.

5.2 Current Business Model for Product A, Product B and Product C

Six main critical value adding activities that describe company X's way of working and how the firm creates customer value today have been identified. Those six main critical value adding activities can be referred as the building block key activities in Osterwalder's framework. Therefore, the six main critical value adding activities are in this analysis interchangeable with key activities. The logic regarding those six key activities influencing streams of cost and revenue, which in turn affect the product contribution calculation, is identical for the three products, thus it is concluded that these products share the same business model.

Figure 14 presents the current business model for product A, product B and product C. The business model is designed in regard to the relationship between the six key activities and how they influence streams of cost and revenue, which is in line with the argumentation of business system and profit model according to Itami and Nishimo (2010).

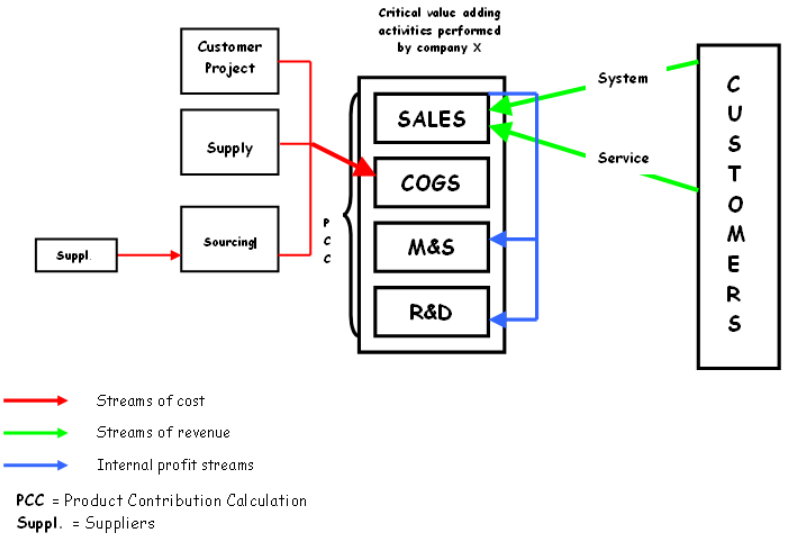

Figure 14 - ***The model is an illustration of the current business model for product A, product B and product C.***

The six key activities are:

- The business offering contributing to SALES
- Customer project
- Sourcing
- Supply

} All three compose total COGS

- M&S
- R&D

In the next coming sections, those six key activities will be analyzed in detail.

5.2.1 SALES

According to Lampel and Mintzberg (1996), there exists a trade-off between cost effectiveness and customer satisfaction among several manufacturing companies. A company can focus on standardization, thus enhance cost effectiveness through repetition or focus on customization in order to fulfill the customer's specific needs. Company X offers two businesses that generate sales, which in turn affect the stream of revenue, see Figure 14. Today, the company is able to match the customer's requirements in best possible way regarding both businesses by adapting the systems according to the customer's specific needs and thus, all products are unique and none of them are totally alike. In other words, company X focuses on customization in order to fulfill the customer's demand and increase the customer satisfaction.

System Business

By offering totally customer adapted end systems, the customer can have all the adjustments and requirements it desires. The ability to fully customize all systems is one of company X's main strengths, which has a large impact on the customer satisfaction and therefore contributes to the company's competitive advantage. The customization plays a vital role for the customer who probably orders the products from company X partly due to the possibility to get the products exactly as it wants. However, in order to be able to offer totally customization company X needs to have well-developed competences, knowledge, as well as available recourses and technology. This together with the development and compilation of the unique products might result in increased manufacturing time, which increases the lead times and extends time for delivery. Due to the unique products, the manufacturing of the three products can seldom be performed in regard to any pre-defined assembly line. This along with the necessary education needed for the employees in order to perform the required work for every unique system inhibits a smooth flow in the supply process. It can be concluded that the education, the increased amount of labour hours due to new manufacturing processes, as well as the inability to have a smooth flow in the supply result in an unproductive and complex way of working, which influences the costs and therefore also affects the desired gross margin.

The final product is priced according to the adaptations required to fulfill the customer's need, which affects total cost for producing the product. The price can be seen as one of company X's weaknesses and cannot be set any higher, since product A's price is already maximized and the other two products face a high level of competition, thus they are price sensitive. Today, company X utilizes a bottom-up pricing strategy when selling its products, see Figure 11 in chapter 4. Hence, total cost controls the price of a product and if the cost increases due to further necessary technology development in order to meet the customization it will result in lower profit for the company. In current time, company X accepts all costs correlated to customer adjustments and the company has no maximum level of total cost, which directly affects the gross margin. Consequently, if the customer requires a complex and large amount of customization, which in turn affects the number of labour hours spent on each customer project, taken together with the fact that the price cannot be set any higher it will result in lower profit. This reasoning is also in line with Lampel and Mintzberg (1996) who conclude that customization often has a negative impact on total cost, since the costs tends to increase in proportion to the number of product changes.

Service Business

The service business is the most profitable business of company X's business offerings. One reason for this could be that there is no need for investment in technology development for the company. Zott and Amit (2009) discuss the importance of creating value through lock-in of customers that attract and keep them as business model participants. It is possible to say that company X's service business serves as a lock-in of customers that continue to create value for the customers during the whole products' length of life. This is due to the customers' dependence of the company's customized service contracts, which is a result of the

products' need for a minimum level of basic service in order to extend the products' length of life. This might give company X a unique position with an opportunity to set higher prices on the service business due to low power of buyers, as well as low threat of entry within the industry.

The service business, as the system business, is customized to a great extent due to diverse customer needs. The service and support solutions are composed by considering the customer's specific needs. By always adjusting and developing a new service contract requires a large amount of administration and labour hours, since no contract is the other alike. In addition, the diverse and customized products and service contracts result in a product administration including a large pool of spare parts, which ties up a large amount of capital in company X's warehouse. But as the business model is designed today, this pool of spare parts is essential in order to increase customer satisfaction. Today, company X's service and support contracts are connected to a fixed price commitment, which implies that the company occasionally needs to perform more service than the customer has paid for, which influences the product profitability due to more labour hours spent.

The high level of customization also affects the actual service of the systems. All systems are unique, thus almost all service and support solutions need to be adjusted in order to fit the customized product. This results in high costs for company X that seldom can serve several products according to exactly the same framework. This in turn also affects the number of labour hours spent to serve the products, as all service contracts require a new procedure and approach, which affect total cost for the company to offer the service business. This is also, as previously mentioned, related to the view of Lampel and Mintzberg (1996) who propose that total cost increases as the adaptations increase.

5.2.2 COGS

It is believable that the high level of customization limits company X's ability to utilize prognosis regarding future demand and technology development, which obstructs planning and estimation of upcoming costs. This in turn makes it hard for company X to estimate a project's gross margin, which directly affects a single product's profitability. This is also due to the company's current bottom-up pricing strategy that accepts all costs. In addition, the high level of customer adaptation leads towards the fact that company X has to buy material for every single customer project, which presumable increases costs.

Customer Project

As the empirical findings demonstrate all company X's customer projects involves a high level of customer adaptation. The company's ability to meet the entire customer's requirements often results in project realization problems, as well as lack of well-defined documents and product descriptions. This means that the company has high start-up and developing costs for each new customer project, as well as it might obstruct the production process and increase lead times. It is possible to conclude that the company today has an indistinct and complicated work processes

involving a large amount of personnel. Thus, a huge amount of labour hours is spent on each customer project, which has a direct negative impact on costs.

One reason for company X's indistinct and complicated way of working regarding the customer projects could be the fact that there is a lack of consolidate responsibility between all projects. This implies that previous experience from one customer project is not transferred to another new customer project, thus learning and production experience is hindered. There might be possible to believe that company X should have production experience and utilize it to its fullest potential as production experience could be seen as one internal attractive resource for a company to hold in order to stay competitive, but unfortunately this is rarely the case. Figure 12 in chapter 4 illustrates how new customer projects inherit errors from older customer projects. This means that the same errors needs to be corrected over and over again, which is an unnecessary cost that burdens costs due to a lot of rework.

Sourcing

As for the previous mentioned key activities, sourcing is also highly affected by the customization. It is possible to conclude that the high level of customer adaptation results in an inability for company X to utilize prognosis and planning of the sourcing process. The lack of prognosis regarding future customer demands causes a dilemma between quantity discounts and storage of material. The company should want to cut prices for purchased material in order to decrease costs. However, quantity discounts means that company X has to order a large volume of material, but since the company is not able to utilize prognosis this might result in too high volumes of material bought that in the end is not fully used by the supply department. Thus, the non-used material contributes to an increased tied-up capital in terms of warehouse cost. Consequently, company X should strive for working towards prognosis in the future to diminish and control costs for purchased material. Also, the company's service business has a negative impact on the warehouse cost, since the different kind of service agreements and support contracts requires that the sourcing department has to keep the large pool of spare parts continuously available.

Today, the high level of customer adaptation also signifies that material is bought for every single customer project and that company X has to buy a large amount of different article numbers. Hence, the conclusion that the company, as for the case of customer projects, lacks a person who has a consolidate responsibility over the sourcing process can be drawn. The lack of consolidate responsibility results in low coordination of sourcing between different projects, which has a negative impact on company X's ability to develop good relationships with its suppliers. All this implies that the company does not have a common way of working regarding its sourcing strategy, which results in high administration costs. To solve this problem, the company has to establish a framework for supplier relationship management that takes into consideration the hierarchy of the importance of the different suppliers, as well as set up rules for their relationship and how the suppliers should be treated.

Supply

The high level of customer adaptation permeates company X's supply process as well. All the unique products make it believable that the company probably cannot have any pre-produced building blocks, since there are several changes during and between customer projects for the same product. This statement is also strengthen by Gu and Sosale (1999) who claim that generally it is hard for an enterprise to develop and produce a product that satisfies all customers' needs. The authors suggest that by utilizing pre-produced modules manufacturing can be improved, as the modules can be manufactured separately. This way of working is seen as a critical factor for company X's internal efficiency, because all the unclear foundations hinders a smooth production flow and requires new education for the employees for every single customer project in order to understand and meet the customer's requirements. Also, this results in the fact that almost no recycling of old constructions for product A, product B and product C can be utilized, which means that a partly new way of working for each customer project is necessary. The non-parallel relationship between customer driven technology development and supply, which can be seen in Figure 13 in chapter 4, makes it possible to believe that often a delayed delivery to the customers occurs due to increased lead times, which affects internal costs. Accordingly, company X's absence of pre-produced building blocks and common way of working for each customer project, as an outcome of the high level of customer adaptation ends up in the problem of increased labour hours and costs.

5.2.3 M&S

Today, M&S is funded by company X's yearly result, see the blue arrow in Figure 14. Therefore, the importance for the company to release capital is further strengthen by the need for M&S to receive funding. This is due to the fact that M&S is closest to company X's customers and is the company's core to sell their products in order to stay competitive in the industry.

As supported by the empirical findings, all customer requirements are accepted by the salesman in order to increase customer satisfaction. This implies that the salesmen sometimes promise customer specifications that are technically hard and expensive for company X to fulfill, which can be seen as high risk. In addition, many internal labour hours have to be spent in order to match the specific customer adaptation with company X's internal resources, technology and knowledge. However, this is the way company X always has been doing business, but it must be stated that this also drives internal costs. On one hand, by accepting all customer adaptation the company can be sure to fully meet the customers' demand and ensure that they are totally satisfied, which is a valuable competitive advantage and might result in increased market share for the company. On the other hand, as stated by Lampel and Mintzberg (1996) the total cost for producing and delivering an adjusted system increases in proportion to the extent of customer adaptation, which in turn forces up the market price of the system in order to be able to cover the high internal costs and reach a desirable gross margin. This might affect the company's competitive situation in a negative manner as the products are price sensitive.

Hence, it is vital that company X reaches a balance concerning how to, at an acceptable level, meet the customer's requirements, while at the same time keeps internal costs at a minimum level.

5.2.4 R&D

As the mission of the thesis is to release capital in order to sufficiently finance future technology development high profit for company X is needed. R&D is, as can be seen in Figure 14, funded by the company's yearly result, thus it is extremely vital to decrease internal costs. As company X is a technology company, it is essential that it stays in the technological forefront within the industry. Hence, investments in R&D are necessary to stay competitive and internal efficiency must therefore be reached. Today, the R&D expense mainly consists of labour hours that burdens costs. However, those labour hours are in current situation seen as necessary for the company to perform its R&D activities, which aim to discover innovations and continue with the technological development.

5.2.5 Summary of Current Business Model for Product A, Product B and Product C

To summarize, it has been identified that company X is a rather "messy" organization in the sense that the employees lack a common way of working in several departments within the company. This can partly be explained by the lack of consolidate responsibility among the customer projects, which sometimes affects the other key activities. However, in present time company X tries to work for their best, but there is definitely a potential to improve current processes. The six key activities composing the current business model for product A, product B and product C involve a high level of customer adaptation in order to create customer value and increase the customer satisfaction. The customization creates complexity within the organization, which kind of results in chaos throughout the whole value chain as it starts in M&S and spreads further along the value chain that affects and permeates all key activities. Henceforth, this high level of customer adaptation directly affects all six key activities in the sense of a huge amount of labour hours spent, which drives costs. Consequently, a conclusion can be drawn that productivity efforts are necessary for company X in order to increase the product profitability.

5.3 Business Model Renewal at Company X

According to Teece (2009), firms tend to fail and go bankruptcy as a consequence of rarely transforming their business model. Instead, many firms keep running their business in a way that used to be the right manner for too long. Nevertheless, if an enterprise succeeds in renewing its established business model it normally brings increased customer value and/or decreased costs. This strengthens the previous conclusion that company X can decrease internal costs by renewing its existing business model for the three products.

Further, Teece (2009) states that business model renewal is a complicated process and this argumentation is also in line with Sandström and Osborne (2010) who argue that reshaping an existing business model is a challenge, since the whole value chain is influenced by the change. Accordingly, it is vital that company X understands that

the renewal of the business model for product A, product B and product C will be a time consuming and costly challenge. Chesbrough (2010) claims that organizational leadership, where especially the process of leading change, is important when renewing a business model. This statement is also highlighted by Doz and Kosonen (2010) who suggest that members of the top management team have to reach collective commitment to trust and understand each other, as well as daring to take risks connected to the business model renewal. Based upon that statement it is recommended that the management team at company X should be fully responsible and lead the process of business model renewal for the three products in portfolio Y.

5.4 Suggestions for Improved Business Model

To address research question number two in the thesis, which considers how company X can change its business model in order to improve the product profitability, this section will outline suggestions for an improved business model. Previous analysis shows that the business model for product A, product B and product C is not optimal including a huge amount on labour spent as a result of the high level of customization.

It is suggested that all three products should share a common business model grounded upon modularization where the products' main characteristics are taken into consideration. The new way of working concerning modularization will require a large investment funded by company X's yearly result, but it is seen as necessary as it is believable that common modules and platforms between the products will provide long-term positive effects resulting in increased product profitability. Regarding the renewed business model, it is important that company X reaches a balance concerning how to, at an acceptable level, meet the customer's requirements, while at the same time keep internal costs at a minimum level. This can be achieved by, as just mentioned, introducing modular design. This will in a long-term perspective where it is suggested that the company strives for utilizing highest possible level of standardization increase the possibility for company X to localize in the upper right corner in Figure 3 in chapter 2. It is vital that company X remains flexible regarding its offers in order to at fullest extent still meet customers' demand, because it is the company's main competitive advantage. Jose and Tollenaere (2003) claim that by utilizing modules high variety among the products can be reached, which is desirable for the company to maintain flexible. In order to successfully implement this renewed business model, a change in company X's corporate culture and way of working is crucial. In the next coming sections, the suggested renewed business model based upon modular design and platform solutions will be outlined concerning the six critical key activities.

5.4.1 SALES

Regarding the renewed business model company X should focus on modularization, which according to Jose and Tollenaere (2005) eases the customization of a large variety of products, but still allows standardization of certain components. This can be argued as a good solution for the company in order to increase the product profitability, as Lampel and Mintzberg (1996) state that standardization enhances cost effectiveness. A best case scenario for company X would be to simultaneously

utilize a large amount of modularization and a high level of standardization in order to achieve both high diversity, as well as low cost for the three products, see the upper right corner in Figure 3 in chapter 2. It is important that company X keeps its ability to be flexible concerning its offers in order to still attract customers. In line with the discussion of Ernst and Kamrad (2000) modularization increases the flexibility of a system because it supports new configurations and systems from a given set of modules. Therefore, due to both the cost effectiveness and flexibility, modularization is seen as a properly and profitable alternative for product A, product B and product C.

System business

It is suggested that product A, product B and product C should be based upon modules, which still allows company X to be flexible. This is also supported by Hsuan (1999) who claims that by combining, matching and assemble standard modules in various ways, different end-products and models with diverse modular product design and sometimes dissimilar function will be shaped. The ability for customers to add or change the arrangement of modules will also increase the chances for company X to introduce new functions of the three products in a cheap way, since modules will facilitate the production process. This is also described as an advantage of modularization by Gu and Sosale (1999). Therefore, it can be concluded that by utilizing modularization, company X will be able to keep its flexibility within the design of the products, while still diminish internal costs in order to increase the product profitability. In addition, a consequence of the modular structure is simpler products due to already complete compiled descriptions of the three products.

By building the products upon several common modules company X can also utilize platforms. This conclusion can be drawn based on Jose and Tollenaere (2003) argumentation that a platform is a set of standard modules that forms a common structure. It is proposed that company X should develop a product family consisting of the three products, as these products are similar. According to Jose and Tollenaere (2003), a product family is a group of products using the same platform, which facilitate and accelerate the supply and development phases. This platform can be referred as a common solution shared among all three products. It is essential that this platform constitutes of as many modules as possible, since costs and risks will therefore be distributed among the products using the same platform, which is also in line with the argumentation of Robertson and Ulrich (1998). The larger the share of common modules is among the three products the greater is the chance for company X to reach economies of scale, which is supported by Murray and White (1983). In order for company X to use common modules, Jose and Tollenaere (2003) argue that a careful analysis and investigation regarding which modules that are common today and which that have a potential to be shared among the products in the future are needed. This is assumed to be both time consuming and costly for the company, but necessary in order to develop a well-functioned platform. It must not be forgotten that unique modules will also build up the end products. Consequently, it is recommended that company X, in line with the conclusion of Jose and Tollenaere (2003), should perform a complex cost analysis to identify and reduce the number of unique modules to maximize the economic benefit that common modules can bring.

Feitzinger and Lee (1997) claim that modular design is one way to achieve mass customization, which is also a future potential for company X to strive for as the products are produced in high volumes.

Further, it is suggested that company X should utilize a new economical model in order to control internal costs. This new economical model includes a top-down pricing strategy, see Figure 15. The meaning of a top-down pricing strategy is that the company sets the market price first, and then the desired gross margin in percent is added, which signifies that only a maximum amount of costs are accepted. As a result, company X has to adjust the costs based on the market price and desired gross margin, which facilities control of internal costs for each project.

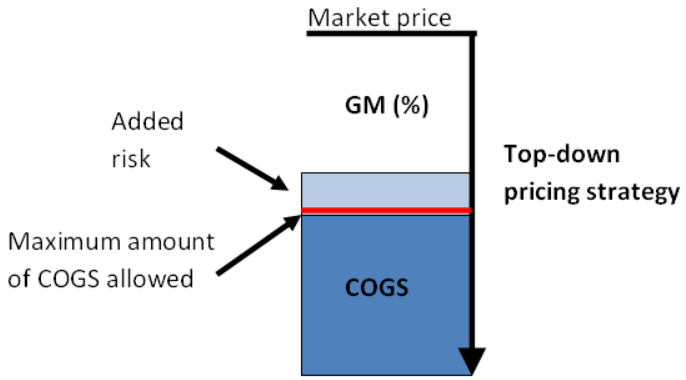

Figure 15 -The top-down pricing strategy where only a maximum amount of COGS is allowed.

The improved control of internal costs will be possible through implementing modular design and platform solutions, which will also facilitate larger volumes produced and cheaper manufacturing as a result of commonality and repetition. Consequently, it will benefit the customers and affect the market price in a positive manner by reason of decreased and controlled costs. Further, this conclusion is supported by Hsuan (1999).

Service business

The service business for product A, product B and product C can also be facilitated by the modular design and platform solutions. In line with the Gu and Sosale (1999), the preventive maintenance and recovery repairs will be benefitted by using modules as it will be easy for company X to disassembly the products where it is only the faulty module that needs to be temporary replaced. Further, since the service business provides high gross margins it is suggested that company X should increase its focus on this business.

5.4.2 COGS

Production Project

Instead of utilizing customer projects for the three products it is suggested that the renewed business model should contain production projects only including a limited amount of development and customer adaptation. In addition with clear product definitions it is most likely that the production projects will result in increased control of internal costs, since company X will as a result of the modularization know

more precisely how the products will look like. The limited amount of development and customer adaptation will be a result of the introduction of the modular design and platform solutions, which only allows customization to a constrained amount and according to Lampel and Mintzberg (1996) brings cost effectiveness.

The meaning of a production project is a project with clear product definitions. In order to decrease and control the internal costs for the three products, it is suggested that the production projects should only contain a limited amount of development and customer adaptation. It is believable that this new way of working will result in decreased project cost, risks and reduced lead times. One reason for this is that the production project should hold base documentation and requirements, which can facilitate construction, as well as verification of the products.

Sourcing

The sourcing process included in the renewed business model should focus on purchasing material and components for several production projects simultaneously, since all three products will share common modules. Also, the modular design and platform solutions can enable prognosis, since almost exactly the same components will be used continuously. This will allow for coordination of sourcing between different production projects. The prognosis will most likely contribute to volume benefits regarding material, since company X will due to already complete complied descriptions of product A, product B and product C be able to order large quantities simultaneously. Hence, the company will be able to negotiate more favorable price with the suppliers, which will decrease the internal costs as a result of a more centralized sourcing strategy.

Supply

According to Hsuan (1999) modularization is a part of a company's manufacturing strategy, thus the implementation of modular design and platform solutions will have significant impact on company X's supply process. It is believable that the concept of production project will enable repetition of the supply process, since all products will be based upon the same modules, as well as create balance regarding warehouse costs. In this way, the products can be built in regard to prognosis rather than order. This way of managing the supply process will enable easy assembling of different pre-manufactured modules, because all modules will be designed to fit together and can be manufactured separately. This will optimize equipment utilization and facilitate smoother flow, which is also seen as one of the main advantages of modularization presented by Gu and Sosale (1999). Further, the authors claim that common modules increase the production efficiency and quality, while at the same time reduce costs, which will probably be the case for product A, product B and product C.

It is believable that the repetition of the supply process will ease the education among the employees regarding the manufacturing, because the amount of customization will be narrowed. This in turn will affect the lead times and start-up cost for each production project in a positive manner. Hsuan (1999) also indicates

the result of short lead times when assembling different modules into a whole system. In other words, the assembling will have shorter lead times compared to today. This is also in line with Fredriksson (2006) who claims that the assembly time through utilizing modules decreases by reason of a reached module flow achieved through no unique assembly activities performed, see Figure 4 in chapter 2.

Furthermore, it is suggested that all necessary customer driven development should occur in parallel with supply, see Figure 16. This will be possible due to the modular design that allows dividing of complicated product design tasks into sub-tasks, thus easing parallel development. This advantage of modularization is also stressed by Gu and Sosale (1999) who further claim that an outcome of modular product design is reduced development and design time, which in turn will enable decreased lead times and thus, more precisely secure delivery to customers through decreasing time to market. By implementing modular design company X will moreover, according to Ernst and Kamrad (2000), have the opportunity to benefit from economies of scale through manufacturing exactly the same modules simultaneously, thus reaching volume benefits and decreased cost per unit, which will have a direct impact on costs and eliminate risks.

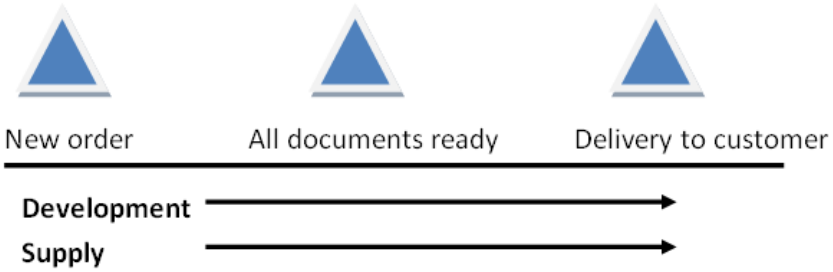

Figure 16 -The relationship between development and supply in the renewed business model, which should occur in parallel.

5.4.3 M&S

Lampel and Mintzberg (1996) highlight that standard modules imply reduction of product variety. One critical aspect to consider is whether the customers at all demand the functions that standard modules can bring or not. A counter argument to this finding is presented by Gu and Sosale (1999) who state that even if a company utilizes modular design of a product variety to the customers can still be offered. Thus, it is believable that company X can manage to retain and attract new customers, but it will put a lot of pressure on the M&S department that has to learn how to sell the products based on modular design and platform solutions successfully. For instance, to facilitate the selling process for the salesmen at company X it is proposed that an internal product catalogue illustrating all acceptable combinations of modules can be utilized.

5.4.4 R&D

In order for company X to offer well-functioned products based upon modular design and platform solutions, R&D will play a significant role. Initial, the R&D expense will

probably be high in order to develop a reliable and good platform that all three products can be based upon. However, over time this expense will stepwise decrease due to the fact that the platform solution will secure robust design where almost no changes are made, but also since technological development and customization will be limited. It is important to mention that the benefits of the platform solution and the payback from the investment in the initial R&D will be reached when the production volume is high, which is the case for company X and also in line with the argumentation of Robertson and Ulrich (1998).

It must be mentioned that the analysis above including the renewed business model is a best case scenario for company X where the product profitability most likely will increase. Similar to the findings of Chesbrough (2010), it is vital that company X knows when to shift resources and processes from the existing business model toward the renewed business model. Hence, it is suggested that a period of co-existence between the models should exist in order to not loose effectiveness. Renewal of a business model involves according to Doz and Kosonen (2010) a challenge regarding resistance to change. Consequently, company X must be prepared to face all potential problems that might arise and not give up at first frustration and setback.

6. Discussion

In this chapter potential challenges that company X might face when implementing the suggested renewed business model will be discussed. The chapter will end up in a sensitivity discussion and analysis.

As is concluded in the previous section, a renewed business model is suggested in order to increase the product profitability. To successfully introduce this renewed business model it is essential that company X changes its corporate culture, since an implementation of modules and platforms includes systematic transformations within the organization. Major changes are often connected with high potential risks and it must not be forgotten to critically discuss this investigation. In order to successfully implement the renewed business model and new way of working, it is vital that the management team drives and is fully responsible for the change, as well as secure that all employees understand the importance of the renewed business model. Company X's organizational and economical models must function and interact, which oblige that the change is accepted by all employees. Consequently, it is important that company X engages all the employees and gets everybody on board regarding this new way of working. If the management team fails to establish a mutual understanding and way of working regarding modularization, a potential outcome is that the company might face internal resistance, which will affect the success of the renewed business model.

It is fundamental for company X to consider that there might exist an internal resistance to change among the employees as the business model renewal will impact the whole organization and interrupt the employees comfort zone and their practiced way of working. Changes that the business model renewal can bring include everything from new responsibilities among the personnel to new thinking within the supply process. An essential point is to give the transformations the opportunity to be integrated within company X and have patience to await the long-term effects of the changes. Probably, the new way of working will generate many questions and skepticism regarding the organizational change among the employees. Consequently, it is even more vital that the employees have fully support from the management team that communicates an understanding regarding the concept of modular design and platform solutions with its belonging advantages. The employees must participate in the change and feel that their contribution creates value. In addition, company X has to understand that the business model renewal will be a time consuming and costly challenge.

6.1 Sensitivity Discussion and Analysis

One vital aspect to consider when conducting this thesis in order to create best possible judgment and increase the trustworthiness of the thesis is the limited period of time, which has made it hard to grasp the current way of working and the company as a whole. Further, another possible risk is the fact that the interviewed people might have justified and flattered their own business area, which makes it

hard to estimate a correct and fair picture of company X and this should be kept in mind when taking part of this investigation.

7. Conclusions and Recommendations

This chapter will aim to conclude the thesis and provide answers to the two research questions, as well as propose stepwise actions on how company X can increase its product profitability.

7.1 Conclusions

As set out in the objective of the thesis, the purpose is to map and analyze the present business model within product portfolio Y, as well as develop proposals for an improved business model in order to increase the product profitability. The discussion and analysis clearly shows that today company X holds one business model for product A, product B and product C. This current business model involves a high level of customer adaptation where the company is able to meet all customers' requirements, which permeates the six identified key activities; sales, customer project, sourcing, supply, M&S and R&D. The high level of customization results in a “messy” organization with unstructured and uncommon way of working, which drives labour hours and increases lead times. Thus, the company’s internal costs are affected in a negative manner. The customization creates complexity within the organization, which kind of results in chaos throughout the whole value chain as it starts in M&S and spreads further along the value chain that affects all key activities. Also, this business model contains a bottom-up pricing strategy, which implies that company X accepts all costs. This is not seen to be a suitable economical model in order to increase the product profitability.

For the renewed business model it is suggested that company X designs product A, product B and product C according to modular design and platform solutions. The modules will build up the end products and only a limited amount of customization should be accepted. It is vital that the common platforms should contain as many common modules as possible between the three products in order to achieve cost effectiveness. Products build upon modularization will involve a new mode of operation where clear product descriptions and ready-to-use manufacturing preparations, as well as test equipments are utilized in order to create smoother flows. In addition, clear division of responsibilities and division of labour will be facilitated by the new mode of operation. Furthermore, prognosis of the centralized sourcing process and supply process, as well as relationship management with suppliers will be enabled. It is proposed that the renewed business model should include a top-down pricing, which facilitates control of internal costs. It is believable that this new way of working will permeate all the six key activities and result in internal efficiency in terms of more structured way of working, increased controlled M&S and R&D activities, diminished lead times and less labour hours spent. This in turn will diminish the internal costs, as well as risks and end up in increased product profitability. However, to succeed with the implementation of the renewed business model a change in the corporate culture is necessary where the management team at company X will play a vital role.

7.2 Recommendations

In order for company X to succeed in increasing the product profitability, it is recommended that the company follows the below mentioned stepwise actions:

The management team must be fully responsible and lead the process of business model renewal, as well as clearly advocate its importance among the employees.

Change the corporate culture and implement the suggested renewed business model including all three products build upon modular design and platform solutions.

A new mode of operation is necessary including; production projects, centralized sourcing process, clear division of responsibilities and division of labour, structured and common way of working, as well as more controlled M&S and R&D activities.

Establish a profitability approach throughout the whole organization. Control and steer costs by implementing a top-down pricing strategy.

Consider change management. The employees must participate in the business model renewal and feel that their contribution creates value. Give the changes the opportunity to be integrated within the company and have patience to await the long-term effects of the changes. Company X must dare to succeed!

Reference List

Published Material

Baldwin, C.Y., and Clark, K.B. (1997). Managing in an age of modularity. *Harvard Business Review.* Vol 75-5. pp. 84-94

Bryman, A. and Bell, E. (2007). *Business Research Method.* Second edition. Oxford: Oxford University Press.

Bryman, A. (2004). *Social Research Methods.* Second edition. Oxford: Oxford University Press.

Chesbrough, H. (2010). Business model Innovation: Opportunities and Barriers. *Long Range Planning,* vol. 43, pp. 354 – 363.

Doz, Y.L and Kosonen, M. (2010). Embedding Strategic Agility – A Leadership Agenda for Accelerating Business Model Renewal. *Long Range Planning,* vol. 43, pp. 370 – 382

Ernst, R and Kamrad, B (2000). Evaluation of supply chain structures through modularization and postponement. *European Journal of Operational Research.* Vol. 124. pp 495-510

Feitzinger, E and Lee, H.L (1997). Mass Customization at Hewlett-Packard: The Power of Postponement. *Harvard Business Review.* January- February 1997. pp.116-121

Fredriksson, P (2006). Operations and logistics issues in modular assembly processes: cases from the automotive sector. *Journal of Manufacturing Technology Management.* Vol. 17-2. pp 168-186

Fredriksson, p (2006). Operations and logistic issues in modular assembly processes: cases from the automotive sector. *Journal of Manufacturing Technology Management.*Vol.17 – 2. pp. 168-186. Quote Wild, R (1977). *Essentials of Production and Operations Management,* Holt, Rinehart and Winston, London. And Bennett, D (1986). *Production System Design,* Buttenworth & Co Ltd, London

Gu, P and Sosale, S (1999). Product modularization for life cycle engineering. *Robotics and Computer Integrated Manufacturing.* Vol 15. pp 387-401

Henry, A. (2008). *Understanding Strategic Management*. Second edition. New York: Oxford University Press Inc

Hsuan, J. (1999). Impacts of supplier-buyer relationships on modularization in new product development. *European Journal of Purchasing & Supply Management.* Vol 5. pp197-209

Itami, H. and Nishino, K. (2010). Killing Two Birds with One stone: Profit for Now and Learning for the Future. *Long Range Planning,* vol. 43, pp. 364 – 369.

Johnson, M.W., Christensen, C.M. and Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review.* pp. 51 – 59.

Jose, A and Tollenaere, M (2005). Modular and platform methods for product family design: literature analysis. *Journal of Intelligent Manufacturing.* Vol 16. pp 371-390.

Lampel, J and Mintzberg, H (1996). Customizing Customization. *Solan Management Review, 1996. Vol 38-1. pp 21-30*

Lantz, A. (2007). *Intervjumetodik.* Lund: Studentlitteratur.
Patel, R. and Davidsson, B. (2003). *Forskningsmetodikens grunder.* Lund: Studentlitteratur.

Magretta, J. (2002). Why Business Models Matters. *Harvard Business Review,* vol. 80, pp. 86-92

Murray, J.D. and White R.W. (1983). Economies of Scale and Economies of Scope in Multiproduct Financial Institutions: A Study of British Columbia Credit Card Unions. *The Journal of Finance.* Vol XXXVIII – 3. pp 887-902

Robertson, D and Ulrich, K (1998). Planning for Product Platforms. *Sloan Management Review.* Summer 1998. pp. 19-31

Silveira,G, Borenstein, D and Fogliatto, F (2000). Mass customization: Literature review and research directions. *Int J. Production Economics.* Vol. 72. pp 1-13

Teece, D.J. (2009). Business Models, Business strategy and Innovation. *Long Range Planning.* vol. 43. pp. 172-194

Zott, C. and Amit, R. (2009). Business Model Design: An Activity System Perspective. *Long Range Planning*. 2009. pp. 1 - 11

Unpublished Material

Sandström, C., Osborne, R. (2010). Managing business model renewal, forthcoming in *International Journal of Business and Systems Research.*

Other Sources

Magnus Holmén, Associate Professor at the Department of Technology Management and Economics, Chalmers University of Technology. Lecture 3: surveys and questionnaires expost, 27th of March 2010.

Osaterwalder, A. and Pignetur, Y (2009). *Business model generation.* [online]. Available: http://www.alexosterwalder.com/books.html [Accessed 21th of March, 2011]

Appendices

Appendix 1 - Abbreviations

COGS	Cost of Goods Sold. A post in PCC.
GM	Gross Margin. A post in PCC. GM = SALES - COGS
M&S	Marketing and Sales
PC	Product Contribution. A post in PCC. PC = SALES – COGS – M&S – R&D
PCC	Product Contribution Calculation
R&D	Research and Development

Appendix 2 – Gantt Schedule

MONTH	January	February	March	April	May	June
TASK						
Monthly Meetings	1	2	3	4	5	
Literature Studies						
Phase 0						
Terminology – Phase 1						
Phase 2						
Phase 3						
Review and Analyze Data						
Map Current BMs						
Analyze Current BMs						
1st Improved BM						
2nd Improved BM						
Feedback						
Final BM and Presentation						
Report Writing						

Appendix 3 – Standard Interview Template

Interview number:
Name:
Date and time:

Interview template

1. Tell us about your business area/department.

2. What is your role in product portfolio Y?

3. How is your department's current way of working?

    3.1 How does your department contribute to COGS?

4. According to you, how does company X earn money?

5. Are there any critical components affecting the profitability for company X?

6. How do the streams of cost and revenue at company X look like?

    6.1 How does your department contribute to those streams?

7. What drive costs in a project?

    7.1 Cost of goods sold (COGS)?
    7.2 Cost of M&S?
    7.3 Cost of R&D?

8. What are the risks related to your business area (that affect COGS)?

9. How can company X:

    9.1 Decrease COGS?
    9.2 Decrease tied-up capital?
    9.3 Decrease risks?

10. What are the future possibilities for company X in order to increase the product profitability?

    10.1In that case, how will your department be affected?