NTNU – Trondheim
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Buyer-Supplier Collaboration in New Product Development

Reduction of Ramp-up time for high-tech products

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Globalization
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Preface

This master thesis is the last part of the degree in Global Production Management at the Department of Production and Quality Engineering at NTNU. The master thesis is connected to the ongoing project SoundChain were Kongsberg Maritime Subsea and Hadelandprodukter AS are working together with researchers from NTNU and SINTEF. The purpose of the study is to look into suppliers collaboration in development of new high-tech products.

I would like to thank my supervisors, Erlend Alfnes at NTNU and Børge Sjøbakk at SINTEF, for their guidance, constructive feedback, and encouragement that have been critical to carry out this task.
I would also like to thank representatives from both Kongsberg Maritime Subsea and Hapro who found time to participate in interviews, answer questions, and given me insights in their operations and processes.

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Halvor Eid Nielsen

Abstract

Product development has always been a key activity to gain competitive advantage. Especially in technology based industry, such as the maritime subsea industry. Due to increasing globalization and high competition from low cost countries, companies need to streamline the supply chain and development in order to get new product out on the market fast and efficient.

Involving suppliers in the development have shown great effect on reduced development time and cost while increasing quality of the product. By involving suppliers and their knowledge in the development, they can contribute to a product that is easier and faster to manufacture. By being a part of the development, the manufacturer and suppliers can get deeper knowledge and understanding of the product they will produce, and be able to prepare and test needed equipment or services in order to be ready to produce the product when production start. These advantages can help reducing the time a new product uses from the start of the development until the manufacturer produces the product at full capacity.

The purpose of this thesis is to explore how to involve core supplier in development of new product in order to have an efficient and fast development and production of new product. The study include a review of literature on product development and supplier involvement and a case study of the dyadic relationship between the two Norwegian companies Kongsberg Maritime Subsea and Hadelandprodukter AS.

This thesis provide an insight in the strategic factors connected to supplier involvement in development of new products. Such insight are valuable in terms of gaining a greater understanding of how suppliers can be involved in order to have a successful outcome of the involvement. The study also produce some important success factors in both product development and suppliers involvement. Bases on the findings some suggestion for solution to involvement barriers have been introduced.

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Abbreviations

APQP	Advanced Product Quality Planning
ESI	Early Supplier Involvement
Hapro	Hadelandprodukter AS
KMS	Kongsberg Maritime Subsea
RBV	Resource based view
RFQ	Request for Quotation
SCM	Supply Chain Management
TCE	Transaction cost economics
WIP	Work In Process

Chapter 1. Introduction

In this chapter the research strategy and motivation are presented. The background for the study will first be presented, before the problem description will introduce the research goal and research question. The scope and limitations are then presented before the structure of the study will be described at the end.

1.1. Background

Knowledge-based production of innovative, highly technical and highly customized products has been an area where Norway traditionally has had large competitive abilities and growth potential. Through access on knowledge and with a high focus on scientific research, development and high quality and performance, Norwegian producers of high technological products for maritime industry, like Kongsberg Maritime Subsea (KMS), have been able to stay competitive and established themselves as world leaders in their markets. In such premium segment of products the buyers have been willing to pay a higher price for the products then in the volume segment, where the competition is dominated by low cost countries with less expensive products with a lower level of performance. The latest year producers from low cost countries have closed in on the Norwegians with higher performance level and low productions cost on their products.

KMS are continuously introducing new products in order to stay competitive in the market of maritime high-tech products. Today, they are facing problems with the time new products uses from the start of the development until production run at full capacity. Even mature products have long lead-time. The amount of scrap, long throughput time, large WIP inventories and little flexibility to adapt to the changing demand results in large inventories and loss in sales.

KMS is aware of the challenges connected with the changing market conditions and estimates that they will lose large part of their market shares to other competitors within 5

years if the trend continues. Therefore, they have initiated the research project "SoundChain" in order to stay competitive in the future. SoundChain is a collaboration project where the two companies Kongsberg Maritime Subsea and Hadelandprodukter AS (herby Hapro) together with researchers from NTNU and SINTEF will try to find solutions to the problems that the companies are facing. The focus of the research project is on streamlining the supply chain for competitive production of subsea sensor systems.

1.2. Problem description

In the literature there are different terms describing timelines used in production industry. Carrillo and Franza (2006) described development timeline by showing the difference between time-to-market and ramp-up time. Time-to-market is described as the time from start of product development until the first product is ready for sales in the market. While the Ramp-up time is the time from the development starts until the production is running at full capacity, or at volume needed to meet the peak demand. This is showed by the timeline in Figure 1

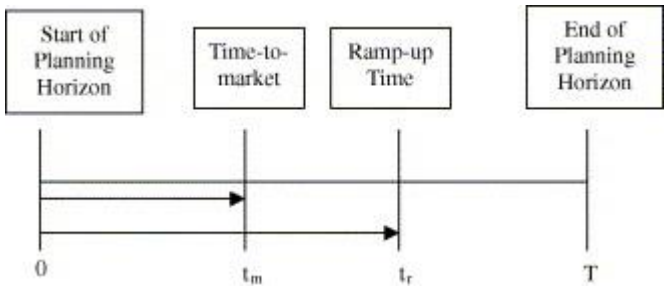

Figure 1 Development timeline by Carrillo and Franza

In order to stay competitive in the market, KMS need to find a way to reduce the ramp-up time for their new products. KMS wants to look at the involvement of core suppliers in early phases of the development process of new products, and look at how this can be done, in order to get the new products out on the market as fast and efficient as possible without losing their edge of quality and performance.

Supplier involvement as a topic has been discussed in the supply chain management literature for some time. Johnsen (2009) looks at previous studies in supplier involvement in new product development. He finds that theories and models are often focusing on high-volume industries with stable product portfolios and stable demand. Even with different types of production industry there should be several similarities. Many studies (Ragatz et al., 2002, Petersen et al., 2005, Mikkola and Skjøtt-Larsen, 2006) have showed that close supplier-buyer relation can reduce the Ramp-up time and cost for new products. However, there is still lack of established models of how to achieve this, for supplier involvement in high-tech industries.

This study will look at the collaboration between the supplier and the buyer during development of new products in order to find ways to reduce the ramp-up time and have a more efficient development and production process. This will be done by answering the problem statement.

Problem statement:
How can core suppliers be involved in the development of new high-tech products in order to reduce the products' ramp-up time?

The study will look at both the buyer and the suppliers perspective. Looking into the buyer and the supplier's perspective will hopefully give a deeper understanding of the challenges related to the involvement of suppliers in high-tech industries.
To answer the problem statement. Two research questions have been defined, each addressing different aspects of the topic, and together they will contribute to answer the overlying problem statement. The following research questions are defined.

RQ1:

What are critical success factors for supplier involvement in new product development?

RQ2:

How can ramp-up time for new high-tech products for the maritime market be reduced?

Based on the findings this study will try to establish a collaboration model for involvement of core suppliers in high-tech product environment.

1.3. Scope

To find and select the best supplier is a large task and important as the initial part of the collaboration process for any buying company. However, the selection process will not be looked upon in this study. This study takes as a prerequisite that the supplier is selected and qualified by the buyer.

The main focus of this study will be the relation between the supplier and the buyer as a dyadic linkage in development process of new products. There is done studies that connect the early supplier involvement into network theory (Biemans, 1992). This is not been used in this study, duo to the focus on the dyadic relation between one buyer and one supplier.

Product development processes include many activities from different departments within a company. This study will look into the engineering and production part connected to the development of product and processes for ramp up and production of the new products. Areas of the product development connected to the market analyses, pricing and promotion will not be covered.

1.4. Structure of the study

This study will follow the traditional structure of a theoretical and empirical study where the theoretical part are compared with the findings of the empirical part.
In chapter 2, the methodology will be described and argued.
The theoretical part in chapter 3 summarizes existing literature of supply chain management, product development and supplier involvement that can contribute to a faster development and production of new products.
In chapter 4, the empirical part of the study is presenting the dyadic relationship between KMS and Hapro. This chapter describes the way the two companies are collaborating today, in their strive to development of new products, and how they can collaborate in the future in order to meet their goal of a more efficient and fast development process of new

products. The theoretical and empirical parts will be compared and discussed in chapter 5, before the conclusions based on the study findings are presented in chapter 6.

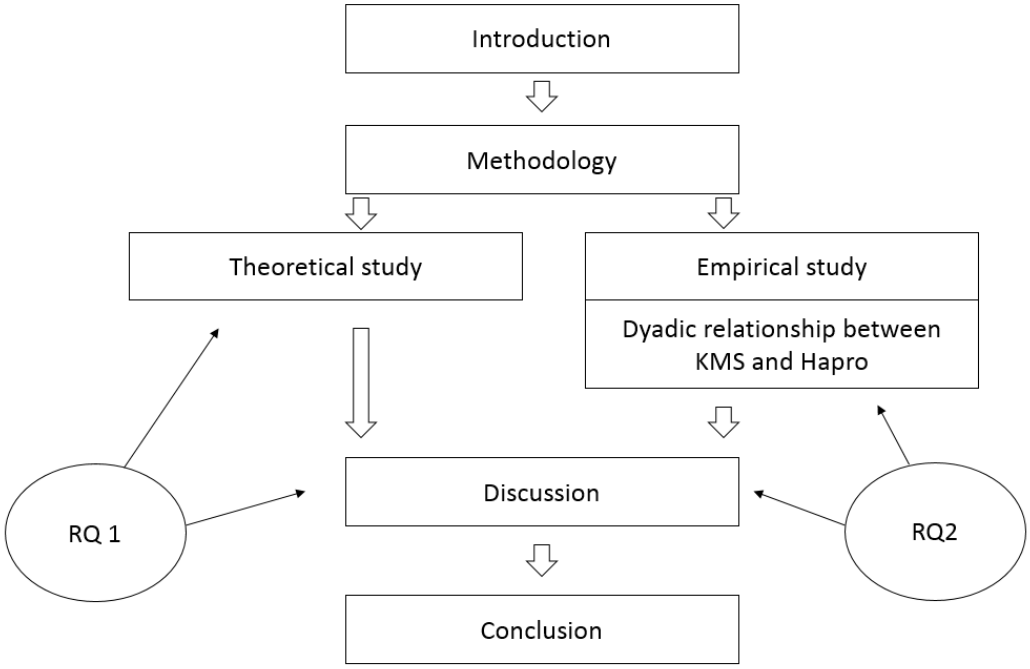

Figure 2 Structure of the study

Chapter 2. Methodology

In this chapter, the research methods used in this study are described and discussed. First, the selection of research methods are discussed, then the literature review is described, followed by the empirical method. In the end, there is a section regarding the quality of the research.

2.1. Research strategy

Research methodology is a systematic way to solve a problem. This means having techniques and procedures for collecting data, analyzing, describing and explaining phenomena. These techniques are called research methods (Karlsson, 2009) Research methods can be divided into, quantitative and qualitative methods. The quantitative methods are non-descriptive, numerical research with results presented as numbers, tables and graphs. Quantitative research answer “what”, “where” and “when“ questions. Qualitative research is descriptive, non-numerical and aim to answer “why” and “how” questions (Bryman and Bell, 2011). The aim of this study is to explore and evaluate how buyer-supplier collaborations can contribute to faster ramp-up time for new high-tech products. A qualitative approach is therefor chosen for this study.

This study has been performed as a research-based project consisting of a theoretical and an empirical part in order to answer the stated research questions. These two parts will be the basis for answering the problem statement.

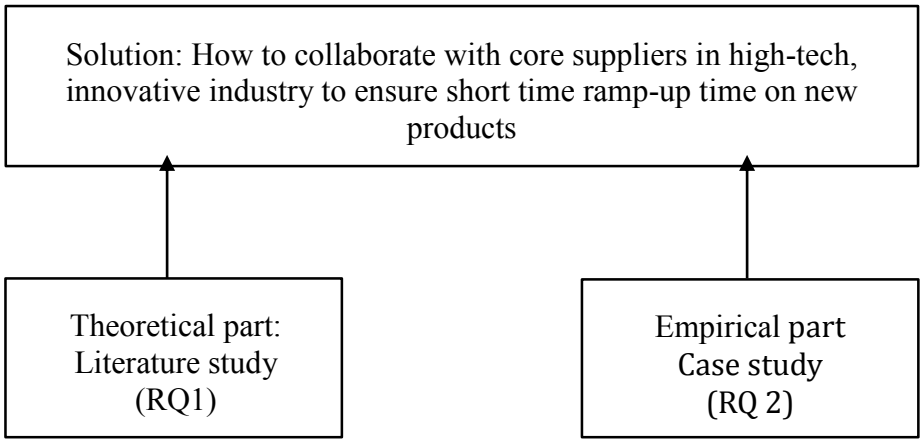

Figure 3 Structure of the master thesis study

The next sections describe the methods used in this study, with their advantages and limitations.

2.2. Theoretical method

A literature review is conducted in order to be familiar with the theory on the investigated phenomenon and to see how others have approached this research phenomenon. It provides a basis to build on and relates the study to the larger academic discussion by finding the gap between the faced challenge and existing knowledge about it in the literature. It also help limit the scope of the study and adjusting the research question (Bryman and Bell, 2011, Yin, 2013).

2.2.1. Review Procedure

The focus of the literature review was established by the research questions and the problem description. Three main categories were chosen to identify the needed information to answer the problems statement and research questions. These categories were then further divided into sub categories. The main categories and sub categories are presented in Table 1

Table 1 Literature review categories

Supply Chain Management	- Supply chain - Make-or-buy decisions - Outsourcing
Production Development	- Development processes - Product introduction
Supplier Involvement	- Timing of involvement - Early Supplier Involvement - Buyer-supplier relationship - Information exchange

A set of key words was selected and used in the main search for literature. Examples of key search words are listed in Table 2. The words were divided into two sets. Set 1 are the words that can were used alone, and set 2 are words that can were used in addition to set 1. This was done in order to narrow the search and get more accurate searches. The list was updated throughout the literature search process.

Table 2 Examples of key search words

Key search word set 1	**Key search word set 2`**
New Product Development	Collaboration
Outsourcing	Integration
Product development	Lean Production
Supplier Involvement	Make-or buy
	Management
	Process
	Relationship
	Supplier

Based on the key words, relevant articles and books were found. The abstract were read in order to see the relevance of the articles. For the articles with an abstract that seemed relevant, the articles were stored in EndNote reference manger and given close review. From the articles with high relevance, snowball-sampling technique were used by looking

through the references in order to find more papers relevant to the topic. All relevant findings were stored into EndNote.

For the literature review, NTNUs internal database *Oria.no* was used as main search engine, thereby getting access to a wide range of articles and journals. It have only been used articles and books that were peer review in this study. In addition to Oria, searches have been done in ProQuest, Science Direct, Emerald, Springer, NTNUBIBSYS and Google Scholar.

2.2.2. Quality of articles

In order to determine the quality of the paper that were review, the journals were looked up in the Association of Business Schools- Academic Journal Quality Guide. The guide ranks journals from different research field by the quality of the articles published. In addition, the journals were also looked up at the home page of the Norwegian database of statistic and higher educations (Database for statistikk om høgre utdanning): *(http://dbh.nsd.uib.no/kanaler/)* where journals are ranked based on quality of the published articles. This gives securities of quality according to the result in the search.

2.3. Empirical method

The empirical part of the study was conducted as a case study of KMS and Hapro. According to Yin (2013), a case study research is the best research strategy when research variables cannot be controlled and are on-going, or have recently been on-going. Typical situations of such research types, are studies where the research questions are “how” and “why”, and where the focus is contemporary phenomenon (as opposed to entirely historical). In this study the focus is mainly contemporary, as KMS and Hapro are continuously developing new products together.

In the case study, information has been collected from semi-structured interviews and document analysis. This was done to ensure data triangulation, which will help to secure the construct validity of the case study.

2.3.1. Semi-structured Interviews.

Semi constructed interviews are used in order to collect data by outlining the topic that allows the interviewee to talk about their opinion on a particular subject (Bryman and Bell, 2011). Semi-structured interviews are used to conduct exploratory or evolutionary research. This study, as mention earlier, aims to explore and evaluate how buyer-supplier collaborations can contribute to faster ramp-up time for new high-tech products (Matthews and Ross, 2014, Bryman and Bell, 2011, Yin, 2013).

Semi-structured interviews can be chosen for several reasons (Bryman and Bell, 2011, Matthews and Ross, 2014)

1. This method includes an interview guide to ensure that the relevant questions are discussed and to keep the conversation within the researcher's topic of interest.
2. There is no need to follow a strict order of questions. Exploratory approach is used - interviewer has a possibility to ask additional question in response to interview participant replies.
3. Semi-structured interview allows a researcher to explore different aspects of the phenomenon and to identify advantages and disadvantages of these aspects.
4. Semi-structured interview is adaptable to different participants.

Even if semi-structured interviews are an appropriate research method in this case there are limitation to the methods (Matthews and Ross, 2014)

1. Interviewing is a time consuming data gathering, transcription, coding and grouping
2. Large amount of "raw" data is gathered
3. Researcher need to develop interview skills since the interview is heavily dependent on the interviewer skills
4. Participants may focus on issues that are of interest to them, but not to the researcher. This can be eliminated to a certain degree by careful explanation of the research topic and the research aim in the beginning of interview

Despite the limitations, semi-structured interviews were a chosen as the preferred method to collect data for this study.

Four interviews were conducted. In order to get rich insights and cover of the different challenges in the process, representatives from different parts of the process inside the companies were chosen to participate in the interviews. Participants from the two companies (KMS and Hapro), with simular area of responsibility were selected in order to get the information about the same processes from both companies. This was done in order to see if there were any differences from the buyer and supplier sides.

Interview guides were developed in order to help in conduction the interviews. Such guides helps the interviewer to remember all the different topics that need to be covered during the interview. The guide was developed by creating a set of open ended questions. The interviewees get guided in the right direction and then can talk more freely from their own experience. The role of the interviewer is important here, to follow up with additional question to ensure that the needed information is gathered from all participants in the study.

The interviews were recorded with permission of the participants. The recordings were transcribed and send to the participants for approval. All the audio recordings and the transcripts were archived together. The transcript from the interviews can be found in the appendix.

2.4. Quality of the research

To evaluate the quality of research, Yin (2013) describes four tests that are common to all social science methods: Construct validity; internal validity; external validity; and reliability. The next section summarize these tests.

2.4.1. Construct validity

Construct validity is described by Yin (2013) as to identify correct operational measures for the concepts being studied.

By having multiple people in different positions from both companies in the case study, provides several views on the topic and can be used as multiple sources of evidence in the

answers given. During the interviews, the same question was addressed to several interviewees, in order to receive information that is accurate. This will serve the purpose of triangulation as described by Yin (2013).The research methodology aimed to establish a clear chain of evidence and allowing other researchers or external observers to come to the same conclusion, based on the data findings done in this study (Yin, 2013).

2.4.2. Internal Validity

Internal validity is concerned with the question of whether a causal relationship, whereby certain conditions are believed to lead to other conditions, are distinguished from spurious relationships (Yin, 2013, Bryman and Bell, 2011). This can be assured through examining conflicting explanations, as well as data analysis techniques, logic modeling and explanation building.

In situations where there this study has revealed contradicting evidence of theory of method, both side have been introduced and discussed.
A case study involved an inference every time an event cannot be directly observed (Yin, 2013). Most of the information used in empirical case have been collected through interviews, and often been the personal opinion and reflections to the interviewees.
The interviewees have review the answers in order to correct wrongful inferences, to limit the loss in internal validity.

2.4.3. External Validity

External validity deals with defining the domain to which a study's findings can be generalized (Yin, 2013) Critics to the use of case studies is the problem of whether the findings can be generalized beyond the immediate confines of the case (Yin, 2013). Both opponents and those favouring the research method consider the findings of this type of method not generalized. However, those favouring case studies believe that the findings can be generalized if the same results are found through replication of the study. Multiple case study are therefore promoted by Yin (2013), increased possibility of experiencing both direct and theoretical replication of events later used for theory building.

This case study have been compared to the findings in the theory in order to reveal the domain to which the findings be generalized. In addition both companies and their characteristics have been presented in order to generalize the findings based on the constrains within the market the companies are competing in. While all the interviewees are within the same buyer-supplier relationship, there different roles have provided different insight that one company alone would not have.

2.4.4. Reliability

Reliability in research methodology is described as demonstrating that the operations in the study can be repeated, and that it then will give the same results(Yin, 2013).
Qualitative research is discussed to be subjective, and is hard to replicate, because the interpretation of the answers are so depending on the person doing the research. (Bryman and Bell, 2011)

Yin (2013)describe ways to increase the reliability and validity. Among those are use of multiple sources; to have key informants to review the case report; search for patterns; build explanations and address rival explanation; and use theory in the design phase and build proper protocol and data base.

In this study the methodology have been described and thereby allowed replication by other researchers. The literature search by using key words and *oria.no* allow replication. However, usage of snowball sampling makes the findings harder to replicate then if only key words were used. The narrative approach, without focusing on explicit criteria for inclusion or exclusion of articles believed to be relevant to the study, may have been affected by personal bias have therefore reduced the reliability of the study.
For the empirical part an interview guide was developed in order to collect the evidence and ensure the needed information were gathered throughout the interviews. This guide may help others to come to the same conclusions form the data given in the interviews.
The interviews held have been transcribed and can be found in Appendix, this makes it possible for other to come to the same conclusions based on the answers given in the interviews. This strengthens the reliability of the study.

2.4.5. Summary

Bryman and Bell (2011) claim that qualitative research suffer from a lack of transparency, is too subjective and difficult to replicate, and it lacks the ability generalise the findings to a large population. These are certainly issues that have been struggled with in order to ensure validity and reliability for the study. The lack of transparency have been tried to reduce through clear documentation of the research design and data collection. The matter of subjectivity have been addressed by using multiple sources, and take into the account the researchers personal view. In terms of generalisation the finding from the empirical part have been compared to relevant theory in order to see any linking.

Despite some pointed out weaknesses in the quality of the research, there has been a general focus on ensuring the best quality possible for the study, having resulted in a degree of validity and reliability in the study that can be looked at as sufficient

Chapter 3. Literature review

This chapter will go through the different part of the literature that are looked at as relevant to the topic. There will first be a brief introduction of the importance of supply chain management, before the topics of product development and supplier involvement have been looked at in depth. In the end of the chapter there is produced a theoretical framework form the findings of supplier involvement in product development.

3.1. Supply Chain Management

A Supply chain consist of all parties involved in fulfilling the costumer's request, through upstream and downstream linkages. This is not limited to manufacturing but include raw material, transport, storage and retailers and even the costumer it selves. A supply chain is dynamic and involves constant flow of information, product, and funds between different stages. The goal for of every supply chain should be to maximize the overall value generated.(Chopra and Meindl, 2007)

In the last hundred years, the structure of supply chains has changed. In the 1920's the common use was to do all activities in-house, and if the need for new processes or capabilities occurred. The firms developed the capabilities or vertical integrated it by acquiring other firms that had the needed knowledge or capabilities. In the last decades, firms tend to focus on core capabilities and buy or outsource the rest to others. This makes the supply chain consist of more actors and more complex structures then earlier. Today supply chains can be both large and complex even for simple products. Christopher (2012) argue that the supply chain can be misleading term in today's market and should be replaced with demand network, due to the fact that the chains is driven by demand in the market, not by the suppliers. And that it normally are several customers and suppliers involved in

a more complex total system that are can be looked more like a network then a chain. Despite this ‘supply chain’ is the widely used phrase.

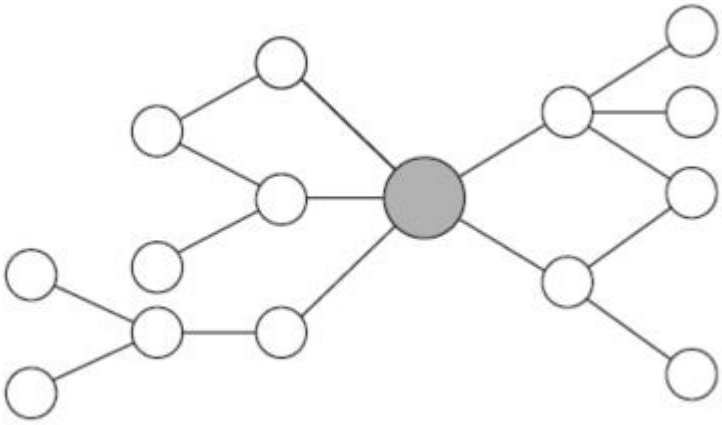

Figure 4 Supply Network by Christopher

In the 1980’s the term Supply Chain Management (SCM) developed through the need of integrating the key business processes from the end user to the original suppliers.
The basic idea in supply chain management is that companies and corporations involve themselves in a supply chain by exchanging information about market fluctuations and production capabilities. If all relevant information is accessible for all companies in the supply chain, everyone can work toward a better optimization of the total supply chain, which will lead to better production, distribution and cut cost (Cousins et al., 2007, Christopher, 2012).

Since all the different activities in a supply chain contribute to the cost and efficiency of the final product/service, SCM is strategically important in order be competitive in the global market. SCM is a heavily investigated area, and is receiving more and more focus by companies in all industries.

Even if the SCM have a general scope on the supply chain as a hole, it also focuses on dyadic relationships between buyers and suppliers, and how to optimize them, both for each firm and the overall supply chain. In case of KMS and Hapro’s the focus will be lying on the dyadic linkage, where the roles are set in order of supplier and buyer. For KMSs part,

their supply chain is a large and complex structure. This makes is difficult to manages and coordinate all part in a manner that make it efficient and cost effective.

3.1.1. Make or Buy decision

The make-or-buy decision is a generic question in the manufacturing industry. It will decide whether the firm should be producing the product, process, service themselves, or buy it from other firms.

Today, few organisations have the skills and resources required to design and manufacture the entries products in-house. However, there are some industries that are having this amount of vertical integration today. Some organization in the oil industry control the entire supply chain, from exploration and production of crude oil, all the way to sales of end products, such as petrol, diesel and lubricants (Cousins et al., 2007). In other industries, the trend are moving away from vertical integration. Firms are focusing more on the core activities and buy the rest from others. Especially firms in high-cost countries have no chance to compete with low cost countries on cost driven products, and need to focus on areas where they can have competitive advantage in other ways. Even activities, knowledge and development can be purchased in order to achieve the needed competitive advantage (Quinn and Strategy, 2013).

In general, the make-or-buy decision is closely connected to the firm's corporate strategy and supply strategy. The decision determines the areas where the firms will compete and those it will leave to others. (Cousins et al., 2007)

In the literature, there are two main approaches to this question. The transaction cost economics (TCE) argues for a cost focused strategy. While resource-based view (RBV) looks at firms resources. Das and Teng (2000) look at both approaches in the context of building relations. They differentiate companies by the use of the TCE and RBV approach according to the position in the market. The TCE companies are typical competing over price, and tries to build alliances in order to achieve their competitive advantage. While RBV companies are companies that are competing on their competences and knowledge. They build alliances to protect and strengthen their place in the market place. Several

studies have showed that both views are complementary to each other, in order to cover all the aspects of the decision. (McIvor, 2008, Brewer et al., 2013, Cousins et al., 2007)

Handfield et al. (1999) produced a framework in order to determine what parts/products to outsource, and what to keep in-house. In this framework the authors differentiate between development and the manufacturing, and address the factors that can point towards the different solution.

Insource	• High internal capability • Product specification control • Proprietary design	• Established internal core competence • Develop promising new process technology • Available manufacturing capacity
Outsource	• Supplier design expertise • Proprietary supplier technology • Potential for joint development • Reduce time-to-market through	• Cost • Quality • Delivery • Lack of Internal Capacity • Commodity-like products • Non-core processes
	Design and development	**Manufacture**

Figure 5 Outsource decisions by Handfield et al.

In this study, the make-or-buy decision is the starting point for buyer-supplier collaboration and early involvement of suppliers. From the make-or-buy decision there are two outcome; To have the product, process or service done in-house, or outsource it. Outsourcing will be looked at in the next section.

3.1.2. Outsourcing

Outsourcing is when any supply chain function is bought by a third party. It is one of the most important issues facing companies.(Chopra and Meindl, 2007)

For long time purchasing activity were been looked at as only a functional and task focused activity, without any strategic importance. This picture have been changing the last decades, and the role of purchasing have become one of the main strategic factors in firm's management. (Chopra and Meindl, 2007, Cousins et al., 2007, Christopher, 2012) Through the 1970's the products life cycles become shorter, and the market shifted away from companies doing all the work in-house. Product specification were standardized and firm used the benefits of consolidations in order to stay competitive. In the 1990's more sophisticated purchasing practises were implemented, which moved many firms towards long-term collaborative relationships, innovations, purchasing influenced supplier investments and supply chain practices.

Kraljic (1983)was early with announcing the importance of purchasing as a strategic function in companies. His portfolio approach is still widely used across many industries, and is often a good starting point for any sourcing activity.
Handfield et al. (1999) describe that the outsourcing decision should be approached in a systematic way if possible, where strategic core competencies in product and process design and manufacturing are assessed. It is showed a trend toward outsourcing commodity-like items and focusing internal effort on added-value activities such as system integration. (Handfield et al., 1999) Since more and more activities no longer are looked at as core competence product, the importance of coordination and integration across different actors are getting greater, in order to fulfil their end costumers requests. (Chopra and Meindl, 2007)

In summary, SCM is strategic important task for any company, not only can it control and organize the business actives, it can also guide companies in how they want to do business in the future. In today's market, there is a trend towards more outsourcing, so each firm focusing on core capabilities and let other do the rest. This give a higher need for SCM and better collaboration with the core suppliers in order to ensure a good flow in the value chain. This is not only for the product flow, but also for the development of new product. In the next section, the product development will be looked at before investigating how supplier involvement can be handled.

3.2. Product development

With the increasing global competition in many industries, companies are operating in markets that demands frequent innovation and higher quality. A large body of literature now exists which has identified new product development as a core process that achieve success in the global economy (McIvor and Humphreys, 2004).

The essence of product development is to meet the needs in the market. This means that the product, service or upgrade can cover the customer needs in a satisfying way.
However, product development can be a complicated and challenging process with many roles to take in to consideration in order to have a successful outcome. Even if the final goal is to satisfy the costumer in the end, other stakeholders are affecting the activities in a product development. The development team may want to deliver a "state of the art" product, while the production team are more concerned about the manufacturability of the product. Other stakeholders might also have demands in order to timing of sales for seasonal product, or ecological aspect etc. (Eppinger and Ulrich, 1995).

The long-term competitiveness of any manufacturing company depends ultimately on the success of its product development capabilities(Wheelwright and Clark, 1992). With its proven advantage, a product development activity poses its own challenges (Eppinger and Ulrich, 1995). Some typical challenges can be;

- Trade of between cost and technology.
- Dynamic environment; technology change, costumers preference evolve, competitors introduce new products and a macroeconomic situation shift
- High degree of detailing, is costly and time consuming
- Need of competence and creativity.
- Time, skills, cost and quality constrain.

3.2.1. Product development projects

Product development are often carried out as a project (Eppinger and Ulrich, 1995).

In the paper from Wheelwright and Clark (1992) they describe development projects based on two dimensions. The degree of changes in the product and the degree of change in the manufacturing process. Based on this two dimensions, they present five types of development projects. The classification suggest that product development not only need to imply development of completely new products. The five types of project are;

- *Derivate projects* range from cost-reduced versions of existing products to add-one or enhancements for an existing production process.
- *Breakthrough projects* are at the other end of the development spectrum because they involve significant changes to existing products and processes.
- *Platform projects* are in the middle of the development spectrum and are thus harder to define. They entail product and/or process changes then derivatives do, but they do not introduce the untried new technologies or materials that breakthrough products do.
- *Research and development* is the creation of the know-how and know-why and technologies that eventually translate into commercial development.
- *Alliances and partnerships*, which also lies outside the boundaries of the development map, can be formed to pursue any type of project-R&D, break through, platform, or derivative.

This classification can be used to map the different development project within a company, in order to determine how to uses resources on the different projects in a company. Each of the five project types requires unique combination of development resources and management style (Wheelwright and Clark, 1992).

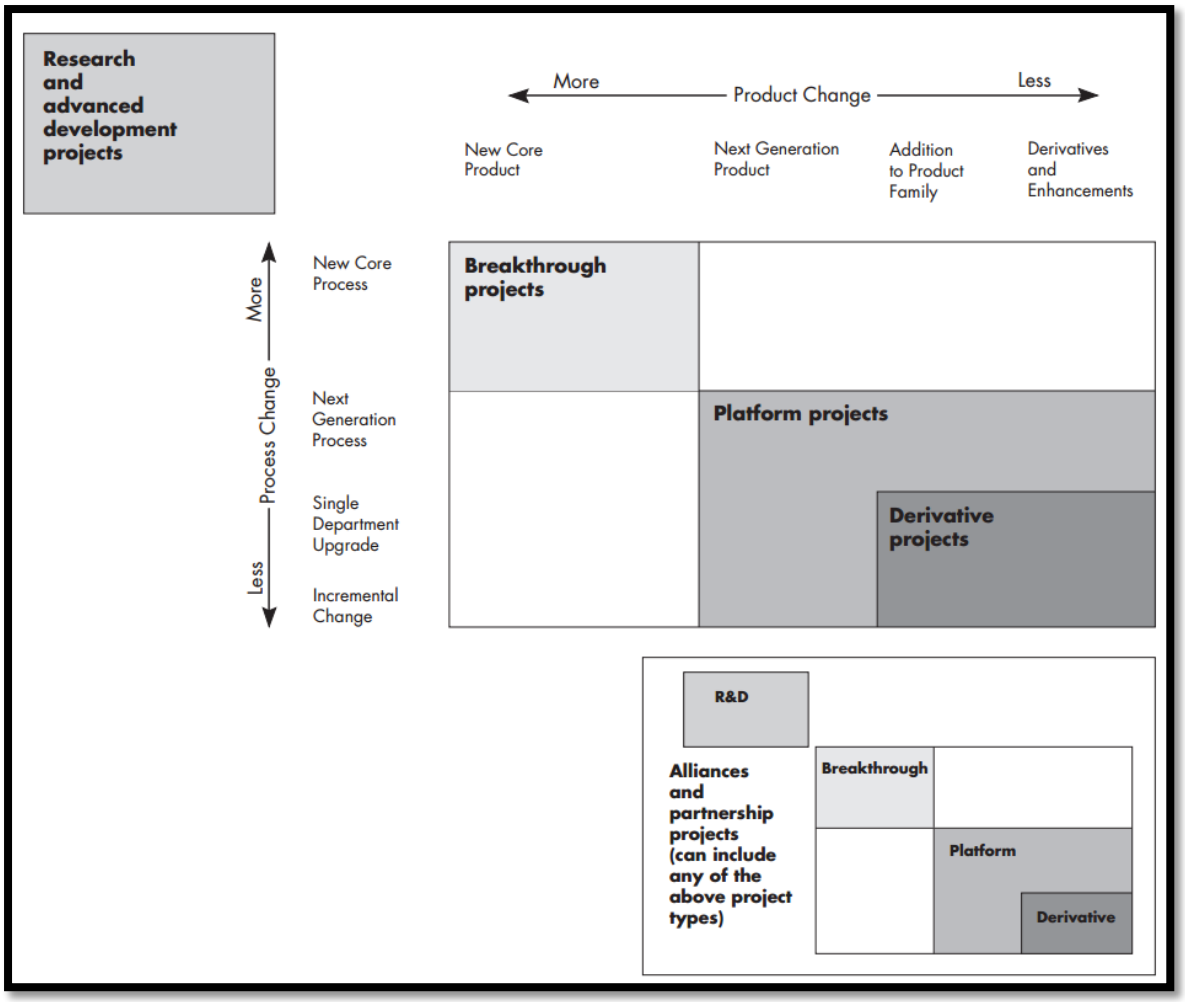

Figure 6 Five types of development projects by Wheelwright & Clark

3.2.2. NPD process

Through the literature, several different models and description of the product development processes are presented (Eppinger and Ulrich, 1995). Most of the models have large similarities, with just small differences. In this study, the model from Handfield et al. (1999) will be introduced and explained. In the paper from Handfield et al. (1999), the development process is described and differenced into 5 stages, where it go through the process from start of the development up to full-scale production of the new product, process or service.

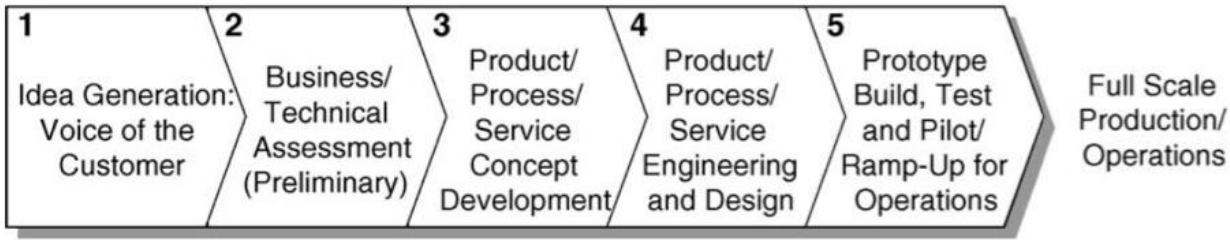

Figure 7 New product development process by Handfield, (1999)

In the first step, "the idea generation" the customer needs is explored by the marketing and design personal. They try to draw a picture of what product, process or service there is a need for, and which of this needs that can be covered by new products/processes or services. In the second step business assessment is done, here the engineers look at the technical aspect of how to solve the problems. The product, process or service requirements are sett and up towards the costumer needs. The third step is where the concepts and early design is done; performance specification will normally be "frozen" after this stage. A preliminary prototype may be crated in the purpose of the concept definitions. The fourth step is where the detailed engineering and designing is completed and prototype is produced. In the final stage the prototype are tested and the production process made ready for ramp-up to full-scale production. The changes in this stage are normally small and are more or less adjustment on fixed solutions.

Even if the second and third phases, where the design and technical engineering are done, is a small part of the total development cost, the decisions made in this phase effecting much of the total product development. According to Handfield et al. (1999), around 80% of the total development cost are determined or "locked-in" by the decisions of this stage. As the development goes on, it becomes increasingly difficult and costly to make design changes. Decisions made early are having large impact on the final product's cycle time, quality and cost. It is therefore crucial to involve as much expertise on the product, process and technical aspects early in the development process. (Handfield et al., 1999, Ragatz et al., 1997, Petersen et al., 2005, Clark, 1989)

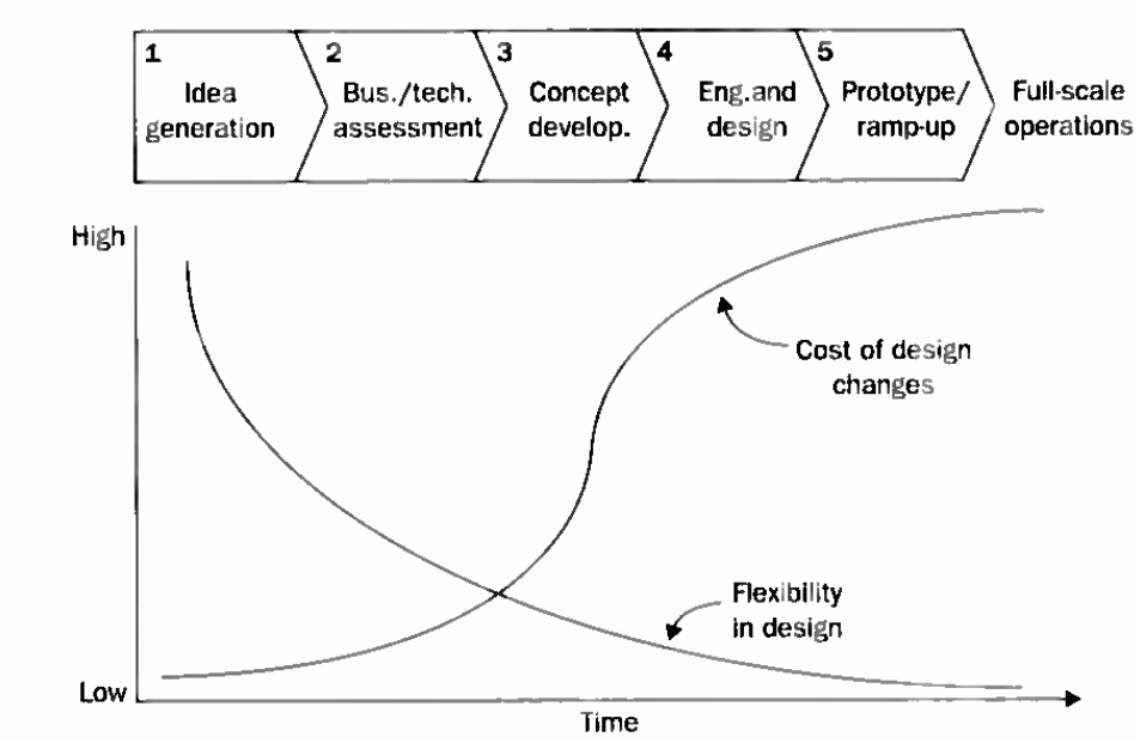

Figure 8 Design flexibility and cost of design changes by Cousins et al. (2008)

The concept of front-loading is good way to show some of the effect starting early in the development process. Front-loading is a concept used in development processes where the developer put resources early into the development process in order to identify and solve design problems in the early phases of development. (Thomke and Fujimoto, 2000) Since much of the work is done in the design stage, simulation and testing can be done parallel to other engineering, this reduces the lead time and cost of the development, while it frees up resources to be more innovative in the marketplace. (Thomke and Fujimoto, 2000)

3.2.3. Development tools

Do to the strategic importance and high amount of focus on produce development in many industries, there have been developed many tool to assist the development in order to ensure the quality and efficiency throughout the process.

Many of the tools are developed for specific industries and further evolved into industries that se the potential benefits. Especially the automotive industry have been important for development of tools and systems to the production development topic.

Stage-gate systems was introduced by Cooper (1990), and describe is a tool to control the development process. The idea is that in order to move from one development phase to another, there need to be a clearance by a gate. This can be a list of processes or activates that need to be done in order to go on with the next step in the development process. It
The automotive industry uses they and have developed a process plan that insure the quality of the development. Sanongpong (2009) describe it as Advance Product Quality Planning (APQP). The APQP embodies the concepts of error prevention and continual improvement in contrasted to error detection, and is based on a multidisciplinary approach.

The term of concurrent, engineering and design for manufacture have been in the manufacture industry for some time. The use of cross-functional team to design and look at the production process together with the design of the actual products. Concurrent engineering focus will not only be on reducing the ramp-up time, but reducing the cost of the development, material selection and quality in all steps of the process. The combined expertise from the buyer and supplier will reduce possible problems in the future, and thereby speed up both the development and the production of the product.

Concurrent engineering have been a tool to have shorter cycle times and faster development. Developments in NPD models emphasize the benefits of overlapping and concurrent engineering, instead of sequential activities have (Imai et al., 1984).
The benefits of concurrent engineering are also reaped by managing several development cycles in different companies. In this sense, the early involvement of external sources in NPD represent a major key to shorter development cycle (Bonaccorsi and Lipparini, 1994).

One step future is the three-dimensional concurrent engineering (Fine, 1998). In addition to look at both the product and the process, Fine also introduced the supply chain. By develop the product, process and the supply chain simultaneously, the different team can get the big picture and prevent future problems by applying the specific knowledge from the different department.

3.2.4. Summary product development

In summary, product development is strategic important activity in order to get a sustainable long-term competitive advantage. The subject have been widely looked at in the literature.

Common success factors in product development are:

- Supplier and customer's involvement
- Senior management support
- Effective project leader
- Internal and external communications of the development teams
- Cross-functional team composition
- Product concept effectiveness.

3.3. Supplier Involvement

To involve suppliers in the development of new product have been more comment. The issue have been research widely, mainly in the mass production industries, but also in project based industries. Since the 80's the literature have proven results of improvement of new product development when supplier have been involved. (Johnsen, 2009) The early work focused on the Japanese automotive industry, and the systems they were using in order to outperform other firms in the industry. By involve suppliers and rely heavily on them, Japanese's manufactories manages to bring new models out on the market fast, with more innovative features and with less resources used in terms of development hours and number of engineers involved (Wynstra et al., 2001). Through the 90's some studies move the focus on to the problems regarding involving the suppliers and barriers for shear training, trust, risk & rewards sharing, agreed performance measurements and top management commitment. In the latest decades, various models of involvement have been discussed with focus on speed, quality and cost, utilization of the supplier technology. Today the focus have also come towards long-term perspective of supplier involvement, future collaboration, access to technology roadmap.

Even if most of the literature shows positive, effects to early supplier involvement there are some research that not show effect by introduction suppliers early. Eisenhardt and Tabrizi (1995) and Zirger and Hartley (1996) got mixed results in early involvement of suppliers in their studies, where the main focus was the time of development project. They however believe that supplier involvement can reduce the time-to-market for development projects if managed properly.

3.3.1. Timing of involvement

There is no clear situation or timing in a development process the supplier have to be involved. Several studies have tried to determent the stage in the development the suppliers can be involved. The findings are divers and arguable (Petersen et al., 2005)

There are several studies that suggest supplier involvement early in the design phase of the product development. Through the concept generation and design engineering stage, the

cost of the products will be determent. Suppliers contribution in this phase would facilitate further cost reduction (Ragatz et al., 2002). Another reason identified by the same authors is the technological uncertainty. If the supplier possess high level of expertise in a particular technology relevant for the product, the supplier should be involved in early stages of the development. Wagner and Hoegl (2006) argue that buyer supplier relationship do not merely exist, but emerge. There need to be mutual trust and commitment in order to get close involvement to work.

Even with the benefits that are connected with ESI, timing of supplier involvement is conditional. (Monczka, 2000)discuss that suppliers of simple and less critical items don't need to be involved before engineering of prototype phase, and critical items should be involved in the early stages as idea generations and the business/technical assessment phase. Eisenhardt and Tabrizi (1995) tries to divide the timing of the supplier by situations.(ex predictability or complexity of the project), were the unpredictable and complex project should involve the suppliers early in the process. While in predictable and simple project, the supplier can be involved later in the development. Wagner and Hoegl (2006) divide the integration depending on the project types. In *know-how* project should the supplier be involved early in the process to maximise the capabilities of the supplier throughout the whole development. Suppliers in *capacity* projects, on the other hand, should not necessarily be involved early. (Parker et al., 2008)say the suppliers not necessarily need to be involved early, but at the stage in the development needed.

That the timing is conditional is shown below in Figure 9 by Handfield et al. From the figure, it is possible to involve the supplier at any stage in the development. It is also showed that the degree of "early" or "later" are connected to several different criteria's, such as the complexity of technology and item that are being developed and the strategic alliances with the supplier.

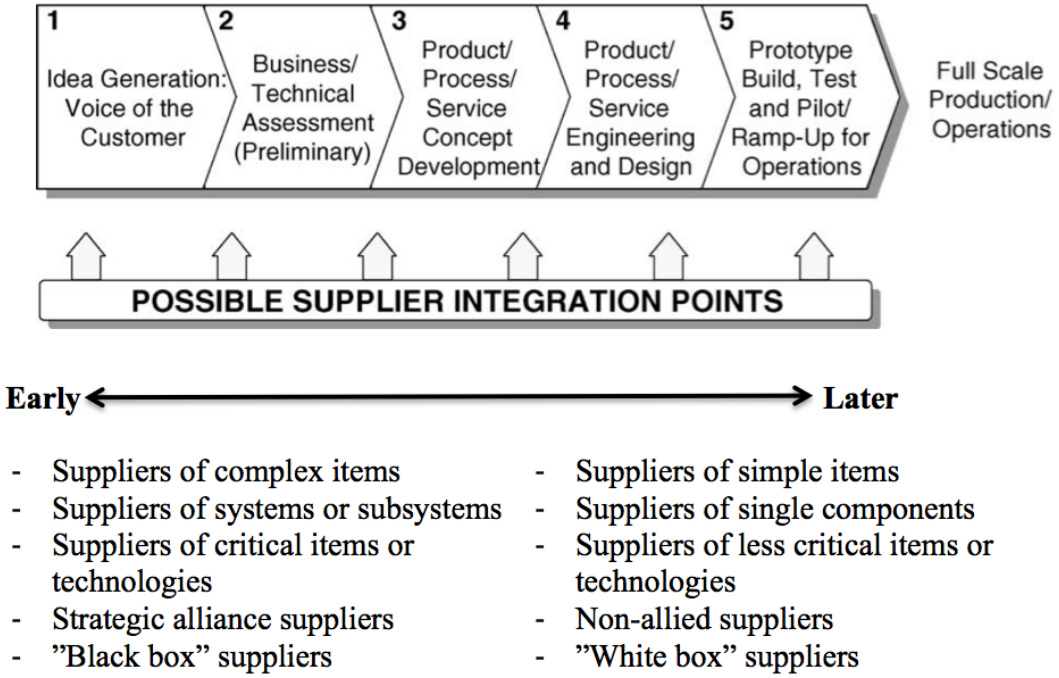

Figure 9 Timing of Supplier involvement by Handfield et al.

In addition to the criteria's mentioned this figure above, Bonaccorsi and Lipparini (1994) identified two dimensions indicating at which stage suppliers become involved in the development, and the level of supplier competition.

The timing of the supplier involvement refers to the stage the costumer begin the search for suitable suppliers. A key factor indicating the depth of the partnering relationship between the customer and its suppliers is when in the process the supplier selection is done.

Degree of competition among suppliers refers to the degree of competition among suppliers at their time of involvement. If involvement happen early then the competition is low, if the competition is high, the involvement happens late in the development process.

3.3.2. Early Supplier Involvement

One type of strategic buyer-supplier collaboration that have adapted by many firms that looking for ways to make their development more time and cost effective, is early supplier involvement.

Through the last decades there have been many studies that show a positive effect on ESI in development projects (Johnsen, 2009). ESI is described as one of the reasons the Japanese for many years were superior to the US and European auto maker in terms of quality, productivity and lead time.(Clark, 1989, Womack et al., 1990) To be able to have supplier collaboration in the decision-making stage of a NPD process has showed great effect on the outcome of the development process, both on cost, development time, manufacturability and quality(Ragatz et al., 2002, Petersen et al., 2005, Mikkola and Skjøtt-Larsen, 2006). ESI also provide a possible route for outsourcing that can reduce the internal complexity of projects and provide extra resources, which can lead to reduction in the critical path of a project (Ragatz et al., 2002).

Studies done on ESI have had a tendency to either viewing the buyers or the suppliers perspective. McIvor and Humphreys (2004) conducted a detailed review on previous research of ESI and connected it with the buyer-supplier relationship. In contrast to most other studies on ESI, they provide a dyadic approach with the viewpoint of both the supplier and the buyer. They describe three main dimension that are critical in order to have a successful ESI in NPD. These dimensions are; extend of supplier involvement; Buyer-supplier relationship; and Information exchanges.

This three dimension will be look into in the next sections.

3.3.2.1. Extend of the supplier involvement

It is an accepted view across industries that the greater the supplier involvement is in a development project, the better the outcome will be. (Johnsen, 2009) However, to build relations with suppliers is a costly and time-consuming process. It is therefore important to have the right amount of involvement with the suppliers in a product development process. (Petersen et al., 2005)

The extent of the supplier involvement is highly dependent of what is needed from the supplier and timing of the involvement. As Mention earlier in the chapter, many decisions made early in the design process are hard and costly to change later in the development. The extent of the involvement needs therefore to be depending on when in process the supplier is needed. Handfield et al. (1999) show a model of the different level of

responsibility on the development process. The model shows how the involvement in the design phase of the product development has impact on the responsibility, and the other way around. *None,* to *Black box.*

None, is when the supplier are not given any responsibility or involvement in the design/development process. Here the supplier more or less just make the item on strict and detailed specification on how the item should be when it is done, but also how it should be produced or handled in the process. This process are also called make to print.
One down side of this kind of collaboration can be that this item will be down prioritized by the supplier do to a lack of responsibility.
White Box, is the least complex approaches to supplier involvement. The supplier is involved in a sort of *ad hoc* manner, were the buyer only "consults" the supplier on the buyer's own design.
Grey Box, is when the supplier and the buyer formal goes together in the design phase and contribute in the product on. This is often what s looked at as a joint development, were both supplier and buyer are having responsibility in the design and development phase of the item. This type of collaboration can be giving improved quality, manufacturability and functionality to the product.
Black Box, is when the supplier get the customer requirement for the product and get more or less the total reasonability for the item. This gives the supplier freedom on how they will solve the problem ad how to develop it if needed. This type of collaboration have been proven very effective in terms of development time and quality when used right. However there need to be a high level of trust in the collaborations in order to get the wanted results. Japanese automakers have used this type of relationship in many cases with great outcome, were they have long lasting relationship between supplier and the buyer. Many firms may be afraid that the information and specific criteria the buying firm have to deliver will be misused and end up within hand of other competitors or opportunistic suppliers

None	"White Box"	"Gray Box"	"Black Box"
No supplier involvement. Supplier "make to print"	Informal Supplier integration. Buyer "consults" with supplier on buyer's design.	Formalized supplier integration. Joint development activity between buyer and supplier.	Design is primarily supplier driven, based on buyer's performance specification

None **Level of responsibility** High

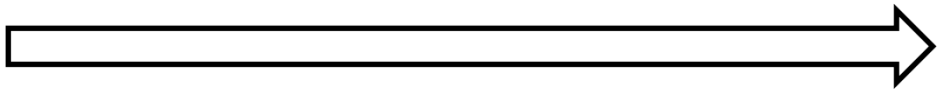

Figure 10 Level of responsibility by Handfield et al.

Bonaccorsi and Lipparini (1994) also look at the degree of competition among the suppliers as a factor in extend of the supplier involvement. They argue that a key factor indicating the depth of the partnering relationship between the costumer and its suppliers is at what stage the supplier selection decision is made.

3.3.2.2. Buyer-Supplier relationship

An absolute important aspect of having a successful development with involvement of supplier will be the buyer-supplier relationship.

(Wagner and Hoegl, 2006) differentiate the supplier involvement in NPD in two types of projects; *Know-how* project and *capacity* project, depending on what the buying firm are looking after in the collaboration.

Know-how projects are projects were the buying company are intentionally after utilize the suppliers specialized knowledge, often in form of technology. The suppliers is given responsibility for critical part or comprehensive modules or systems. This is the type of suppliers that the company often want to make a long-term relationship with, do to the future needs of technology.

Capacity project are projects were the buying company uses the suppliers Research and

Development capabilities in order to overcome the shortages in their own R&D resources. This it typical project with low level of innovativeness, and short time frame.

From the research done by Gadde and Snehota (2000) it is showed that suppliers contribute to buyers success in two ways: economically in by reduction in the cost, but also in terms of development and innovation. This view gives a deeper insight to the benefits of involving suppliers compared to the economic benefits provided by the traditional purchasing theory. Gadde and Snehota (2000) Show this in a total cost and benefits from form a buyer-supplier relationship.

Table 3 Gadde and Snehota's cost and benefits of relationship

Relationship Cost	Relationship benefits
• Direct procurement costs • Direct transaction cost • Relationship handling cost • Supply handling cost	• Cost benefits • Revenue benefits

Jap (2001) finds in his study that interorganizational goal congruence and the trusting relationship of individuals also aid in the preservation of and sustainability of these advantages against the poisonous effects of opportunism suspicions over time.
He argues the possibility of gaining competitive advantage form buyer-supplier relationship is based on the following conditions;
(1)*Resource heterogeneity*, which mean the researches have various efficiencies and productivities.
(2) *ex ante limits to the competition*. That means that any way of producing value to the market gives competitive advantage, and by combining different unique resources and competences together, the firms will create superior value to the market.
(3) *ex post limit to competition*, is means crating barrier to the competition by other firms. By involving suppliers it is hard for competitors to duplicate or copy of the effort and activities the collaboration firms do together, and the competing firms may not be able to crate the same value.
(4) *Imperfect mobility* refer to the resources that are not easily traded. This resource gives more value inside the firm then in others.

Trent and Monczka (1998) Determent that almost 50% of the firms they studies indicated barriers existed that limited their ability to include suppliers. These barriers included resistance on the part of the buyer or the supplier to shearing proprietary information relevant to the design and a design culture that makes personnel from the buying company reluctant to share their responsibility in the product development process.

(Cousins, 2002) Developed a framework based on level of dependency and/or trust involved in development relationship. It shows the two different view of competitive relationship, and the co-operative relationships. IN many cases, competitive relationships are based on a skewed distribution of power such that a win-lose mentality is adapted by the participating organisations. Many manufacturing companies are having competitive buyer-supplier relationships, pitting one supplier against another to obtain the optimum buy. In (Cousins, 2002) framework ,co-operative relationship emphasise a sheared independence and therefore a need to distribute responsibility and power. Instead of competing between firms, this is replaced by competing between networks.

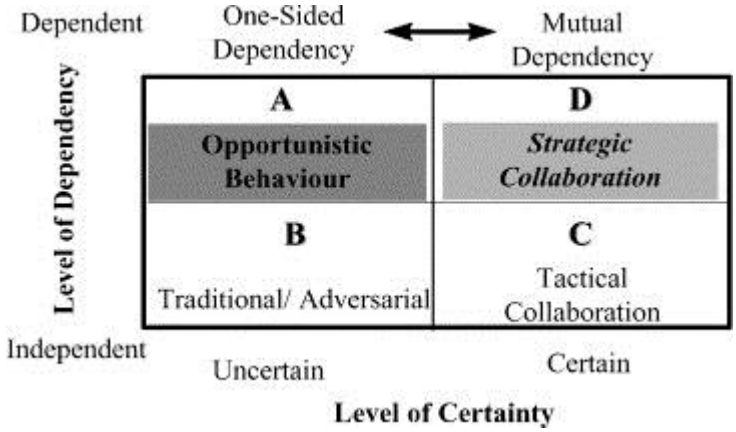

Figure 11 Cousins relationship framework

(Ragatz et al., 1997) introduce criteria's for a successful supplier involvement to NPD process. In the model they describe that barriers to suppliers integrations depends on a concept they call *relationship structure*.

- Buyer top management commitment
- Shared education and training

- Joint agreement on performance measures
- Confidence in supplier's capability
- Formalized risk/reward sharing
- Formal trust development practices
- Supplier's top management commitment.

While the relationship structure have little direct effect, they can be looked at as enablers for Asset allocation:

- Technology information
- Customer requirement
- Direct cross-functional intercompany communication
- Co-location
- Supplier participation on project team
- Common linked information system
- Technology sharing
- Shared plan and equipment

The barriers related to managing suppliers involvement in product development:(Ragatz et al., 1997).

(1) There might be a concern at different levels of organization for sharing the proprietary information with suppliers. The major concern is about this information being Increasing Supplier Responsibility revealed to the competitors intentionally or unintentionally. This concern might be even more problematic when a supplier company itself is a competitor.

(2) Buying companies designers or engineers may not accept the ideas from the suppliers. Ragatz et al. (1997) name this issue as "not invented here". This issue is directly associated with cultural aspect of the buying firm. Also, buying company designers or engineers might resist giving up any control over design decisions.

(3) There is a possibility that above mentioned problem arises from the supplier end also. This is a bigger challenge for the suppliers when they are dealing with a more powerful buyer. A supplier might worry about inequitable treatment (Ragatz et al., 1997)

3.3.2.3. Information exchange

In general, there are many studies showing communication between supplier and buyer as a critical factor for successful projects. Development projects are no exception.
Ragatz et al. (1997) find that the greatest differentiator between most and least successful NPD projects it supplier membership. Swink (1999)define that supplier influence are depending on the direct involvement and communication supplier have with the project team. In this sense the more communication the more influence the supplier have. Wasti and Liker (1997) on the other hand show that the frequency of the communication does not increase with the supplier's capabilities and responsibilities. The reason might be that highly capable suppliers are better suited to handle their problems with their own resources.

Wagner and Hoegl (2006) look at the most important capabilities in order to get a successful integration. He divide them into two types of capabilities; Hard, and Soft.
The hard criteria's are normally criteria's that are possible to measure and can be clearly defined. The soft criteria's on the other hand are far worse to measure, and can be very personal dependent.

Table 4 Supplier capabilities for NPD by Wagner and Hoegl

Hard Capabilities	**Soft Capabilities**
Competence, qualification	Trust and reliability
Flexibility	Openness and mutual support
References	Congruence of goals ("win-win")
Local distance	Dedication contact person
Innovativeness	Active, entrepreneurial behaviour
Quality management in place	
Size and stability of the supplier	
Compatibility of systems	
Customer orientation	

From the research done by Wagner and Hoegl (2006) they show that the soft criteria's are well as important for successful development as the hard criteria's. This can make the selection of supplier difficult. Especially in the since of trust. IP problematic can be a

reason that firms decide to do development in-house instead of develop together with supplier.

To make clear IP agreement is therefore necessarily in collaboration with suppliers that can be opportunistic or in position to spared the knowledge. To make clear agreements in general for involvement in the project/development have a positive effect on the outcome. (Ragatz et al., 1997) To make clear agreements on risk and reward sheering, joint agreements on performance measurements, confidentiality/nondisclosure agreement and license agreements are gives better chances for successful supplier involvement. The workers don't need to be careful or confused on the task, and the work can faster be focused on the actual work. Petersen et al. (2005) address the degree of familiarity with the supplier, their level of involvement in prior efforts and their engineering design capabilities, of often high on the priority list from firms with successful development project.

Membership in the NPD project from the supplier is according to Ragatz et al. (1997), the factor that differentiate the most and least successful integration. This challenge is often close connected to some of the soft capabilities, as trust and willingness to cooperate. Often the "danger" of sheer technical specification and core technologies is a high barrier in order to get mutual trust in the in the development team. To have clear IP agreements will help both firm in this situation (Handfield et al., 1999).

3.3.2.4. Summary of ESI

In an overall view, there is many studies that shown positive effect from early supplier involvement (Petersen et al., 2005). However, there have been shown some potential drawbacks as well. The potential benefits and drawback have been summarized in the following table.

Table 5 Potential benefits and drawback from ESI

Potential Benefits	Potential Drawbacks
• Improved quality in end products • Reduced development time • Reduced cost • Better manufacturability • Possibility for outsourcing (reduced internal complexity and critical path) • Improved buyer-supplier relationship lead to smoother projects in the future	• Resistance in sharing of knowledge. Buyer or supplier are holding back on proprietary information that is relevant to the design • Doubts about the efficiencies of undergoing significant changes in the organizations structure. Specially in technical difficult product • Possible delays on the development process

Despite the given effects of ESI there is many challenges that need to be handled in order to have a beneficial collaboration.

Key factor for adopting the involvement

- Understanding of the concept of collaboration
- Culture of encouragement for joint problem solving
- Senior management support
- Commitment among those that are most involved in the

3.4. Theoretical findings

In this chapter, the literature have been reviewed on the topics of product development and supplier involvement. Involving suppliers in the development process have been more and more commend in many industries. From the ESI part in this chapter there are presented some potential benefits and drawbacks.

We can see from the literature that the timing and the extend of the supplier involvement are close connected. However, there are also situations where it is not the case. Typical criteria's that determine the timing and extent of the supplier involvement are:

- Technical difficulty of the product and/or process
- The level of technology uncertainty.
- Importance of the product, in terms of economical and strategically
- Degree of competition for suppliers.

Success criteria's can be summarized in the table bellow.

Table 6 Success factors for product development and supplier involvement

Product development	**Supplier involvement**
• Team Composition • Project leadership and Senior management support • Product concept effectiveness • Supplier customer integration.	• Right timing of the involvement • Right extend of involvement • Information exchange • Suppliers technical knowledge in the needed area • Supplier membership in the development project. • Clear agreement in terms of performance measures, Risk/reward sharing, IP, and confidentiality.

Chapter 4. Empirical Part

In this chapter the empirical part of this study is presented. The SoundChian project will be introduced, together with the involved parts, and the challenges they are looking at. Before the finding from the case study will be presented. The information is gather from semi-structured interviews, and documents that are connected to the companies and the SoundChain product.

4.1. General idea behind SoundChain

As mentions in chapter 1 the SoundChain project is collaboration project between KMS and Hapro. The main goal is to ensure a long-term competitive advantage for Norwegian producers of knowledge intensive high-tech products for the maritime industry. One aspect of the projects is to look at collaboration with the core suppliers in the supply chain.

4.1.1. General information about KMS

Kongsberg Maritime Subsea is one of 8 market segments within Kongsberg Maritime. KONGSBERG is an international technology corporation that delivers advanced and reliable solutions that improve safety, security and performance in complex operations and during extreme conditions. The Group is a customer focused organization with a worldwide performance culture. KONGSBERG works with demanding customers in the global defence, maritime, oil and gas and aerospace industries.

Kongsberg Maritime produce high technological subsea sensor systems that are in the premium segment of products with high level of performance and quality. The products have a high level of innovativeness and new product are continuously introduced. They produce products for the global market with special focus on countries with large offshore, shipyard and energy exploration and production industries. In 2014 Kongsberg Maritime

had an operation revenue on 9703 million Norwegian crowns, and have 4659 employees in 59 offices in 20 countries. (31.Dec. 2014)

4.1.2. General information about Hapro

Hapro is one of the leading SEM (Electronic Manufacturing Services) in northern Europe. They deliver a broad range of services from small prototype production of new ideas to mass production. They focus on high quality on all products and services, and are continuously working for improvement and strengthening the quality culture in their staff. In 2013 they had an operation revenue on 449 million Norwegian crowns, and have 285 employees in their facilities at Hadeland in Norway. Hapro is a contract producer, and do not develop the product they are producing today.

4.1.3. Products in SoundChain

KM uses Hapro as a supplier on several of their products. In this section, two of the product that are looked at as cases in SoundChain will be introduced. Hapro is involved in different way on the two products.

Today KMS are not having Hapro in any part of their development. KMS are developing product and Hapro is a contract manufacturer. Hapro deliver sub components, or complete products, depending on the product looked at. For the two products introduced there are two different approaches.

4.1.3.1. Product A: HiPAP501 system

The HiPAP501 product comes from the High Performance Acoustic Positioning and underwater navigation system (HiPAP) family, and uses Super Short Base Line (SSBL) technology. This means that the positioning is calculated based on range and on vertical and horizontal angle measurements, from a single multi-element transducer. The system provides three-dimensional transponder positions relative to the vessel.

The total product of HiPAP501 is set up by having one transducer mounted on a hull unit that allow the transducer to be lowed some meters below the hull of the vessel. A Transceivers Unit containing transmitter, preamplifiers and beam forming electronics is

mounted close to the hull unit. The transceiver unit convert the signals from the transducer into readable data and sends it to the operations station. This is a make to order system that have several different sub suppliers.

Today KMS are developing all the products in-house, and then send out request on the parts they need. Hapro are today producing parts to the transceiver cabinet. KMS are buying the cabinet from a third supplier, and get the circuit board and the other needed electronics from Hapro, before KMS assemble cabinet. They are looking at the possibility to outsource the whole cabinet to Hapro.

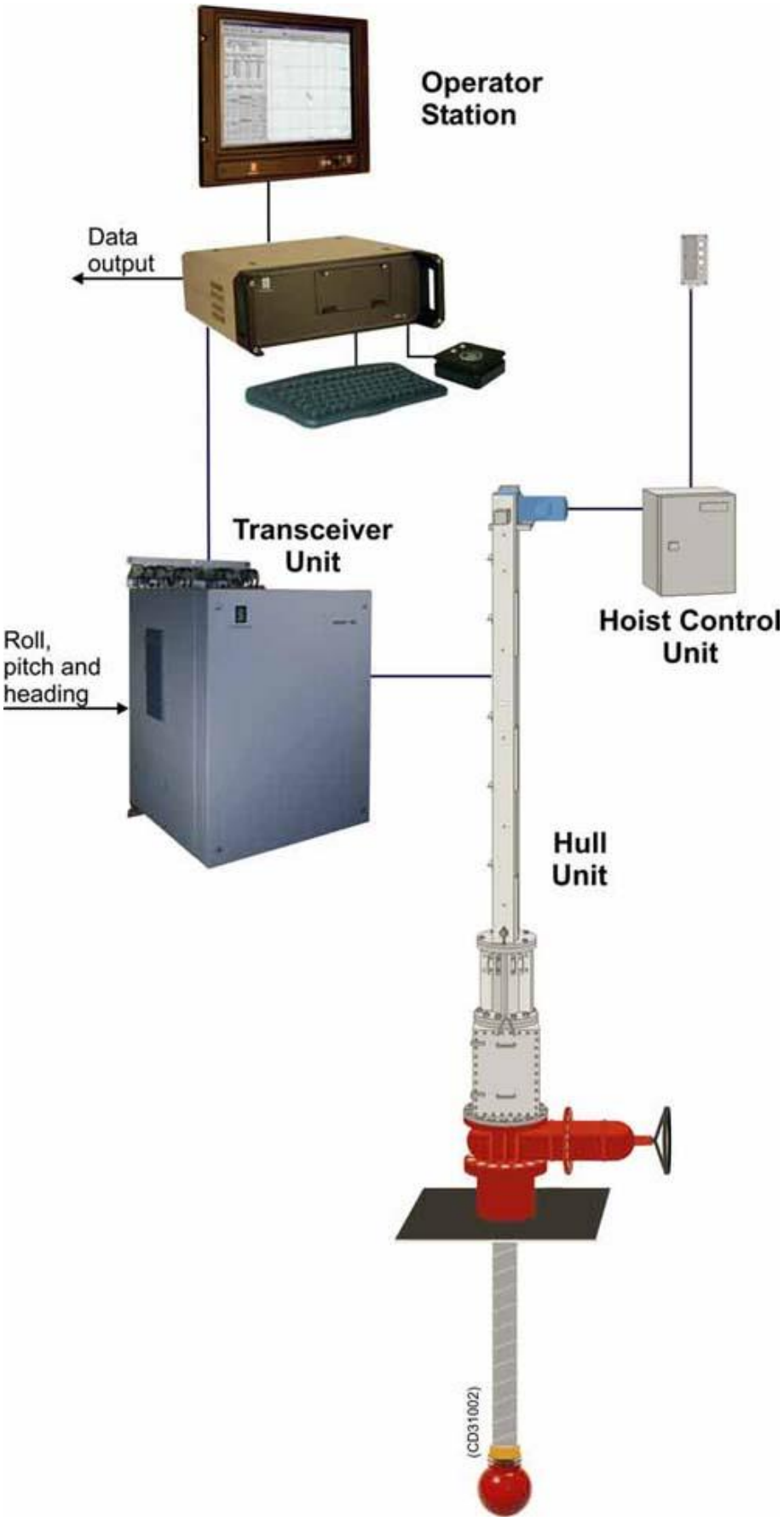

Figure 12 HiPAP 501 system

4.1.3.2. Product B: ES10 and ES12

ES 10 and ES12 are simpler sensor product that sells in high volume. A Spanish company mount the sensors on flowing devices, and deploy them out in the sea. The sensor register all subsea movement underneath where it is diploid. Combined with large volume of other sensors, it is possible to monitored movements over large areas. The movements they are looking for is the movement of fish steams. This give a possibility to sell this information to fishers, so they can be able to know where to fish.

Today KMS are producing the total product. The product is develop and originally produced by KMS. Do to problems with having the capacity in order to produce the needed volume; KMS moved the manufacturing of the transducer (ES10) over to Hapro. This is an unusual situation for KMS, because transducer-technology is considered as core competence.

4.2. Research findings

Both the buyer KMS and the supplier Hapro were interviewed and questioned about several different areas of the problems related to supplier involvement and product development. Both the interview guides and the interviews are in appendix .

Table 7 Interview records

Interview Participants	**Participant's role and position in the company**
Kongsberg Maritime Subsea	
Participant 1	Project Manager
Participant 2	Supply Chain Quality Manager
Hapro	
Participant 1	Project Manager SoundChain at Hapro
Participant 2	Key Account Manager Offshore/Subsea

Development ant collaboration today.

Today Hapro is not taking part in any development activity of new product together with KMS. The development start with KMS make a process maps of the needed products, were all the part of production testing are connected. Do to competition and price differences in the market of suppliers, many of the suppliers are not determine at this point. KMS sends out an request for the needed product/part to their suppliers, and the suppliers come with an offer on the delivery. Depending on KMSs classification on the suppliers and the offer they produce, supplier with the best overall offer gets the job. Hapro as a supplier see the product at KMS, make some assumptions on the product. If they win the production, they uses the production documentation from KMS. The production documentations can be problematic. Sometimes the documentation is not sufficient, and Hapro needs to find solution of certain specifications or problems connected to production of the product. This is not always easy to do before they are having the product in their hands. Only small changes or adjustments is done at Hapro, after the product is developed and set in production. If changes are made it is followed by extensive testing and validation from KMS, which can be a time consuming process.

Information exchanges

The firm are having continuously meetings on a weekly basis, both internally and together. Here they evaluate the collaboration, take on problems and gets up to date on changes and delivery performance. This system works well.

Quality documentations

Both companies have general focus on quality in their product and processes. However there are often situation where KMS not deliver sufficient production documentation and Hapro needs to develop their own production documentation in addition to the one they gets from KMS.

When asked, what the biggest problems for fast an efficient development and production is today. The participant from Hapro and KMS gave the following answers:

Hapro:

Internal:

- To find god suppliers for some of the components that are requested from KMS. They use much time on finding suppliers. Especially they have problems with some of their suppliers of mechanical part. They need to construct and manufacture the component after we got the job from KMS, this take time, and are often delayed do to problems with the first parts.
- To have all needed production documentation and specifics ready in time when we start the production.

With buyer:

- To be a part of the development of the products, in order to have some knowledge of the challenges connected with the product before they sit with the product in their hands.

KMS:

Internal:

- Need to leave room in the production to development testing. Today there is to little time set aside to internal testing and often down prioritised by other projects.
- Needs to focus on the things that are needed. To much other stuff is developed, that there is no direct need for in the market.
- Have to be on time.
- Get an overall structure on how to develop product. Now all department are doing it differently, and the supply chain department struggles to coordinate all the different needs connected to that.

With suppliers:

- Involve core suppliers,
- Outsource the production documentation (blue ocean for Hapro)
- Develop a close relationship with suppliers, where supplier have responsibility to come up with changes, and do the needed development. KMS needs only to approve the changes/developments.

What is the reason that Hapro is good today?

Hapro:

- Hapro is flexible, adaptable, and quality minded. They are good at prioritise and have been through the years willing to do investment in order to have the best equipment, needed.

KMS:

- KMS have been in the market for a long time, have both experience and history.
- Customer focus. The costumer gets always sufficient attentions.
- God products, in form on the technology.

4.3. Summary of the empirical part

In this chapter the SoundChain project have been presented together with the two companies that take part of the project, KMS and Hapro. The products that are looked at in the project have been introduced before the findings of the interviews have been presented. Through the documents and interview from both Hapro and KMS, information's about the collaborations and the processes connected with development of new product have been examined.

There is clear agreement from both companies that supplier involvement in the development of new products can make the collaboration more streamlined, reduce the ramp-up time, and make better products. However, there are still barriers to overcome in order to have the needed involvement.

In the next chapter, the findings from this chapter will be compared and discussed with the findings form the literature.

Chapter 5. Discussion

In the two previous chapters, the findings from the theoretical and empirical parts are described. In this chapter, these findings will be compared and discussed.

Product development

The process of product development at KMS is close connected with internal development and also supply chain management, where focus is can be directed on the need of outsourcing on many of their product. Outsourcing of knowledge is also something that is named in the literature as possibility (Ragatz et al., 2002). By outsource some of the development, and improvement on existing products to suppliers, KMS can focus more on the development of new core products.

Involvement of supplier

While there is support from the literature that supplier involvement in product development will have a positive effect on the outcome of the development process in terms of faster development, more efficient production processes, higher quality and manufacturability of the product. There is different views on the timing of the involvement. Hapro do not want to put a lot of effort and all their good ideas in the product development if the production in the end will happened at their competitor.

KMS are also concerned with the early involvement if thy find out later in the development that Hapro not is the best supplier after RFQ testing of possible suppliers.

KMS tells that the product they are buying from Hapro have shifted from complex and advanced circuit board product towards a more standard electronic products, that open for competitors with lower productions cost. At the same time, they are phasing out production of transducers to Hapro, which they consider as core competence.

Hapro and KMS are both aware that early involvement will be beneficial for both firms in terms of development speed and better solutions on the total product. However there are still problems connected to agreement on how to organize the involvement.

The differentiation between the soft and hard capabilities by Wagner and Hoegl (2006) are interesting in order to see what is needed to have a successful involvement of suppliers. He argue that the soft capabilities are difficult to measure, and that this can make the selection of supplier hard. In the case of Hapro and KMS, KMS have already selected Hapro as their supplier, and are now looking at ways to make the involvement successful. The soft criteria's can therefore bee used as a guideline to what is needed. However some of the criteria's can be hard to developed unless there is a clear understanding from both companies the importance of the collaboration

Level of responsibility

The way the development is done today, Hapro can be put into the "white box" supplier by using the types of development by Handfield et al. (1999). Hapro produces after the design KMS have produced. If needed KMS consults Hapro in eventual changes or adjustments. Both firms want to move toward a "grey box" supplier where the involvement is performed as a common joint development with KMS and Hapro.

There is still some cases where Hapro can be looked at as a possible "black box" supplier. From the literature black box development have been proven very effective in term of development time and quality when used right. However this inquires a large amount of trust from KMS perspective. Since Hapro is only a component supplier, it may also be technological knowledge or other barriers that can be in the way of this.

Concurrent engineering:

As seen in the literature on 3D concurrent engineering (Fine, 1998). The product, process and the supply chain are all three areas where early involvement of suppliers in the development process can contribute. Hapro and KMS are both pointing at all three of the dimensions in the possible advantages of early involvement in the development.

Product: By being involved in the design phase: The development team with specific knowledge of manufacturing and technology can detect possible problems before they occur, and make solutions that will make the product easier, faster and more efficient to manufacture, without losing any of the quality or

Process: By being involved in the design phase, the manufacturing company can start testing and validations of their production line simultaneously with the development, by having the needed information on the product. Hapro addresses this as one of the main problems for shorter ramp-up time on new products in the future. They say they have little knowledge of the product until they have it in their hands.
Supply chain: By being involved in the design phase, the supplier can earlier find suitable sub suppliers for the products. Hapro mentions challenges connected with suppliers of mechanical parts. That the requirements are high from KMS, and that it takes time to find suppliers that can produce the part with the needed specification.

There is general mentioned by the literature that the development of collaboration and linkage with the firms are costly and demanding. In the case of KMS and Hapro, they are already working close together and have routines on communications, feedback and problem solving.

5.1.1. Challenges connected to supplier involvement

KMS do not want to bind themselves to one supplier for production of the needed part in the design stage. For electronics, they have 3 main companies that can deliver the products, and they want to see which one that comes up with the best offer on the products specification. There is support for this concern in the literature, Eisenhardt and Tabrizi (1995) suggest that early involvement may be difficult to achieve because there is less certainty about which supplier will be used. This problem is mention this as one most common barriers connected to involvement of suppliers from the literature "In some instances, the company is still playing suppliers off against one another in the design process in order to extract more favourable terms" (McIvor and Humphreys, 2004).

Hapro is aware of this, and is not interested in contribute with knowledge, expertise and their ideas in products if they end up with not getting the production. The usual concern is that the proprietary information may be revealed, intentionally or unintentionally, to competitors (Ragatz et al., 1997).

Other challenges:

- KM internally needs time and space in their own production in order to test products that are in the development.
- KMS internally, struggle with a lack of structure between their own department, that cases trouble for the supply management department, which are cover all the other departments.
    - Introducing a common platform in the way to do business.

- Hapro struggle with finding suppliers for some of the prats they need in order to product the promised product to Hapro. This can take some time due to technical difficulty and high tolerances.

    - By thinking manufacturing in the development, some of this problems can be solved.
    - KMS addressed that engineers in some situations make to small tolerances on products, in order to be sure of the functionality. This bay lead to problems for the suppliers, while other options are better suited in order to make the product manufactured.

5.1.2. Possible solutions in SoundChain

As seen in the previous sections, there is some challenges connected to the involvement. In this section, some suggestions for solutions will be presented.

Payment for the contribution of development can be an alternative to the supplier.
By looking at the development process as a separate service, Hapro can take part in the development with their knowledge and get payed for it.
This way KMS can have the same process for supplier selection as of today, since the development is done as a separate activity. By being a part of the development process

Hapro would have an advantages of detailed knowledge about the product, that can make them better suited the other suppliers to win the manufacturing job.

Other challenges with the collaboration

KMS think that in order to overcome future challenges and competition, Hapro need to be able to develop their processes themselves, while KMS can push the limit within their core competence such as transducer technology. KMS is technology-house while Hapro on their own can develop the needed production and improvement of the production process.

Hapro see there is needed better and more detailed productions documents for many of the products they are getting form KMS. If the documentation do not meet the needed specification, and Hapro needs to make new documentations anyway. There should be a market for delivering this type of documentations as a service for Hapro.
This is a strategic decision Hapro needs to make. From the cases study it looks like there is a need for this types of services in the market.

As shown from other industries like the Japanese automotive industry, close long-term relationship can outperform the competitors, and build a stronger competitive advantage then if the suppliers are competing internally (Wasti and Liker, 1997). A tight relationship can make barrier to other suppliers based on the uniqueness of the relationship that the two firms combined will produce more value to the product and market place then other firms will do. This can be the case of KMS and Hapro. However, there need to be clear agreements for IP, risk/reward shearing and performance measures, which can be difficult to make.

Chapter 6. Conclusion

This chapter contains the conclusions of the study. It goes thorough the findings and contributions from the different part of the study, before some future work is suggested.

Involvement of suppliers in the development of new product have showed great result in reduction of development time, cost and increased quality. This thesis investigate how companies in high-tech industries can involve suppliers in the development processes in order to reduce the ramp-up time for new products. It has been done through a literature review and a case study.

The result from this study are twofold. First, a literature study was conducted in order to identify the success criteria's for supplier involvement in new product development as stated in RQ1. The literature showed the criteria's are highly dependent on type of product, type of development and competition of suppliers. It further showed that typical success factors are the supplier's technical knowledge in the areas of involvement and the degree of supplier membership in the development projects. In addition agreed performance measures, risk/reward shearing and IP agreements can be crucial in order to overcome the barriers connected to the involvement.

The empirical research look into the dyadic relationship of KMS and Hapro and look at their challenges connected to ramp-up time on new products. It also answer the second research question, by looking at factor that can reduce the ramp-up time both internally in the companies, but also through collaboration. There is clear agreement from both companies that supplier involvement in the development of new products can make the collaboration more streamlined, reduce the ramp-up time, and make better products. However, there are still challenges to overcome in order to have the needed involvement. The challenges have been discussed and possible solution have been presented.

In other findings there has been shown alignment with the literature and the case study about some of the main barrier for involvement early in the development process. The

challenges KMS and Hapro addresses in the case study can be found in other studies, and is an area that have been looked at as difficult also in the literature.

This study has suggested some possible solution to challenges KMS and Hapro are facing when looking at supplier involvement. solve the challenge with long-term agreement between the buyer and supplier. New business areas for the suppliers as development and production documentations producers have been presented.

Further research

Do to the limited extend of the case study in this thesis; more research is needed in order to see if the findings are consistent.

There is address issues that the supplier's supplier cause delay for the new products ramp-up time. It would therefore be interesting to have broader approach on the involvement in the development. Not only look at the buyer-supplier relationship, but also include second and third tier suppliers and look at the development with a supply chain approach.

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APPENDIX A - INTERVIEW GUIDE KMS

Introduksjon
Navn:
Stilling og ansvarsområde:

Kan jeg ta opp intervjuet?
Kan jeg sende intervjuets innhold tilbake for godkjenning når etterarbeidet er ferdig?
Fortelle kort om oppgaven min, Scope og ønsket resultat.

Utviklings prosessen
Identifisere utviklings prosessen
Har dere en fast utviklings prosess?
Hvilke steg inneholder denne planen? og hva finnes av gate-check punkter?
Hva kreves av dokumentasjon for fremdrift?
I hvor stor grad brukes eksisterende produkter i utviklingen. (Videreutvikling)

Intern produksjon
I hvilken grad må nye produksjons prosesser utvikles i forbindelse med utvikling av nye produkter?
Er det alltid noen med produksjonsansvar i utviklingen?
I hvilken grad vektlegges produksjonen i utviklingen? Sammenlignet med produktet ytelse for eksempel?
Hva finnes det rutiner for videreføring av tidligere produksjon?
Hva gjøres for at produksjonen av nye produkter skal være effektive? Fleksibilitet i produksjonen, Design for manufacturing

Sourcing
Når i utviklingsprosessen og hvordan bestemmes det at deler skal gjøres av andre (make-or-buy)?
Testes eventuelle leverandørene før de får oppdraget?

Hva bestemmer hvem som skal produsere delen/delproduktet osv? Er det noen langsiktig tankegang med i prosessen?
Bruke av kjente leverandører mot eventuelle nye?

Informasjonsflyt til kjerne leverandøren
Når innlemmes leverandøren i utviklingen?
I så fall i hvilken grad bidrar leverandøren? Er det passive og svarer når de blir spurt eller aktivt med i prosessen.
Blir informasjonen påvirket av IP rettigheter?
Hva gjøre dere for å få nødvendig tilit fra kunden/KM

Kvalitets krav
Hva kreves av leverandøren? I forhold til produktet, prosesser og produksjon.
Hva kreves for at de følger standardene dere er sertifisert med?

Evaluering av samarbeidet.
Hvordan blir samarbeid evaluert.
Er det tilstrekkelig, i form av feil/ikke gunstige prosesser skjer om igjen?

Oppsummering
Hva er de største problemene for rask introduksjon av nye produkter i dag?
Hvorfor?
Hvordan kan dette løses?

Avslutting
Hva skjer videre: transkribere intervjuet, sendt tilbake for godkjenning.
Takk for deltagelsen

APPENDIX B - INTERVIEW GUIDE HAPRO

Introduksjon
Navn:
Stilling og ansvarsområde:

Kan jeg ta opp intervjuet?
Kan jeg sende intervjuets innhold tilbake for godkjenning når etterarbeidet er ferdig?
Fortelle kort om oppgaven min, Scope og ønsket resultat.

Utvikling av nye produkter
Identifisere utviklings prosessen?
Har dere en fast utviklings prosess?
Hvilke steg inneholder denne planen? og hva finnes av gate-check punkter
Hva kreves av dokumentasjon for fremdrift?
I hvor stor grad brukes eksisterende produkter i utviklingen. (Videreutvikling)
I hvilken grad brukes disse i samarbeid med KM

Intern produksjon
I hvilken grad må nye produksjons prosesser utvikles i forbindelse med utvikling av nye produkter? Eller nye oppdrag?
I hvilken grad vektlegges produksjonen i utviklingen? Sammenlignet med produktet ytelse for eksempel?
Er det alltid noen med produksjonsansvar i utviklingen?
Finnes det rutiner for videreføring av tidligere produksjon?
Hva gjøres for at produksjonen av nye produkter skal være effektive? Fleksibilitet i produksjonen. (står kort om det på hjemmesiden)

I forbindelse med KMs sine utviklinger
Til hvilken grad blir dere innlemmet i utviklingsprosessen?
Når i prosessen blir dere med?
Hva skal til for at dere får oppdraget? Er det noen usikkerheter rundt tildelingen.

Bruke av kjente leverandører mot eventuelle nye?

Informasjonsflyt med KMS

Når innlemmes dere i utviklingen?

I så fall i hvilken grad bidrar leverandøren? Er det passive og svarer når de blir spurt eller aktivt med i prosessen.

Blir informasjonen påvirket av IP rettigheter?

Hva gjøre dere for å få nødvendig tilit fra kunden/KM

Kvalitets krav

Hva stilles av krav fra KMS? I forhold til produktet, prosesser og produksjon.

Hvordan samsvarer disse med deres egne krav.

Hva kreves for at dere følger standardene dere er sertifisert med,

Evaluering av samarbeidet

Hvordan blir samarbeid evaluert, internt og sammen med KMS?

Er det tilstrekkelig, i form av feil/ikke gunstige prosesser skjer om igjen?

Oppsummering

Hva er de største problemene for rask introduksjon av nye produkter i dag?

Hvorfor?

Hvordan kan dette løses?

Avslutting

Hva skjer videre: transkribere intervjuet, sendt tilbake for godkjenning.

Takk for deltagelsen

APPENDIX C – INTERVIEW 1 KMS

Onsdag 20. mai

Project manager hos Kongsberg Maritime Subsea

Arbeidsoppgaver:

Oppfølgings ansvar for alt av ekkolodd til fiskeri. Er med på utviklingen av nye svingere og er med å løser dag til dag problemer på eksisterende produkter og kunder.

Sitter i fiskeriavdelingen.

Kort introduksjon

Når dere utvikler produkter internt og sammen med andre. Har dere en fast plan eller konkrete steg dere skal igjennom.

Det har vi. Fiskeri avdelingen lager produkter hvor svingeren inngår, teknologiavdelingen er avdelingen hvor selve svingeren blir utviklet. Det er de som sitter på rutinene på hvordan det skal gjøres, når det gjelder utvikling.

Har dere felles prosesser i forhold til gate-check punkter og hva hvert steg inneholde i en utviklings fase. Er det felles for hele KMS?

Det skal være felles for hele KMS ja.

Overordnet, hvilke faser er det?

Net fokus er på den såkalte fase 2 rapport, Prosjektbeskrivelsen. Første utkast til en spesifikasjons. Det finnes også en fase 1 rapport som er mer en konsept studie. Den pleier sjelden formaliseres for når det kommer så langt at det skal utvikles et nytt produkt, så er det gjennomgått en prosess allerede uten at den er formalisert. Derfor går man rett på fase 2.

For videre fremdrift. Hva er det som kreves av dokumentasjon ved disse fasene? Har dere noen faste krav for hva som kreves av dokumentasjon?

Ja det har vi, men der bør du heller prate med de som kjører de prosjektene. Teknologi avdelingen

Hvor mye innlemmes produksjonen inn i utviklingsprosessen? I forhold til at produktene skal produseres på en rask og effektiv måte?

Alle de ulike avdelingene i produksjonen er med i løpet av utviklingstiden i vært fall. Før prosjektet skal avsluttes må produserbarheten være godkjent av produksjonen.

Hele utviklingsprosessen går jo i hovedsak ut på å lage dokumentasjon.

Produksjonsunderlaget er resultatet av prosjektet.

I hvor stor grad bruker dere videre føring av eksisterende produkter i utviklingen? Videre føring?

I veldig stor grad. Både gjenbruk av utstyring, men også av design og kunnskap.

Eco loddene og svingerene som brukes til fiskeri er veldig like.

Gjelder dette også produksjonsprosessene?

Dette gjelder også produksjonen ja, da det ikke er mange varianter å produsere det på.

Når i utviklingsprosessen er bestemmes det om dere skal gjøre jobben selv eller om noen andre skal gjøre det? Make-or-buy valg.

Når det gjelder transdusere/svingere så lages det alltid alt internt. Det er kun dette ene tilfelle hvor Hapro fikk produksjon siden volumet ble så stort.

Transdusere blir sett på som kjerne teknologi så det blir aldri stil spørsmål om det skal gjøres av noen andre.

Hvordan gjør dere da med informasjons overføring til Hapro? Ved overføringen

Det var jo en del av utfordringen der, siden dette aldri har blitt satt ut før. Det var en del ting som ikke ble tenkt godt nok igjennom i forkant. Det ble nok en bratt læringskurve for Hapro også, som måtte tilegne seg en viss kunnskap om Hydroakustikk, for å skjønne flere av tingene som taes for gitt ved KMS.

Da var produktet modent og det var ikke noe utvikling som ble gjort med Hapro. Det var kun produksjonsmessig?

Ja

Finnes det generelle retningslinjer for avtaler av IP-rettigheter?

Har kun være med å inngå sånne avtaler case by case, der det har vært behov for det.

Signerte NDA avtaler, men vet ikke om det er noen generelle retningslinjer.

Når dere satt ut produksjonen til Hapro, Hva hadde dere av krav til kvalitet fra dem?

Det vet jeg ikke da jeg ikke var med på selve prosessen.

Prosessen ble kjørt litt rart. Vi som satt på fiskeri avdelingen ble i veldig liten grad involvert.

Hva finnes av krav til kvalitet for produkter og prosesser internt?

Stort apparat av prosess beskrivelser og prosedyrer, kvalitet er veldig i fokus

Gjøres det noe ekstra for å følge sertifiserings standarder?

På svinger utvikling har vi kvalifikasjons programmer som kjøres. Det er ikke noen standard-tester som dekker kvalifikasjonene av transduserer. Så der gjøres det en ganske omfattende miljøtesting. Avhengig av bruksområdet for den aktuelle transduseren. Ting som står montert

under båt for eksempel vil bli kjørt kraftige sjokk tester på, da de som bli stående å slå i stampesjø.

Samarbeidet med Hapro, hvordan blir det samarbeidet evaluert?

Vet ikke hvordan samarbeid med Hapro har blitt evaluert i forbindelse med jeg var mindre med i prosessen. Jeg var med på kjøre en rekke kvalifiseringer på noen transdusere siden de byttet et støpe materiale. Men jeg vet ikke hvordan det er blitt gjort. Samarbeidet med Hapro ligger under Supply Chain, produksjons avdelingen. I og med at produktet var modent var det de som hadde ansvaret for å produsere og sette ut produksjonen og den evalueringen er gjort der.

Hva anser du som det største problemet i dag for å nye produkter raskt ut i markedet?

Et problem er å få tilgang i produksjonsressurser i utviklingstiden kan være et problem. Det er støy i forhold til normal produksjonen. Og leveranser til kunder bli alltid prioritert foran internt styrte prosjekter. Det fører ofte til forsinkelser.

Noen ideer på hvordan dette kan løses?

Man må sette av tid. Sette av for eksempel 10% av produksjonskapasiteten til å håndtere prosjekter. Estimere i produksjonen med prosjektutvikling også og ikke bare produksjon. Sette av ressurser til utvikling i parallell, ikke bare vanlig produksjon.

Det blir ikke satt av noe tid i produksjonen for testing i forbindelse med utvikling?

Nei ikke nok. Og om det er satt av så er det lett for at det havner bakerst i prioriteringskøen bak leveransen til eksterne kunder.

En annen måte å gjøre det på er å sette opp dedikerte mennesker som kun eller primært skal jobbe med utvikling.

I produksjonen er arbeiderene ikke allokert til prosjekter i det hele tatt. Hoved oppgaven er løpende produksjon. Så hvis det kommer til prosjekt relaterte oppgaver er det mer eller mindre tilfeldig hvordan man blir dratt inn.

Hva tror du er nøkkelen til at dere er gode.

Det er nok en kombinasjon av flere ting. Vi har vært med lenge i de markedene vi er. Historikk er viktig. Og kundeoppfølging er viktig. Kunden får alltid stor oppmerksomhet.

Er det kunderelasjonene som gjør at de ønsker å bruke dere som leverandør?

Ja jeg tror det er det aller viktigste, vertfall i fiskeriavdelingen.

I tillegg til at produktene er gode, selvfølgelig. Vi er langt fremme på teknologien.

Avslutting.

APPENDIX D – INTERVIEW 2 KMS

Torsdag 21.mai

Supply chain quality manager hos Kongsberg Maritime Subsea

Arbeidsoppgaver:

Faktisk produktkvalitet. Det kunden opplever I forbindelse med produktet.

Ikke noe med ISO sertifisering, men alt som har med test av produksjonsutstyr, underlag, sikring av at leverandørene levere det de skal.

Kort introduksjon

KMS jobber mye med utvilkling.

Vi er mer et teknologi hus enn en produksjonsbedrift.

Har dere noen klare utviklings prosesser som dere følger?

Ja, det har vi jo. Men følger vi dem?

Vi har en prosess som vi kaller IPD (Intergrated product development) der KMS har 5 hovedprosesser. Hvor alle hovedprosessene skal være med i de forskjellige fasene av et utviklingsprosjekt for å sikre at alle hensyn blir tatt i utvikling av et nytt produkt.

Så min rolle i utviklingsprosjekter er at jeg er koblingspunktet mot Supply chain. Det er jeg som plukker ut de folka fra supply chain for å supportere det prosjektet ønsker.

Er det noen faste gate-check punkter dere har i de forskjellige fasene og overgangene mellom dem, som krever en viss dokumentasjon for å gå videre i de forskjellige fasene?

Det burde hvert

Blir ikke gjort.

På overskrift nivå. Det er en del formelle ting, men det er ikke systematisert godt nok. Det er på noen prosjekter, men det er veldig individuelt i forhold til prosjektlederen. Jeg føler at det er en av de tingene vi må bli bedre på og det er også en av tingene som det er kartlagt at vi skal bli bedre på.

Hva er grunnen til at det ikke blir fulgt opp?

Dette blir veldig min mening, men det jeg tror:

Vi er et hus som er satt sammen av flere bedrifter som er kjøpt opp, integrert, co-operert og osv. Så alle er litt verdensmestere og gjør det på sin måte fordi alle er unike. Også blir vi kanskje ikke så unike allikevel. Men nå tvinger det seg litt mer frem, fordi vi har en felles

teknologiavdeling som lager basis moduler som nå blir brukt i alle de andre avdelingene. Disse avdelingene lager da systemer av basis modulene. Så nå blir det mere likt og da tvinger det seg fram for å få effektiv produksjon og test osv. Også kunne bli mer like når produktene består av de sammen basismodulene

Det tvinger seg frem. Dette er også noe med kompetanse heving og utnyttelse av ressurser og hele bøtte balletten. Så det bunner ut i at vi er nødt til å få til en bedre IPD prosjektstyring. Og da er det gating og sånt for å være sikker på at vi har nådd prosjektenes milepeler.

Jeg vil jo tro at eksisterende produkter er sentralt i utviklingen av nye?

Eksisterende produkter, de er jo der, men Igjen med oss så er vi de dyreste.

Vi er nødt til å ligge i front. Norge er ikke noe lavkost land. Vi kan derfor ikke kopiere noen løsninger og tro at vi skal slå ut andre på pris, så vi må være de som baner vei. Så gamle produkter er et godt utgangspunkt for hvor vi skal gå videre.

Har dere et system for videre utvikling av eksisterende produkter, eller kommer det an på produktet?

Det kommer veldig an på. Sånn som vi jobber er at produkt sjefens hovedjobb er å følge med på markedet og snakke med brukeren og finne ut av behovet til kunden/brukeren. Og det kan i noen tilfeller kan det vært små ting. Modifisere et eksisterende produkt, legge til ny funksjonalitet. Eller det kan være helt nye produkter i nye markeder hvor vi ikke har jobbet før. Og kartlegge hva er det som finner i dag, har vi noe mulighet til å gå inn å lage butikk. Eller så kan det være nye generasjoner, produkter som har utlevd sin levetid fordi det har kommet ny teknologi. Vi har jo hatt en kjempe utvikling på batterier for eksempel. Gått fra Nikkel metall dritt osv. Og når kommer Litium som har helt andre egenskaper.

Dette gjør at teknikken rundt dem også kapsling og ladeteknologi. Altså en liten endring som gjør at kunden opplever en mye lengere levetid på produktet, gjør at vi må gjøre masse tilpasninger. Så produktet kan være ganske likt, men ytelsen på batterilevetiden har blitt lengere. Dette har det medført en masse sertifiseringer og greier for vår del.

I hvor stor grad er produksjonen med i utviklingsprosessen av nye produkter?

Det kommer an på. Hvis vi ser på et helt nytt produkt som også har svinger. Vi har bare en produksjons avdeling som lager svingere, der er det veldig spesialiserte maskiner. Så når vi lager prototyper, de aller første. Så blir de laget i svinger produksjonen. Fordi vi har ikke noe annet sted å lage det. Vi kan ikke gå ut å lage det. Det er dyre maskiner, det er mye miljøkrav i forhold til ventilering, det er mye miljøkrav og forskjellig. De blir derfor produsert i linja av de som til syvende og sist skal produsere produktet.

I hvor stor grad tar dere hensyn til produksjonsvennlighet på de delene som ikke lages in-house i utviklingsprosessen?

I forbindelse med IPD prosessen. Så tegner vi prosessflyten. Da sitter jeg sammen med Strategisk sourcing hos oss. Og så ser vi på hvordan kan vi dele det opp i forhold til hva som er hensiktsmessig for flyten. Vi bruker en styringsmodell, det er mer en prosessflyt. Jeg bruker visual value mapping med de tegnene for å tegne det opp. Og da tegner jeg prosessflyten, og leverandører. Da står det jo ikke navn på leverandørene til å begynne med, men vi trenger en leverandør av ditt og datt og dette skal sette sammen et sted og vi skal ha det inn til oss på det nivået ferdig testet. Så her trenger vi en test, her trenger vi en test. Dette bruker vi som et styringsdokumentet for hvordan vi jobber videre med utviklingen og strukturen på produktet. Sånn er det vi jobber når det fungerer

Når velger dere hvem leverandørene som får jobben?

Det kommer an på. Det er jo en del av SoundChain prosjektet. Hver gang du snakker med en leverandør så ønsker jo de å være veldig tidlig inn i fasen, og det er jo fint. Men hva om vi kjører en RFQ runde med de senere og det viser seg at de er dyrest. Og da får de ikke jobben. Så hvilken gevinst har leverandøren av å være med i utviklingsfasen og hva skal vi gjøre for å trigge de til å være med i utviklings fasen. Dette er jo et av de spørsmålene som kommer opp spesifikt i SoundChain prosjektet. Hvorfor skal de ville være med i utviklingsfasen hvis de taper tilbud etter tilbud etter å ha brukt masse ressurser på gjøre produktet produksjonsvennlig.

For dere har en rekke leverandører å velge på disse produktene?

Ja, standard elektronikkproduksjon kan jo gjøres av mange.

Vi har gått fra å ha veldig komplekse elektronikk-kort til å ha veldig enkle. Vi har hatt fokus på å gjøre det enkelt for å kunne velge leverandører. Så vi kan i prinsippet til en «kina-bedrift» men på grunn av IP så velger vi å ikke gjøre det. Og da er spørsmålet: kan vi bruke «østblokkland» er det greit? Kan vi bruke Svensker, er det greit? Denne IP diskusjonen er jo stadig oppe, rundt hva er det som er greit og hva er ikke. Dette jobbes det også med i forbindelse med SoundChain prosjektet.

Ser dere på dette fra case til case eller ser dere også på det i forhold til langsiktighet?

Vi har en liste over leverandører der vi har delt inn 4 nivåer basert på 11 kriterier som gjør at du havner på et visst nivå. Og inne hvert segment så har vi et antall leverandører. Sånn som på elektronikk i Norge, så har vi stort sett Norautron, Hapro og Nektro. Men så kanskje vi skal bytte ut en av dem fordi vi ikke er fornøyde med kvaliteten, eller hver gnag vi kjører en RFQ er de alltid dyrest, eller at de ikke tilfredsstiller kvalitetskravene våre. Vi har litt sånne krav til

dem med målinger, med lean implementasjon med sånne Supply Quality manual som setter krav. Og hvis de ikke følger opp de så får de da dårligere bedømmelse. Vi har et Seal dokument som beskriver vår bedømming av den leverandøren. Så når vi kjører ne Edit eller de kjører en self-assessment Edit og ikke scorer godt nok og ikke gjøre noe tiltak for å forbedre seg så får de en rød score. Og det er et flagg som gjør at vi skal kanskje gjøre noe med den leverandøren.

Dette er en kontinuerlig prosess som dere gir tilbakemelding til leverandøren hele tiden på hvordan de ligger an?

Det er det vi jobber med ja. Dette er jo ting vi begynt med nå de siste to-tre årene. Og vi ønsker jo å ha verktøy for dette. Vi har ikke noe god EDI (electronic data interchange) løsninger. Det er mye nytt her i forhold til kommunikasjon med leverandører. Vi har vært dårlige til å utvikle leverandører. Vi har aldri satt noen krav til leverandørene og det har gjort at leverandørene ikke har utviklet seg. Jeg mener vi har vært en av hoved årsaken til at leverandørene rundt oss ikke er en av verdens beste. Hadde vi satt krav hadde de måtte strekke seg, men når vi ikke setter krav så gjør de jo ikke noe.

Så nå setter vi krav og nå gjør de noe. Vi merker respons med en gang, så det går rette veien.

Er dette krav for de forskjellige standardene dere bruker av kvalitetsstempling av produktene. Eller går det utenom det?

Vi har noe som heter Supplier Quality Manual. I den står det ikke bare kvalitetskrav, det står om leverings presisjon, det står om at vi har ønske om kost reduksjonsprogrammer. Det står litt av vert?

Har du sett den`? Det er jo bare en av vurderingene, men er et godt utgangspunkt.

Nei, har ikke sett den. Er det samme vurdering på alle leverandørene? Eller graderes det?

Vi har nå fokus på 50 leverandører. De utgjør ca. 80% av våre innkjøp.

**Henviser til Supply quality manualen.. **

Hva tror du er det største problemet for rask introduksjon for nye produkter i dag, hos KMS?

Mener du i samarbeid med leverandøren eller internt i KMS?

Begge dele, så du må gjerne svare på begge dele

I forhold til samarbeid med leverandør tror jeg ikke vi kommer til å få dette til før vi har fått kartlagt en del ting for jeg stiller spørsmål ved en del ting.

Sånn som Hapro da:

Vi leverte opp et produkt der som ikke hadde underlag, eller postit-grunnlag som jeg kaller det. For det hastet veldig. Også lagde Hapro et underlag for å produsere det, også produserte de enheten. Jeg fikk bare greie på tilfeldig at de hadde laget et underlag. Og hvorfor i alle

dager tilbyr ikke de seg å gjør den jobben. Da det tydeligvis er et behov vi som kunde har. Da kunne de tatt betalt for den jobben. Da har de en egenskap som vi ikke får hvis vi går til Kina for eksempel. For jeg mener det at hvis du skal ha en norsk produsent, som er dyrere enn utlandet. Så må det være grunner til at vi velger det. IP er den som alle lener seg på. Og kvalitet blir mindre og mindre siden kortene vi lager er lettere og lettere å lage. Så tror jeg at kvalitetsbiten blir mindre og mindre. Det er mer og mer som går i maskin. De har sammen maskinene i Kina som de har i Norge. Og da er det andre ting de må vær gode på. Da må det for eksempel være testutvikling, tilrettelegging for produksjon, være med i prosjekter. Da tror jeg det å ha en samarbeidspartner i lavkost land som gjøre at for eksempel Hapro kunne vært med på et utviklingsprosjekt tidlig kunne de sagt det at de forplikter seg til en pris som er sånn og sånn. Og vi forplikter oss til et tiår løp der det skal være en kost reduksjon på x antall prosent.

Også må Hapro da jobbe med å finne leverandører, komme med forbedringsforslag og til og med ha compabilitet og kapasitet til å gjøre endringene så vi kan bare godkjenne det. For vi er et teknologi hus, som hele tinden må ligge i front å lage det nyeste, nyeste, nyeste. Og hvis vi da kunne hatt en samarbeids partner som kanskje kunne vedlikeholdt det vi har i dag, så kanskje det er noe for norsk industri.

Internt da, har dere noe forbedringspotensialet?

Ja og det er sånn som du pirket borti sted. Forsikre oss at prosjektene er on-time. Vi skal utvikle det vi skal utvikle ikke alt mulig annet. Ikke sånn kjekt å ha, men det som er kundeverdi. Hele tiden ha fokus på det vi skal gjøre. Og få struktur på det så det er likt. Vi har 4 forskjellige enheter her og de jobber litt forskjellig. Og det er vanskelig for et felles apparat som supply chain, som egentlig er en avdeling som skal supportere alle: Det blir da vanskelig for oss. Vi må være litt kameleon. Vi må tilpasse oss avdelinger hele tiden. Det er vanskelig. Da er det også vanskelig å få stornytt av volum som det egentlig burde bli av disse basis modulene. Fordi det er litt forskjellig her og litt forskjellig der, så blir det unike ting allikevel. Også må vi gjøre krav til mekaniske biter reelle. Vi har en del kra som er veldig strenge. Og det er kanskje fornuftig at de er strenge også, men i enkelttilfeller er de veldig strenge uten at de trenger å være strenge. For i det man setter veldig strenge toleranser, settes det veldig store begrensinger til leverandør valg, som igjen gjør at kosten stiger.

Er det fordi at dere ønsker at produktet skal ha en viss kvalitet eller er det for å nå kvalitets sertifiseringer som må til på produktene?

Det er fordi konstruktøren skal være sikker. På overskrift nivå. Du har rett i de to andre tilfellene der også, men i enkelte tilfelle er det bare for at konstruktøren skal være helt sikker

på at de to bitene skal passe sammen helt tight. Og hvis de er helt sånn, så er han garantert på at de aldri vil lekke vann for eksempel. Men jeg kan også garantere at du finner ikke en leverandører som klarer å levere det. Det er så må toleranser at bare en temperaturendring gjør at godset endrer seg i fysisk størrelse og da er du allerede på utsiden av marginene. Og da bruker vi veldig mye ressurser på å finne leverandører som klarere å produserer dette, da blir det dyrt. Når det kunne være gjort veldig enkelt og mye mye billigere og mye mer effektivt.

Avslutting

APPENDIX E – INTERVIEW 1 HAPRO

Tirsdag 2.juni

Prosjekt leder for SoundChain hos Hapro.

Arbeidsoppgaver:

Organisatorisk ansvar for prosjektet internt hos Hapro, og være bindeleddet mot KMS

Kort om SoundChain

SoundChain prosjektet har ikke kommet skikkelig i gang enda.

Vi har et annet prosjekt gående mot KMS som er et rent Lean prosjekt, og disse prosjektene går litt i hverandre så har ikke helt klart hvor vi havner hen på SoundChain prosjketet.

Kort intro.

Hva gjøres av Intern utvikling frem mot et tilbud?

Da må jo vi se på det underlaget vi får i fra KMS. Vi har jo en nyproduksjonsavdeling, NPI som jobber med utviklingen. Men når det gjelder KMS så kjenner jeg ikke helt til hvordan det gjøres, men inntrykket er jo at vi gir et tilbud, men vi gjøre ikke noe med produktet her noe særlig. Vi ser på det nede hos KMS, også lager vi noen anslag i forhold til det. Også må vi forholde oss til det produksjonsgrunnlaget vi får ifra KMS

For de leverer alltid produksjonsgrunnlag som er detaljert nok at dere kan sette det rett i produksjonen?

Det er jo noe av det som er utfordringene og som sikkert er noe av grunnlaget for SoundChain prosjektet. Så vi har en del utfordringer med det. Det kan være manglende produksjons grunnlag, at vi må finn ut en del sjøl. Og det er ikke alltid sånn at vi ser eller vet det før vi har fått produktet og sitter med det i hånden.

Hva har dere av krav for dokumentasjon for fremdriften dere gjør i forbindelse med et sånn tilbud?

Nå er du inne på deler av produksjonen som jeg ikke har så god kjennskap til.

Hvis du skal ha mer om hva som skjer i tidlig fase og anbud og overføring og sånn, så tror jeg at det er andre du bør prate med.

Hvordan er Samarbeidet deres med deres underleverandører i forhold til når dere produserer et tilbud? Hvor god tid har dere på å sette samme nødvendig kontakt med underleverandører før et tilbud skal leveres?

Veldig godt spørsmål som jeg ikke tør å svare på det heller. For det kjenner jeg ikke til Dette høres ut som et Marked spørsmål.

Jeg har inntrykket at dere er en produksjonsbedrift som er gode på rask produksjon og utvikling av rask produksjonsteknikk. Det står på hjemme siden dere at dere er gode på å være fleksible i produksjonsprosessen.

I hvilken grad må dere endre produksjons prosesser i forhold til produkter dere skal produsere prosesser, i for hold til ny kunder/nye produkter?

Det gjør vi fortløpende og det har jo vært ganske mye av det i forhold til KMS så har vi tilnærmet oss mye. Vi har jo måtte tilegne oss mye kunnskap i forhold til fylling eller topping som vi kaller det. Og dette mer mekatronikk. Vi har jo hatt kunnskapen, men vi har ikke hatt så mye produksjon av det. Så vi har måtte tilpasse oss der.

Har dere noe å si i utviklingen hos KM som gjør at dere kan få en rask produksjon. Eller må dere til rette dere sånn produktet kommer fra KM?

Nei, i første omgang så må vi prøve å produsere det sånn KMS vil ha det, og det er her dette prosjektet (SoundChain) kommer inn. At vi må kommunisere toveis med KMS, sånn at våre forbedringsforslag og endringsforslag kommer frem, og at vi har en dialog rundt det. Dette er jo en av tingene vi ser på i prosjektet, fordi KMS ser jo og vet jo at sånn de har produsert det eller har tenkt å produsere ikke alltid er den beste måten. Vi kommer jo opp med mange og har masse utfordringer som vi har løsningsforslag på. Så vi er jo i løpene dialog med KM rundet det.

Hva er hindrene for denne prosessen?

Nei det er ikke verre eller større hindringer rundt det enn at alt som har med endringer å gjøre. Det er ikke alltid det er like lett å få til ut ifra hva vi ønsker i forhold til hva KMS krever. For eksempel å bytte limtype, eller bytte materiale som de har satt i speck'en sin også ønsker vi å gjøre endringer der for å kunne produsere fortere eller billigere. Da må jo det igjennom en godkjenning hos KMS, og det kan ta noe tid. Men det er nå sånn det er.

Det jobber vi med å få til en raskere takt på det sånn at quick-fikser, kanskje ikke behøve å ta så lang tid. Men vi har jo en løpende dialog på det og føler at vi har en ganske god dialog med KMS på det altså.

Men det er først etter dere har fått tildelt jobben?

Det er helt riktig. Og det som er målet med SoundChain prosjektet er jo at man som underleverandør kan komme tidligere inn da i prosessen for å kunne unngå alle disse problemene man får når man får produktet levert i fanget. Da har man ikke vært med i tidlig fase.

Det er jo noe av det jeg også har funnet i teorien, at det er mange fordeler med å komme inn tidlig. Men det er jo også noen utfordringer. Hva er de største utfordringene sånn dere ser det, med å være med tidlig i en utviklings fase?

Den største utfordringen våre. Vi vil veldig gjerne vært med tidlig, men de produktene vi får fra KMS nå har vi ikke vært med tidlig i. Sånn at vi ser det som en stor fordel hvis vi kunne ha kommet tidlig inn hos dem. Men samtidig, KMS er jo ikke helt enig med seg selv om hvordan de skal løse dette. Fordi hvis man slipper inn noen tidlig så har de ikke lyst til å forlove seg til hvem som skal produsere produktet.

Sånn at hvis Hapro er med i en tidlig fase så er det ikke dermed sagt at Hapro ender opp som produsent for eksempel. Det er jo kanskje den utfordringen man har rundt det da.

Det er jo en beslutning som KMS må ta eller hvordan de skal løse det. Vi som produsent har lyst til å være med tidlig for å si noe om hvordan vi ser for oss at det blir produseres på en mest hensiktsmessig måte.

Når dere vinner et tilbud. Hvordan er informasjons flyten med KMS,

Nok et spørsmål jeg ikke kan svar på utfyllende på faktisk. Det vet jeg ikke helt.

Ok, vi kan gå over til Kvalitets krav.

Hva er det som kreves av kvalitets kra fra KMS. Er det innlemmet i produksjonsgrunnlaget, eller er det andre standarder de krever at dere følger?

Også et veldig godt spørsmål. Det har jeg også litt vanskelig for å svare på. Jeg vet ikke hva de stiller som krav i en sånn overføringsfase. Jeg kjenner mer til når vi sitter å produserer det. Og da forholder vi oss til de produksjonsunderlaget de har sendt over ja.

Er det noe forskjell på det grunnlaget dere får fra dem og det dere har av interne kvalitetskrav til deres produkter?

Det jo kundens krav som kommer først og vi forholder oss til. Men det er jo klart vi har jo none egne ting som kan komme i tillegg. Men vi kan ikke lempe på de kravene som KM som har satt, for det er jo kundens krav som kommer først. Hvis de har sagt at det skal være sånn, så blir det sånn. Også har vi kanskje vi none som er enda strengere hvis du kan si det sånn da. Eller ytterligere krav tillegg til det.

Jeg så på hjemme siden deres at dere har en del sertifiseringer og sånn i forhold til hvem dere leverer til. Er noen av de kravene der som kanskje går over det som man får fra kunden?

Ja det er korrekt. Det er først og fremst kundens som bestemmer, så hvis kunden har sagt at det skal være sånn eller sånn, så blir det sånn. Så kan det hende at vi har noe ekstra interne krav som er strengere enn det. For eksempel til statisk elektrisitet, eller fuktighet. Dette er krav som for så vit kunden ikke har så stort forhold til, men som de selvfølgelig synes er helt greit at vi har.

Det er bra, for det er jo en viktig del i et sånn samarbeid er jo å spille på hverandres styrke. Og jeg vil tro dere har relativt god oversikt på en del områder som KMS ikke nødvendigvis oversikt på?

Jada, det har vi, samtidig så er vi ganske samstemte. De har ikke så veldig mange krav som vi ikke har til oss selv.

Ja for man må vel være kvalitets fokusert om man skal drive bedrift i Norge generelt, hvert fall hvis man skal konkurrere med det globale markedet.

Ja helt klart.

Hvordan evaluere dere et samarbeid når dere har oppdrag. Er det kontinuerlig evaluering, eller i ettertid eller hvordan fungerer det?

Når det gjelder KMS så har vi kontinuerlig kontakt med dem. Vi har ukentlige møter, stemmer ikke det Olav (arbeidsleder)

#Olav bekrefter

Ja, litt avhengig av hvilke produkter. Men vi har stort sett ukentlig kontakt med dem.

Da tar vi opp problemer, forbedringsforslag, oppfølgning av en problem logg, ja alt mulig som blir tatt opp på det møtet.

Har dere evaluering interne møte om evalueringen om spesifikke kunder. Eller sånn som KMS har dere interne møter om evalueringen med KMS?

Ja.

Hvor ofte og hvor tilstrekkelig er de?

Nå kan Olav svar du vet jo mer om dette. Som arbeidsleder i avdelingen her.

Olav:

Halo forresten, Vi har ukentlige møter internt her om fremdrift på det vi skal ha ut mot KMS av produkter neste uke fremover i tid, prognose og slikt sammen med markeds avdelingen de har produksjonen og samarbeider der.

Det fungere bra

Da lurer jeg på hva dere ser på som største problemet for rask introduksjon av produkter i fremtiden?

Hva skal man ta som hoved problem. Vi er stort sett hissige på grøten når det gjelder å få nye produkter fra KMS. Så det vi har sett litt på er jo det du var litt innom tidligere; Det å være med litt før i prosessen sånn at man får litt mer innsikt i utfordringene rundt produktene før vi sitter med dem i fanget. Hva tror du Olav?

Olav:

Nei det er jo det med å ha alt på plass med underlag, dokumentasjon og ha det i orden.
Dette gjelder også prototype avdelingen vår. Som tar produkter og gjøre dem klare for produksjon.

Hvordan vil du kategorisere produktene dere leverer til KMS? Hva slags produkter leverer dere?

Vi har et brett spekter med produkter til dem. Det er ifra de enkleste maste-produserte småting til mer høyavansert produkter. Type skap med elektronikk og kabling osv. Ja det er hele spekteret omtrent.

Det meste går på undervannsteknologi, med svinger-teknologi det er det det bygger på stort sett alt sammen.

Jeg har forstått at dere har tatt over produksjonen av en type svinger fra dem?

Ja vi har et par svingere vi har. Det er svingere i mye. Men det er litt forskjellige type svingere men vi har en type vi produserer veldig stort volum av.

Avslutning.

APPENDIX F – INTERVIEW 2 HAPRO

Torsdag 21.mai

Key account manager for Offshore Subsea hos Hapro

Arbeidsoppgaver:

Har hovedansvar for segmentet. Jobber på marked der oppgaven er å prøve å få inn nye produkter, nye kunder. Kalkulere priser, ansvar for at logistikken går greit og det ikke bygges for store varelager. En god del planlegging samt passer på at produksjonen går som den skal.

Hapro har 4 segmenter

Offshore/ Subsea, Forsvar segment, Industri segment og et tele-kom segment.

I Offshore/Subsea segmentet er Kongsberg en av kundene.

Har hovedansvaret for de kundene som er inne for offshore/subsea.

Tett knyttet opp mot KMS

Kort introduksjon

I hvor stor grad har dere i Hapro være med på utviklingen av produktene sammen med KM?

Liten grad med på utviklingen med KMS. Vi er en kontrakts produsent. Driver ikke å utvikler. Så der er det Kongsberg ansvarlig for utvikling også faser det det over til oss. Vi er jo i konkurranse med andre på forespørsler. Vi får forespørsler og gir tilbud. Vinner noen ting og taper noen ting, ut i fra tilbudet vi gir. Kongsberg bruker andre leverandører enn oss på de samme produktene.

Så bruker dere underleverandører videre?

Vi bruker underleverandører. På mekanikk og komponenter.

I hvilken grad må dere endra eller utvikle produksjonsprosessene i forhold til produkter dere får inn?

Det kommer an på hva produktet skal igjennom av type prosesser. Når det gjelder elektronikk produksjon av elektronikk kortene så har vi bygget opp elektronikk produksjon så har jo vi bygget opp her sånn, så det har vi jo det som skal til av maskiner og linjer og inspeksjonsutstyr og alt. For dette er kjerne virksomheten vår. Men om det er noe spesielle prosesser som de produktene krever så må vi investere i eventuelt utstyr for det eller lage

utstyr for det. Har investert i en del utstyr for KMS. Også er det noen tilfeller hvor KMS ønsker å eie utstyr, så at de setter opp utstyr her som de eier. Sånn som noen type testutstyr, og sånt som de ønsker å ha.

Hva slags krav på dokumentasjon har dere ovenfor KMS i forhold til produksjonen av produktene?

Vi lager jo produksjons underlag for operatørene. Sånn at de skal vite hva de skal ha. Noen ganger ønsker KMS å ha dette i detalj, sånn at de setter en bestilling til oss på at vi lager produksjonsdokumentasjon. Men ofte så får vi med noe fra Kongsberg, men det er ikke godt nok for oss. Sånn at vi må bygge det om. Og da må vi gjøre det på vår kappe for å si det sånn. Hvis det ikke er noe fra før. Og vi er med i en Bi fase for å bygge det for første gang. Det hender og da bestiller de ofte et grunnlag samtidig. Da tar vi bilde underveis når vi bygger prototypen. Men produktet er jo allerede da utviklet der inne(KMS) og veldig ofte bygger de en prototype hos seg selv først og har et vist underlag. Og så bygger vi da en arbeidsbeskrivelse som er internt hos oss. Den eier jo vi.

Fra litraturene har jeg funnet at det å fokusere på produksjonen i designfasen av et produkt kan bidra til å få produktet raskt ut på markedet.

Hender det at det det er et problem at produktet ikke er designet for å produseres?

Vi skulle veldig gjerne vært med på et tidligere stadiet. Men problemet med det, er jo at vi er i konkurranse med andre. Så hvis vi skal inn på et stadiet før forespørsel/tilbuds fasen, så får vi et problem. Hvis vi skal være med å bruke ressurser og gi fra oss masse gode løsninger for at ingeniørene der inne skal lage et produkt med våre løsninger. Så skal en av våre konkurrenter få oppdraget. Det er ikke vi noe interessert i.

Er IP rettighetene som begrenser villighet til å være med i utviklingen?

Ja, Kongsberg ser jo også på dette som vanskelig så de invitere ikke oss på dette stadiet, enda. Men jeg skjønner at i dette prosjektet her så er det snakk om å se på hvordan man kan få det til. Så dette har vi snakket en del om.

Hvor lang tidshorisont har dere på oppdagerne dere får fra KMS?

Vi fikk forespørsel på et nytt produkt i dag som er et avansert produkt. Som er nytt for oss og et ganske avansert produkt. Der skal det lages ti stykker i August. Så vi setter i gang i dag å bygger strukturer også får vi logistikk avdelingen på å forespørre på komponent er og finne MA koster og sånne ting. Så der har vi ganske stram tidshorisont. I og med at de skal ha ut 10 produkter i august på et produkt som ikke er produsert før.

Er faren for å miste oppdrag lenger frem i tid med på å redusere informasjonsdeling?

Vi strekker oss lang for å beholde kunden våre vi. Det er de vi lever av. Vi vet at vi er i sterk konkurranse av bland annet lavkostland. Så vi har mistet mye kunder. Vi har mistet de største kundene våre nå. Og det er jo kritisk for oss det.

Både dere og KMS er fokuserte og langt fremme på kvalitet. Er det noe ekstra krav som stilles fra KMS på de produktene de kjøper hos dere.

Ja, alle kunder har forskjellige karv. Men det er jo IPC klasser som styre de kravene egentlig. Så de velger en standard. Så vi produserer jo etter standarder. Noen av våre kunder krever bla. IPC klasse3. Kongsberg har ikke utviklet produktene sine, de ønsker å komme til klasse 3, men de kan ikke kreve det av oss. De har ikke sine ting på stell så vi ikke kan produsere etter den standarden. Også har vi jo forsvarskunder som har helt andre standarder og het andre krav igjen.

Hvordan er deres arbeid mot kvalitetsstandardene dere følger. Er det områder dere føler det mangler noe og at dere ønsker å gjøre det bedre enn kravene?

Det er noen ting som er viktigere enn disse standardene. For på produkter som skal dypt ned i vannet, så tar ikke standardene for seg enkelte ting. Så der er det egen krav til hvordan man skal håndtere overfalte behandling, renslighet, sammenstilling, o-rings overflater osv. Som spesifiseres fra KMS.

Hvordan evalueres samarbeidet etter oppdrag? Har dere noen rutine på samarbeidet?

Vi har et langsiktig samarbeid med KMS. Så vi har ikke noe evalueringer på samarbeidet. Vi har månedlige møter med KMS som vi kaller månedsmøte. Hvor vi går igjennom forskjellige ting. Det blir det jo tatt opp blant eventuelt hvor mange avvik ting vi har på oss. Det er en del copier vi blir målt på på leveringspresisjons og sånne ting som vi følger opp en gang i måneden i møte med dem.

Har dere noen interne evaluering hvordan samarbeidet går?

Vi har mye interne møte. Vi har daglige fora'er som følger opp ting her.

Hva tror du er største problemet for rask introduksjon av nye produkter i fremtiden?

Vi klare stort sett å svinge oss rundt og prioritere. Det vi sliter mest med er å skaffe komponenter fra underleverandører. Vi skal sammenstille vi også har vi jo produksjon av elektronikken, med linjer og alt for å produsere elektronikken. Så når vi først har alt på plass går det relativt raskt igjennom vårt system her. Og sammenstillingen også, men vi sliter med mekanikk underleverandørene våre veldig ofte. De skal jo lage disse komponentene så det er der flaskehalsen er for å få det raskere igjennom.

De vet ikke spesifikt hva de skal lage før dere får oppdraget fra KMS?

Når vi får oppdrag fra Kongsberg så må vi ut å forespørre fra leverandørene våre. Så skal jo de skaffe materiell, konstruere de mekaniske delene og sette det i produksjon.

Så det er lag i verdikjeden.

Så er det ofte feil første gang, på det vi får fra våre mekanikk underleverandører. Så må det gå noen runder der. Og vi bruke mye tid på å følge opp det.

Har du noen ide på hvordan men kan løse dette problemet, eller gjøre det mer effektivt

Det skal ikke jeg begi meg noe ut på. Jeg kjenner litt for lite til leverandørsiden sånn sett.

Hva er nøkkelen til at dere gjøre det så bra

Vi blir jo valg på mye og får mye bra tilbakemeldinger av våre kunder.

Nøkkelen til at vi gjøre det bra. Vi er fleksible og vi er omstillings dyktige Vi er kvalitetsbevisste. Vi har vært villige til å investere opp gjennom årene i det som trengs for å ha det beste utstyret. Strekker oss lang for å få oppdrag, og få kundene til å være fornøyde.

Avslutter samtalen.