

CHALMERS



Market analysis to enable a sustainable Product Strategy in a multinational company

Master of Science Thesis

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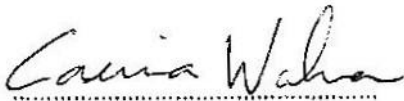
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June 2010

A handwritten signature in black ink that reads "Carina Walman". The signature is written in a cursive style with a horizontal dotted line underneath it.

Carina Walman

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Preface

The purpose with this dissertation was to make a market analysis on the behalf of SKF. The company wants to know their market potential regarding the locknuts. The dissertation also discusses and analyzes the Lean Product Development Process that the company recently adapted. The dissertation answers on questions such as: If there are any gaps in the SKF locknuts assortment? What are their strengths/weaknesses? How does the Lean Product Development Process look like? What kind of cultural differences that may impact the outcome of the dissertation?

During the project, eleven SKF distributors around Germany were interviewed. One interview with a distributor was conducted in a face-to-face meeting between the person responsible for the distribution of locknuts and an SKF employee. The other eight distributors answered a survey that was sent out by e-mail and the answers were analyzed. The face-to-face interview had fixed questions that did not lead to any discussions.

To get an insight in the Lean Product Development process that SKF is using, one interview with a Technology Development Manager was done. For that interview some questions were pre-written. However, the interview fast developed more into a discussion and new questions apart from the prepared one were asked.

Another aspect that is brought up in the dissertation is how the cultural differences may affect an outcome for a research. It discusses what approach that should have been taken to get a better answering quote from the German distributors. If the purpose of the investigation had been clearer the number of answers may have increased.

The investigation showed that it most probably was no reason to extend the assortment that SKF has of locknuts. No distributor had any suggestions on what other types of locknuts that SKF should provide. They thought that the end customers using the locknuts were satisfied with the assortment that they were offered. However, the price could be lower. The compensation for the price is the high quality, which the customers highly value. They also appreciate the support that they get when they want help getting the right type of component for their application field.

The Lean Product Development Process is seen as an improvement. Now everyone involved in the project knows what is going on. The biggest change from the process that they used before is that in the Lean Product Development Process the goal and process is visible and clear for everyone.

List of Abbreviations

DCM – Development Chain Management

R&D – Research & Development

TTM- Time To Market

PDI – Power Distance Index

PDP – Product Development Process

QFD – Quality Function Deployment

Glossary

- Development Chain Management** - Is the management of a network of interconnected business and are involved in the provision of products and services to the end customers.
- Power Distance Index** - Measures the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally.
- R&D** - Department in a company that develops new products
- TTM** - The time it takes for the product to get to the market from the initiate stage
- Uncertainty Avoidance** - It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured situations. Unstructured situations are novel, unknown, surprising, and different from usual. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures.
- QFD** - A method to make the product development process more effective, which leads to pleased customer, shorten developing cycles and higher productivity

Abstract

This dissertation examines the market potential for locknuts from SKF at the German market. A market analysis has been executed that is dealing with questions concerning, whether there are any gaps in the SKF assortments, what the competitors have to offer, what kind of customer segment that is buying the locknuts and what the criteria for the customers are. It also gives an insight of SKF's strengths and weaknesses.

The Product Development Process that SKF uses is also analyzed. The process is Lean inspired, which the company adapted only 2 years ago. The dissertation discusses how a company may adapt the Lean principle in their own organization.

The cultural differences between Sweden and Germany are also presented.

Key words: Market Analysis, Lean Principle Projects, Culture Differences

1. Introduction

In this chapter the background, purpose and the delimitations are revealed. Moreover, a description of SKF is revealed and also a presentation of the structure of the dissertation.

1.1 Background

SKF was founded in 1907, and grew at a rapid rate to become a global company. As early as 1920, the company was well established in Europe, America, Australia, Asia and Africa. Today, SKF is represented in more than 130 countries. The company has more than 100 manufacturing sites and also sales companies supported by about 15,000 distributor locations. SKF also has a widely used e-business marketplace and an efficient global distribution system (www.skf.com, 2010).

SKF Group is the leading global supplier of products, solutions and services within rolling bearings, seals, mechatronics, services and lubrication systems. Services include technical support, maintenance services, condition monitoring and training. Technical development, quality and marketing have been in focus at SKF since the very start. The Group's efforts in research and development have resulted in numerous innovations, forming bases for new standards, products and solutions in the bearing world (www.skf.com, 2010).

SKF offers services focused on optimal management of assets throughout the life cycle. SKF integral maintenance management expertise has accumulated over many years and is systematically brought together in the SKF Asset management support tool (AMST) framework.

As a global knowledge engineering company, SKF technology is used throughout the world in diverse applications, from energy wind farms, offshore oil rigs, aircraft flight control systems, steel and paper mills, high-speed trains to washing machines and millions of motorcycles, trucks and cars. By combining SKF's experience with their customers', SKF can deliver breakthrough performance using products and services from across SKF's main areas of core technical competence (www.skf.com, 2010).

SKF now wants to get a better knowledge about one of their smaller components, the locknuts. Therefore an analysis of the market should be executed. The Master Thesis should include analysis of the competitors and customers buying criteria. Moreover, an analysis on their newly implemented Lean Product Development Process (PDP) will be executed.

This means that the dissertation is divided into two fields that are linked together. The two subjects are market analysis and product development. This due to that SKF briefly expressed, that they wanted to investigate their locknut's assortment, how the German market for locknuts looks like and if there is any obvious gap/s within their assortment of locknuts. SKF also wanted an analysis of their current PDP. These two subjects are connected in that aspect that an analysis of the market is an initiate stage in the PDP. If there is no potential market for the product that will be produced there is no need for starting the project of developing it.

The dissertation also mentions the cultural differences between Sweden and Germany that may when cooperating in a project.

1.2 Purpose

The purpose of this master thesis is to make a market analysis on the behalf of SKF. The company wants to know their market potential, regarding the locknuts. The dissertation also discusses and analysis the Lean Product Development Process that the company recently adapted. The dissertation answers on questions such as if there are any gaps in the SKF locknuts assortment? What are their strengths/weaknesses? How does the Lean Product Development Process look like? What cultural differences may impact on the dissertation? The most appropriate way to get this knowledge is through literature and interviews with both distributors and end users. The interviews were structured and semi-structure, which resulted in both quantitative and qualitative data.

1.3 Limitations

The thesis is limited to the German market because it is a significant market for the company due to that it is a big market with global competitors and to the time limitation on this dissertation.

1.4 Structure of the Dissertation

The dissertation is divided into 3 parts. For SKF personnel the part 2 and 3 provides interesting and relevant information.

Part One (Chapters 1-6) provides an introduction on **why** this dissertation was written, the purpose, limitations and a description of the company. Moreover, it describes the methods used for this investigation and it gives a brief description of the locknuts and their locking principles. A major part describes the theoretical framework for the study.

Part two (Chapters 7-8) reveals the analysis of the German market regarding the locknuts that is gathered through the questionnaires and interviews that have been executed with the German distributors. The PDP that is currently used by the company is also described and analyzed. The Cultural differences that were experienced during the writing of this dissertation are also presented in this part.

Part three (Chapters 9-10) presents the Discussion and Conclusion of the dissertation.

2. The Method of Investigation

This chapter presents how the investigation of the dissertation was executed. It consists of two main parts; **the pre-study**, which is how the data was collected in the initial phase of the dissertation, and **the main study**, which is when the interviews were executed both with the distributors and the end users.

2.1 The Pre Study

The initial stage of the dissertation data gathering was (see fig. 2.1), after talking to the supervisors involved, to read literature available from different databases, libraries and SKF. The literature study was focused on theory and different approaches that could be used when executing this dissertation. The information about locknuts was gathered so that significant knowledge about locknuts was gained. Courses about Bearing Basics, Locknuts, Profitable Distribution and Selling Value were taken.

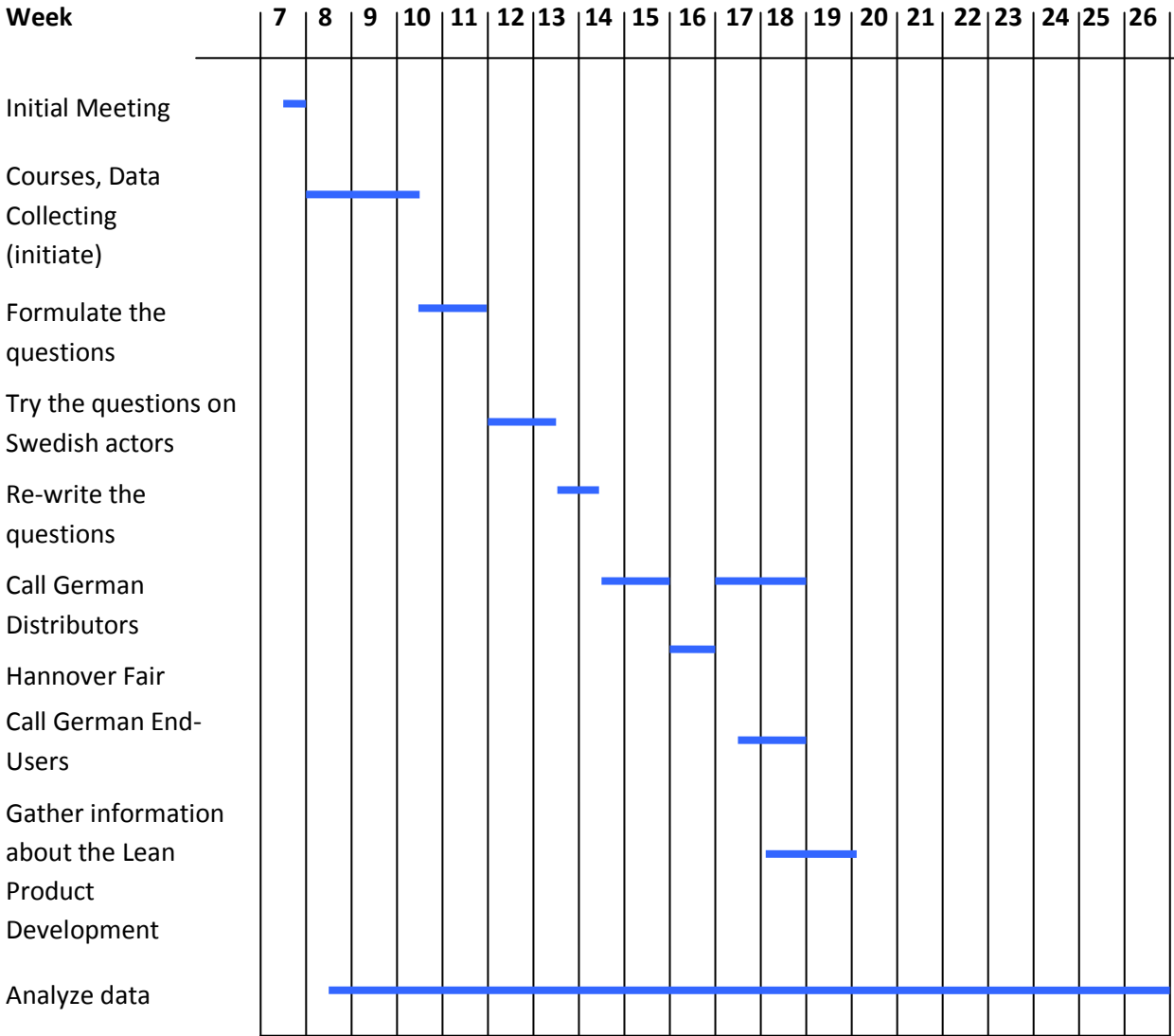


Fig. 2.1 A brief overview of the Time Table for the dissertation

2.1.1 Data Collection

The data was collected from literature and from articles that were found in different databases such as Science Direct, Jstor and Emerald. Moreover, interviews were done with German distributors. Planned interviews with end users could not be **executed** due to the given time limit.

2.2 The Main Study

The first step was to gather all the information available about the SKF assortment regarding the locknuts. That was done through courses from the SKF Distributor College and literature, such as, the SKF catalogue and websites.

The next step was to form questions, so that information that was relevant would be revealed. When that was done the researcher first tried them out on Swedish distributors and end users, since it was thought that it is easier to communicate in the mother tongue. Then the answers were analyzed and the questions re-written in a way so that the information required were revealed from them.

To learn more about Product Development Processes, the initial stage was to read literature about Product Development principles and theories.

To get knowledge about the cultural differences literature was studied.

2.2.1 Interview with local distributors

The researcher then contacted the distributors that belonged to the market that was relevant for the research, which is the German market. After a couple of phone calls an issue was brought up. The interviews could not be executed over the phone, due to language barriers. Consequently emails were then sent out in English.

To be able to get more information about the competitors, a trip to the Hannover Fair in Germany was planned. However, this was cancelled due to that no flights were able to fly to Germany, because of ashes from the Icelandic volcano eruption. The questions were then re-formulated to concentrate more on the competitors, since there were problems getting interesting information about them. The questions were sent out once again to remind the distributors for answers and this time they were both in English and German.

However, the rate of answers was so low that a trip felt that it was needed. Nevertheless, other trips were planned but they were cancelled due to holidays included and that the flights from Gothenburg to Düsseldorf did not match the days needed in Germany.

So to execute the research for the market analysis part helped were gotten from German colleagues. They helped by sending out the surveys and call the distributors, because they could express themselves perfectly in German and have direct contact with the distributors on the German market. The goal was to get at least **ten** surveys answered. The dissertation is based on **eleven** answers, which is a better outcome than expected. One of the interviews was done in a face-to-face meeting between a German distributor and an SKF employee.

During the time that the researcher was waiting for the answers from the surveys the researcher started with the second part of the dissertation, regarding the PDP. An interview with Technology Development Manager was conducted to get an insight of the process. The interview was an open

interview, so that the person being interview could freely explain the process. The interviewer could then ask for further information to clarify some areas that felt necessary.

2.2.2 Interview with End Users

Usually the contact with the end users is through distributors and since end users for this product are scattered and often quiet small it is difficult to get direct contact with them and due to the time limit for the dissertation this could not be executed.

2.2.3 Trustworthiness

The main information about the locknuts was gathered through questionnaires that were sent out with help from SKF colleagues. When the answers were in German help with the translation was given from bi-lingual persons. So it is believable that this method has not affected the trustworthiness from the questionnaires. The distributors are selected from SKF staff so that they are suitable for this research.

The interview related to the PDP was done in the room where the project meetings are held, with a person participating at these meetings. Consequently the interview was conducted face-to-face and the interviewer could ask for information when needed. If the interviewer later on realized that there was something that was unclear or missing in the process, the person could always call or visit the office of the interviewee for further information. This means that the reliability of this information is high, and that misunderstanding is almost none-existing.

3. Locknuts – the components for quick location

This chapter introduces the assortment that SKF has on locknuts. It presents the common application areas for this component. The different kinds of locking principles that SKF have to offer are briefly introduced.

SKF supplies locknuts in a wide range of sizes. The application field for a locknut is wide. It can be used in fields such as: wind turbines, drying cylinders in paper machines, forklifts, buses, and pods. Moreover it is commonly used within automobiles, in areas such as compressors, piston rods, gears, wheels and hubs. Generally it can be said that the locknuts are used to locate bearings and other components onto a shaft as well as to facilitate mounting bearings on tapered journals and dismounting bearings from withdrawal sleeves. They ensure long bearing service life and reliable locking and can prevent bearing fitting damage. SKF locknuts are easy to mount. They do not damage the shaft and the locknuts ensure effective locking.

SKF offers different types of locknuts: KM/KML, HM/HML, KMFE, KMK, KMT/KMTA and HMS, each having its advantages in function and application. SKF offers five different ways of locking on the shaft, locking with a locking washer, locking screw, locking device, locking pins and securing by tightening the internal clamping bolt. Further information about the locknuts and the locking principle are revealed in appendices A-F.

4. Problem analysis

This chapter explains briefly how the market within the locknut field looks today. Additionally, it explains how the company is reaching their end users and also what some of the bigger competitors can offer. It also gives a description about the multi-brand distributors that SKF is using to sell their products and also an explanation of their end users within the locknut field.

4.1 How is the market today?

Due to that it is such a small component and that it is used in such a variety of application fields, it is difficult to get the exact number of how large the market is. Nevertheless, it is easy to suggest that it is a giant one based on that as mentioned in the previous chapter its application fields is in a diversity of areas.

4.2 How is the customer being reached?

Since there are many smaller customers bigger companies such as SKF is using local distributors. An advantage with this is that these local distributors gain a deeper knowledge about their area and therefore can give the customers guiding to the product/s that are needed.

4.3 What do the competitors offer?

The competition within the locknuts is huge, since it is a small component, but yet significant, that is rather easy to produce. Most of the competitors offer almost the same products. However, the price, locking principles and primarily applications fields may vary. When a company has developed a new locking principle, the company can only get patent for it for a specific amount of time. When this patent has expired, the competitors may start to copy this revolutionary type (if it is a big seller). This increases competition, since they are competing with the same products. Instead other aspects may attract the customer such as price or the service that they get when purchasing the component.

4.1 Multi-brand distributors

Often big companies as SKF are using local distribution channels because they can gain the experience from the local distributors. Therefore they, as many other manufacturers, are selling lots of their products through so called multi-brand distributors. Multi-brand distributors are distributors that sell all types of products from a variety of manufacturers. In the German market there are several multi-brand distributors that are selling locknuts. Some of them are Schwartz, Paltra, Eriks, and Kistenpfennig. Each of these distributors has local branch offices, so called *local distributors*. These distributors are located all over Germany in order to serve the local customers in certain geographic areas, as shown in fig. 7.1.

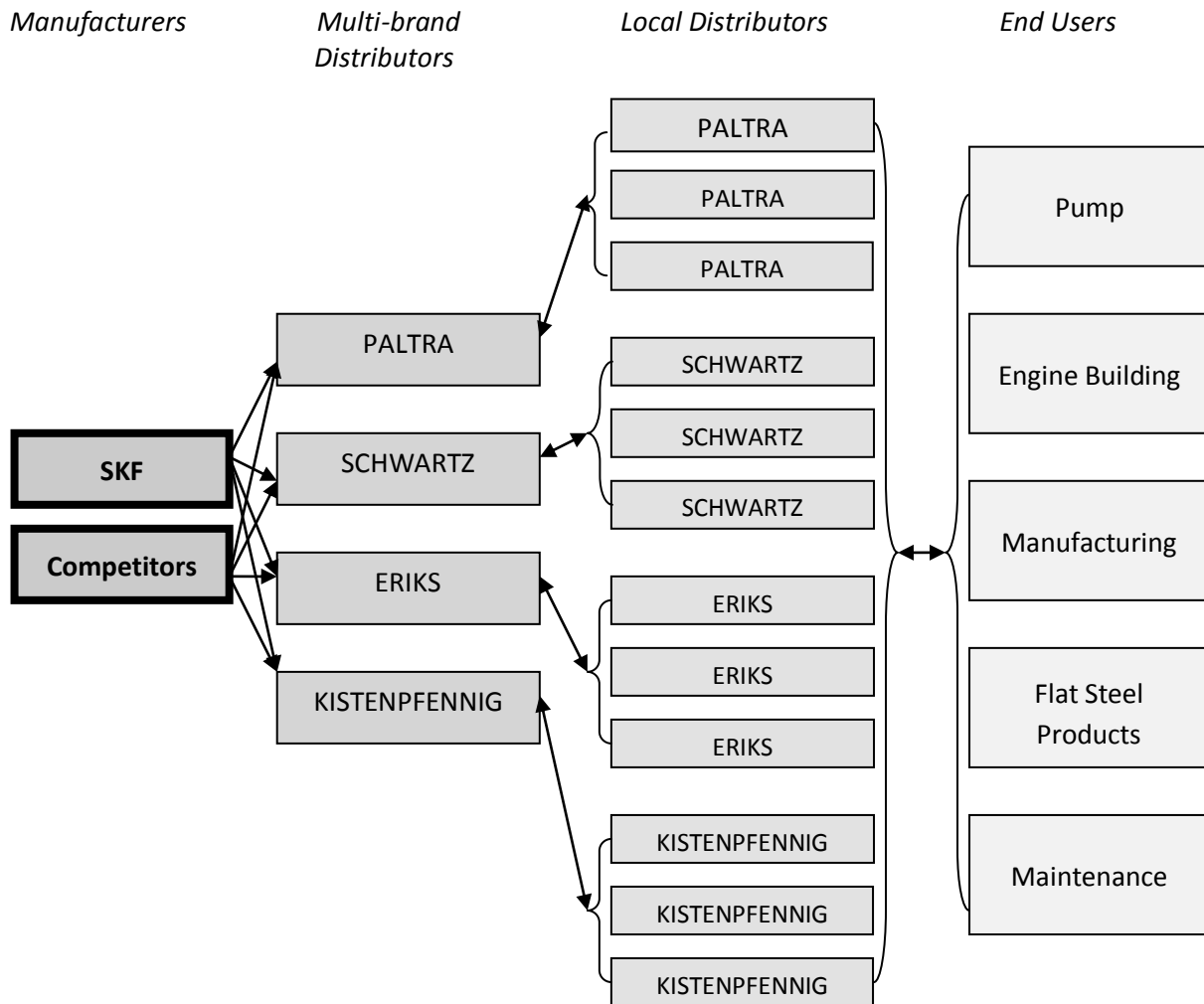


Fig. 4.1 Product flow from manufacturer to end user in the German Market for locknuts

4.2 End Users

To be able to have an understanding of what the needs are, the differences and how the end users perceive values, interviews were supposed to be made with some of them. How the end users were selected for an interview was to be decided based on the interviews with the German distributors. They mentioned the different end users that were relevant for this research and in what field that they belonged to. Due to that locknut is such an “all-around” product, meaning it has a diversity of applications’ fields, the end users belongs to a variety of areas. Since end users are small and scattered and the time limit, this could not be executed.

5. Literature Review

This chapter reviews the literature that is relevant to these subjects that the dissertation brings up. The first part is connected to the market investigations and deals with subject such as; the industrial market (the network model), how communication and commitment influences the relationship between companies or, distributors and companies, or companies and end users. Moreover theories such as strategies are mentioned such as; business to business and the uncertainties and abilities between supplier and customer are revealed, and customer's needs and values are discussed. The different factors that should be considered when executing and analyzes for instance, the financial considerations, external and internal factors are revealed. The industry cycle and Porter's five forces are combined and plans such as the structure plan and business plan are mentioned. Moreover, the theories about PDP are discussed, for instance the Lean Product Development Principle. Questions such as why companies should have PDP's and what problem that can occur during the process and why there should be certain PDP's teams are discussed. The Cultural Differences that may occur when dealing in a multinational environment are also mentioned.

5.1 Industrial market

An industrial market can be viewed as a set of *actors*, *activities* and *resources* that are connected and dependent on each other (Håkansson and Snehota, 1995) as shown in figure 5.1. These three parts are further explained in the next section.

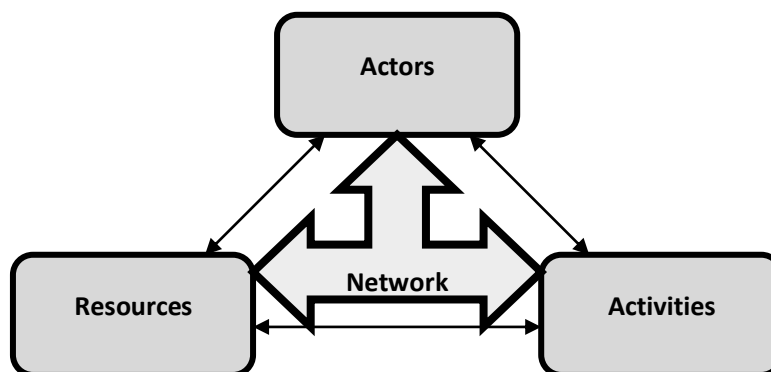


Fig. 5.1 The Actors, Resources and Activities Model

5.1.1 The network model

Actors can be seen as companies and they are performing activities in the network and/or control resources within a certain field. No actor is likely to have complete control of a network, but companies often have an interest of increasing the control in the network (Håkansson and Snehota, 1995). The interactions among actors are both an effect of the co-evolving relationships between the companies in the network and also an important influence on the network. In networks where both economic and social dimensions are of great importance, actors are perceived as embedded. This implies that mutual trust and commitment are important characteristics to which interaction and social exchange are crucial (Wilkinson and Young, 2002).

The **Resources** of a company include its physical, financial and human assets as well as its knowledge and experience. New knowledge emerges and opens new possibilities for a company when the resources are combined. One basic assumption in the industrial network approach is the existence and significance of business relationships. To impact substantially on the features of the resources

and the value they represent the company's tries to combine their resources in a systematic way through close relationships (Gadde, Heumer and Håkansson, 2003).

Activities refer to the combination, development, exchange or creation of resources through the use of other resources in order to create value (Håkansson, 1987). A company can exploit the independencies exist in the activities of the different actors through relating its own activities to the activities of the counterpart. Linking activities between two companies is useful and valuable because it gives both companies the opportunity to rationalize operations that are important and that extend beyond the ownership boundaries (Gadde, Hemmer and Håkansson, 2003).

Hence, these three dimensions are inter-related and together (see fig. 5.1) can be seen as a framework for analyzing industrial markets as networks, a vital reason that connect companies is their business relationships.

5.2 Communication and trust

Communication fosters trust by assisting and resolving arguments and aligning perceptions and expectations (Denise and Young, 2007). Communication between the business and their partners enhances the level of trust and it increases the level of knowledge of the partner's activities. "Trust building via prediction process requires information about target's past actions—the greater the variety of shared experiences, the greater the generated knowledge base and the more a target's behavior becomes predictable" (Cannon, Downey and Mullen, 1998, p. 605). There have been some researchers that have connected these two aspects (communication and trust)

5.3 Commitment

Commitment is a key issue to achieve valuable outcomes for the business themselves, to preserve long-term relationships in interorganizational relations and they attempt to maintain this attribute in their relationship (Hunt and Morgan, 1994). To have commitment is more important in international relations in comparison to domestic relations where external information is easily available from other sources. Commitment may be considered as a desirable qualitative outcome. The quantitative outcomes may eventually translate into financial performance. "It signals the importance of the relationship to the exporting firm and the efforts it will put into it, thereby the exporting firm's willingness to support the middleman, readiness to adapt to his/her needs, etc. Interestingly, while we have seen an enthusiastic interest in this line of research in marketing, we still need more documentation of the link between commitment and financial performance" (Nes, Solberg, and Silkoset, 2007 p. 412).

5.1 Business to Business

The business-to-business (B2B) relationships have over the few decades emerged as an important area of managerial practice and academic inquiry (Turnbull and Zolkiewski, 2006). From a managerial perspective, manufacturers in many business markets witness a strong trend towards closer relationships with selected key suppliers.

The B2B market research refers to research that is undertaken entirely within the business world: a business – the client – wishes to research its business customers or, less commonly, its suppliers or other parties who are involved in the running of (or who contribute to) its business (McNeil, 2005). It only includes those who are in the business and the B2B investigation includes all research where the product or service is being used in a business environment. Business research divides broadly into

two types: first, consumer or business to consumer (B2C), and second, B2B research. B2C research includes research where the product or service is being used in a non-business environment: that is, where respondents are (in most cases) using their own money. B2B research includes all research where the product or service is being used in a business environment (McNeil, 2005).

5.4 Uncertainties and abilities between supplier and customer

The general view of ordinary business conduction is that a customer brings its problems and uncertainties to a supplier, which then brings its abilities to provide a solution. However, the supplier also has its own fairly similar problems and uncertainties and they must rely on the ability of the customer as figure. 5.2 are showing here below.

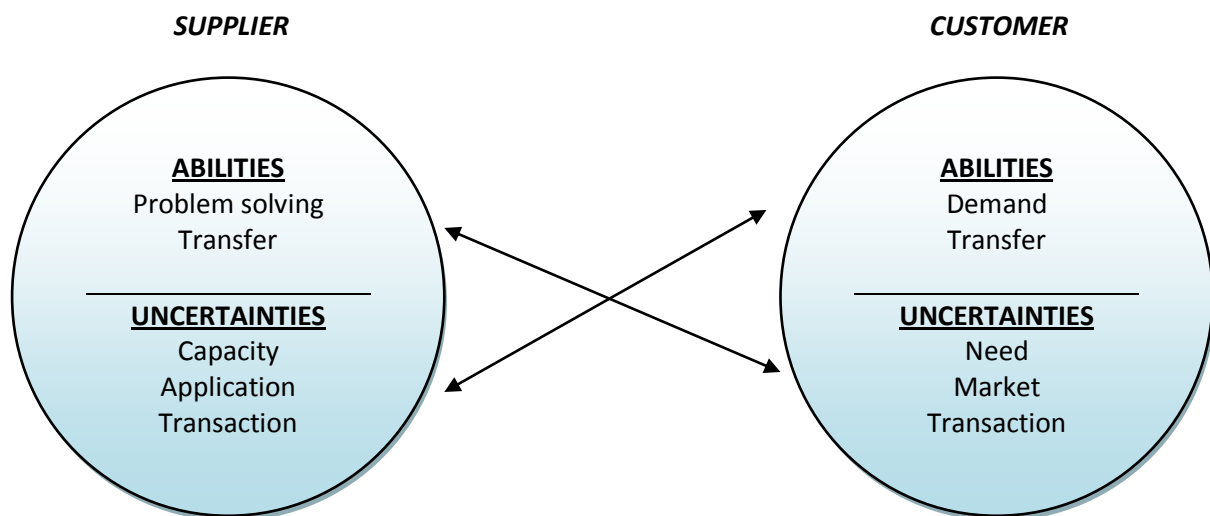


Fig 5.2 The uncertainties and abilities of buyers and sellers.

5.4.1 Uncertainties for Customers

If the customer always knew exactly what they wanted and needed there would not be any significant, if even any uncertainties at all for the customer. Ford et al. (2003) mention three different types of a customer's uncertainties. They are *Need uncertainty*, *Market uncertainty* and *Transaction uncertainty*.

- **Need uncertainty** - The customer has difficulties in specifying its requirements. This is particularly likely when those requirements are new or complicated, or when complex technologies are involved. This results in that a customer with high need uncertainty is likely to "get into bed" with a company with which it already has a relationship, or one with strong abilities or reputation, even if these extend way beyond its immediate requirements. Business customers are likely to value suppliers with a strong brand which they feel they can trust.
- **Market uncertainty** - The customer is uncertain about the supply market it faces due to the fact that there are many different possible ways to meet its requirements. Alternatively, the technologies on which the supply market is based may be changing rapidly and this makes the timing of any purchase decision difficult. This leads to when a customer with high market uncertainty will need to scan its supply market widely and may use several suppliers and "keep its distance" to all of them.

- **Transaction uncertainty** - The customer may be faced with a supplier which it does not know or trust or it may be concerned that it might not get what it thought it ordered, with the performance it expected or at the best price. The outcome is that a customer with high transaction uncertainty can use a number of parallel suppliers and change between them quite frequently as the need arises, or it can concentrate on developing a single closer relationship in which it seeks to improve the offering of the counterpart.

The uncertainties of business customers will not remain constant. Need uncertainty and market uncertainty are likely to decrease as customers become more familiar with the technologies.

5.4.2 Uncertainties for Suppliers

The uncertainties for a supplier have a number of similarities with the uncertainties for the customer. The ideal situation that would simplify the selling process for the supplier would be if they could forecast the exact amount of products that would be sold in the future, if the supplier did not have to change the future of its products and if their customer were reliable partners. However, this is not likely to occur. Ford et al. (2003) reveal three types of uncertainties for a supplier. They are; *Capacity uncertainty*, *Application uncertainty* and *Transaction uncertainty*.

- **Capacity uncertainty** - The supplier is uncertain over the amount that it is likely to be able to sell in the future. This is often common for suppliers with high fixed costs of operation or development, or those with relatively undefined skills, or where the customers are large and concentrated. This result in that supplier with high capacity uncertainty is likely to seek close relationships with at least some of its customers to ensure continuous order volumes, even if at lower price.
- **Application uncertainty** - The way that an offering can best be used may be difficult for a supplier to determine, or may change rapidly, often into quite different directions. The fallout from this is that a supplier that has high application uncertainty will need to be able to monitor its customer relationships and the changes that customer face, whether they are generated internally or in the surrounding network.
- **Transaction uncertainty** - The supplier may not trust a customer to actually take and pay for the volume it has ordered and it may also be uncertain that the customer actually needs what it says it wants. This uncertainty might be acute when the supplier is dealing with a single, large customer, or with which it is unfamiliar, or those for which it has had to undertake considerable development work before payment. This leads to that the supplier often tries to cope with transaction uncertainty by interacting closely with a few customers, or try to limit dependence by having low-involvement relationships with a large number of customers.

The uncertainties of the customer and supplier give opportunities for the two counterparts to influence their relationship. Both the customer and the supplier want to control the relationship and to lead the counterpart in the direction that is most profitable for them. This can be done by either manipulating the uncertainties or by applying one of its abilities in the relationship.

5.5 Relationships with Customer

According to Ford et al. (2003) companies know about the significance of having a relationship with the customers and they are developing it. However, how the relationships are established and preserved may vary between companies and customers. The pattern of interactions in customer relationships, the nature and importance of a company's customers' will vary. The customers are involved in defining the content of a relationship and even the content of a customer's relationship changes over time.

5.5.1 How a relationship develops

The progress when a relationship is built is seldom a uniform process of increasing business. It is hard to make a generic development procedure. However according to Ford et al. (2003), it may be executed in three steps, by *interaction*, *coordinating activities* and by *adapting*.

Interaction – The interaction starts with a first contact with either of the two parties. It should be done in a two way communication where the both parts gets aware of each other and learns about each other. They get the knowledge about what they stand for and their assets. The development of the relationship depends on the commitment, which later may develop into trust. The initial uncertainties of their relationship of the two companies do not necessarily disappear as it develops. The uncertainties may instead change through interactions or be manipulated by counterparts. Therefore, it is significant for seeking the abilities of the counterpart.

Coordinating activities – Suppliers has to process a first order, which is specified from the customer, schedule it and fulfill it. Co-ordination between a supplier and a customer entails costs for both of them and limits their freedom to co-ordinate with others.

Adaptations – If the involved parties are satisfied with the previous steps/stages they will end up in this stage. The pattern of interactions and activities that form the relationship is likely to require adaptations over time. This may concern different elements of the supplier's offering or if its facilities, equipments or operations. Adaptations create mutual dependence and involve opportunity costs, due to that they limit the ability of the companies to simultaneously make adaptations in different relationships.

5.5.2 Customers' needs

If a product will sell or not, depends on if there are any needs for it. Are customers willing to pay for this new product? Is there any demand for it? To get a hint if there is any point for producing a certain product or enter an existing market it is significant to have knowledge about the customers' need. It takes willingness from the company's side to put themselves into a constant learning mode with the customers (Richardson, 1997).

When there is an understanding of the customers' needs, it is essential that the information is leveraged and an avoidance of falling back on a generic presentation is executed. To be able to make a 'customers solution' a deep understanding of customer needs and the unmet needs is required (Ford, 2003). The unmet needs can represent opportunities for companies to increase their market share, to break into a market, or to open up new markets. However, it can also represent threats to established companies in that way that they can be a lever that enables competitors to disrupt an established position (Aaker, 2005). In addition, according to the different criteria's in term of the present or absence of certain needs and the importance attached to each of them, it gives a

possibility to define market segments (Hutt and Speh, 2005). It is therefore significant that before developing a new product and/or a service to gain sufficient information about what creates value for the customer as well as how the customer perceives value.

5.5.3 Customers' Value

Customer perceives value in different ways. However, according to Kotler and Golf (2007) it is generic defined as the difference between the prospective customer's evaluation of all the benefits and costs of an offering and the perceived alternatives. Often the cost of an offering, including the cost of the product, the time, energy and physical cost, is the most significant factor to the buyer. The price to be set correctly is therefore of essence for the customer. To determine how the customer evaluate and perceive value and the cost-benefit trade-offs of the total offering has to be investigated. There are different factors that determine the perceived value a potential customer associate with a given product as shown below (Czinkota and Ronkainen, 2007).

Buyer's perceptions and preferences	
<i>Unique-value effect</i>	Customers are less price-sensitive when they perceive the product and/or service provides unique benefits; there are no acceptable substitutes.
<i>Price-quality effect</i>	Customers are less price-sensitive when they perceive the product or service offer high quality or prestige.
Buyer's awareness of and attitude toward alternatives	
<i>Substitute-awareness effect</i>	Customers are less price-sensitive when they are relative unaware of competing brands or substitute products or services.
<i>Difficult-comparison effect</i>	Customers are less price-sensitive when it is difficult to objectively compare the quality or performance of alternative brands or substitutes.
<i>Sunk-investment effect</i>	Customers are less price-sensitive when the purchase is necessary to gain full benefit from assets previously bought.
Buyer's ability to pay	
<i>Total-expenditure effect</i>	Customers are less price-sensitive when their expenditure for the product or service is a relatively low proportion of their total income.
<i>End-benefit effect</i>	Customers – particularly organizational buyers purchasing raw materials or component parts – are less price-sensitive when the expenditure is a relatively small proportion of the total cost of the end product.
<i>Shared-cost effect</i>	Customers are less price-sensitive when part of the cost of the product or service is borne by another party.
<i>Inventory effect</i>	Customers are less price-sensitive in the short run when they cannot store large quantities of

	the product as a hedge against future price increases.
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Table 5.3 The different factors that determine the perceived value a potential customer associate with a given product.

5.6 Relationships with Suppliers

Companies may outsource their activities to suppliers and by doing that the companies have been able to specialize and it has helped them to improve their efficiency by providing economies of scale in their operations. The company may gain more benefits of suppliers such as the obvious one, which is that the suppliers are the source of the offerings that the company needs. These offerings may include elements of products, service, advice, logistics and adaptations. They may also provide facilities, equipment, components and operations that the company needs (Ford et al. 2003).

Ford et al. (2003) divides the benefits of having suppliers into two categories, cost benefits and revenue benefits. The cost benefit is described as the economic gains to the company from reduction of costs in other areas of its operations than the relationship with the particular supplier. Revenue benefits are the benefits that are increased from the relationship of a supplier that enhance the revenue generating capacity of the customer.

5.7 Opportunity Analysis

Crisis can happen anytime. When that has arisen the market may weaken for many products. This could create havoc in many industries. Previous when this has occurred, it has led to that many managers have had to reevaluate the basis of success in their own industry and in business more generally. Many have realized that the key to success is planning (Dunn et al. 1993).

According to Porter (1980), the strategic alternatives of an enterprise are influenced by a number of factors. The factors are divided into three types; *financial considerations*, *external* and *internal factors*.

5.7.1 Financial considerations

The **Financial Considerations** reflect the financial impact of alternatives in terms of revenues, costs and return on investments.

5.7.2 External Factors

There are different kinds of **external factors**, such as, *market size*, *competition*, *technology*, *government regulations*, *social change* and *nature*. These are explained more detailed below:

Market size needs to be taken into consideration due to the fact that it is the size and makeup of markets for goods and services that influence the nature of the opportunities that an organization faces.

Competition needs to be investigated, because some companies and market focus their strategic planning around the behavior or anticipated behavior of their competitors.

Major **technological** advances tend to create opportunities for companies that are prepared to capitalize on them.

Government Regulations have influence on many phases of marketing, including distribution, advertising price policy, product design and consumer use. Moreover, government controls and regulations such as pollution control devices, reporting requirement, tax policy, safety policy, have added costs to the industry and the consumer.

Social Change presents opportunities as well as hazards to business enterprise.

Nature is connected to weather conditions such as, droughts, floods and blizzards.

5.7.3 Internal Factors

Internal factors are divided into three fields are factors that are connected to organizational purpose, corporate objectives and resources.

5.8 The Industry Life Cycle and Porter's Five Forces

Industries evolve both structurally and in overall size, over time. The industry life cycle can be describes as figure 5.4 shows. It is measured in total industry sales and growth in total industry sales (Friend and Zehle, 2009). Throughout the life cycle, the industry structure and the competitive forces in which business operate, changes. The business's strategy therefore needs to be kept updated and change accordingly.

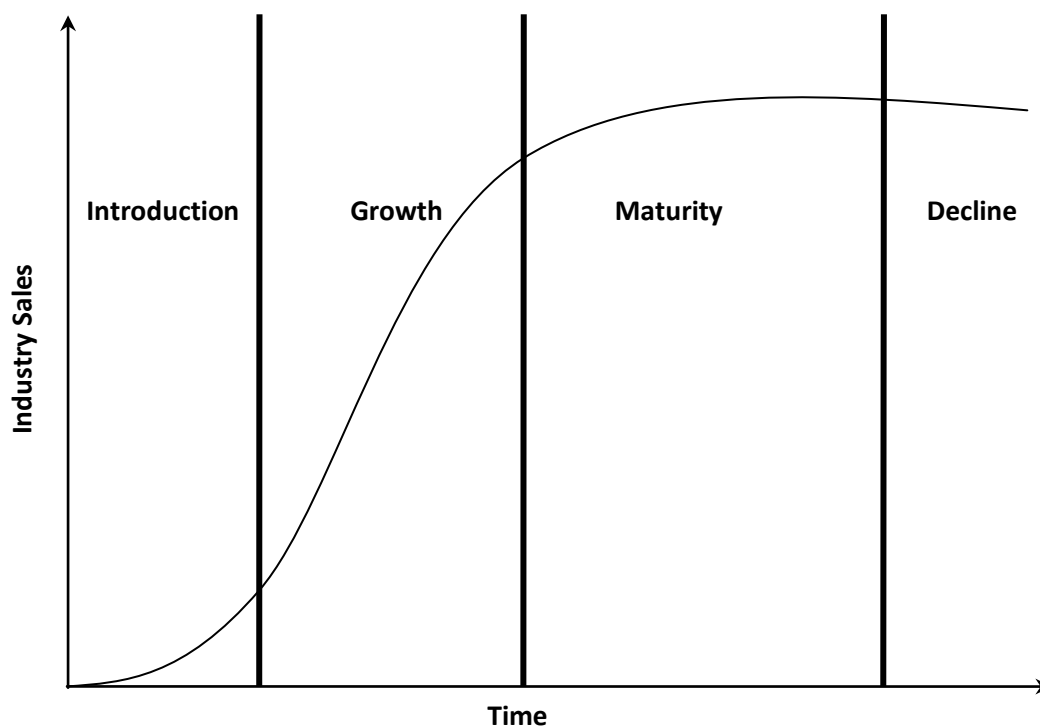


Fig. 5.4 The industry life cycle

When the environmental factors, market factors, and the needs of the consumers' are identified the next step is to analyze competition for each of the specific market segments. In most of the cases there is an established market with clearly identifiable competitors who must be evaluated for their strategies, weaknesses and strengths (Dunn et al. 1993). A question that should be taken into consideration during an analysis like this is: *Which competitors are going after which market segment with what marketing strategy?* The analysis of competition must consider and potential competition (if they could be predicted). However, trying to anticipate the moves of the competitors can become

the basis of choosing or not choosing to go after a given segment. It can also be a basis on the decision on which strategy to use if the effort is made.

A model that can be used to identify the forces to shape a strategy is developed by Michael Porter. This model is explained and shown in fig. 5.5.

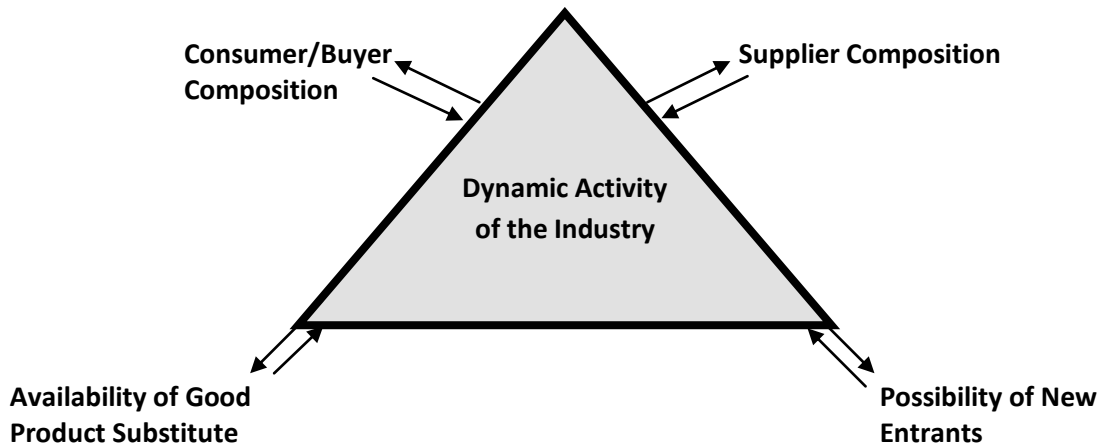


Fig. 5.5 Porters' Five Forces

The **Industry** is constantly involved in dynamic interplay in an attempt to build a successful competitive edge over one another. This is used to improve competitive position and achieve market success.

The **Consumer/Buyer composition** can range from a few large volume purchasers to a large number of volume purchasers. The difference between these two situations is that if the company has a few large volume purchasers the losing of a few consumers can be the difference between success and failure. However, if it has the opposite, which means that if the company has a large series of small consumers and they lose as many consumers as the other company it does not effects that hard.

The **Supplier Composition** can have a positive or a negative impact on profit margins, inventory levels, product quality and prices.

The **Availability of good Product Substitutes** is a major threat to existing firms when high quality substitutes exist. If there are substitutes with producing quantitatively at competitive or comparable prices, that is also a great threat.

The market is constantly evolving and changing which gives **Possibilities of new entrants**.

The five competitive forces are changing during the Industry Life Cycle as shown in table 5.6 and they are explained more in detail further down:

	Introduction	Growth	Maturity	Decline
New Entrants	Few	Bandwagon effect	Consolidation	Exit
Power of Buyers	Low	Very low, demand may be ahead of supply, it's a seller's market	Increasing	High, it's a buyer's market
Power of Suppliers	Medium	High	Declining	Low
Threats from Substitutes	Non-existing	Low	Growing	Substitutes may be the cause of decline
Rivalry among Firms	Low	Low, focus on growth	Intense, as firms seek to continue to grow at the expense of rivals	Declining rivalry as some exit, firms realize that industry is declining

Table 5.6 The Changes of the Porter's five forces during the Industry Life Cycle

Introduction - Due to that the industry is new there are few competitors and there are no threats from substitutes. There is almost none-existing power of the buyers, because they are willing to pay to get the hold of the limited supplier.

Growth- The competitors rapidly grows as other firms enter the growing industry. This stage may be profitable. However, it could also be a cash absorbing stage and a running risk as they jockey for position and market share.

Maturity – in this stage the power of the buyers increases because the capacity matches or even exceeds the demand. The threats from the substitute are growing and the power of the suppliers declines. The mature industries are settled, the risks are low and cash is generated. However, due to rivalry the prices may fall and become a threat to the profitability.

Decline – New challenges is presented here and capacity exceeds supply and thereby the power of buyers increase even more. The threat of substitutes are all time high, which can lead to that firms initiate a collaboration and the weakest company may withdraw from the industry. If the companies manage this correctly a slowly declining industry can produce attractive returns for investors due to that there is no new investments as the industry is gradually run down and milked out for cash.

5.9 Structure Plan

It is good to have kind of structure before initiating a new project. There is no fixed frame on how a structure plan should look like, due to the fact that it will vary from business to business. However, according to Finch (2006) the headlines that are mainly included in a structure plan are: *summary, introduction, business background, the product, the market, operations, management, proposal, forecasts, risks, financial background, conclusion and appendices*. These topics are explained in more details below:

The Summary is there to capture the readers' attention and get them interested in the proposal. The summary is the first thing that the reader is seeing and therefore the most significant part of the

plan. The team, background, the business, what it is that is exciting with the proposal, the success factors, the major risks and how they can be reduced. An explanation on what is needed from the stakeholder, and their rewards should be revealed in the summary. In another word the key points needs to be exposed in this part of the plan.

The Business Background should clarify the key factors and paint a broad picture so that the reader will be able to assimilate the detail that is in the body of the plan

The Product should be explained and why someone should want to invest in that project.

The Market that you compete in or propose to compete in is ought to be defined and explained. Why does or will people buy this goods or services? What essential benefits does it give them?

The explanations of **the Operations** may vary depending on what the business is. If it is a well-known business it is significant to explain the day-to-day operations. However, if it is not a well-known business it needs to be explained how it operates.

The Management team should be explained. For each person, the age, the relevant academic or professional qualifications, experience in the industry and job they are doing or will do, highlights of past employment experience and their share stake in the company if they have one is revealed. Furthermore the person's experiences, qualifications and strengths that are relevant to their proposed role should be brought up.

The Proposal ought to be clear. Questions such as; what the proposal is, How it is to be achieved, the time limitations, the success factors, what the returns are, should be explained.

The Forecast tells the reader where the business is going, not just this year or next but beyond.

The Risks should be taken into considerations, because by raising the issue it shows the reader that there are risks top the business proposal and that there is an awareness of it and even maybe a plan on how to reduce them or even prevent them. If it is said that the proposal is a risk-free proposal then neither investors nor business partners will take the plan seriously.

The size and the complexity of the business that is described are two key factors in the stage where the amount of **financial information** is revealed. A huge and complex business that requires a large investment will demand a great deal of detail because the partners and financiers want to look at all that detail. On the other hand, a small business will be simpler to describe and will justify less investigation, depending on who the audience influences on how much financial information that is needed. For example, you may need to provide far more financial detail for a financier than for a planning authority.

To sum up the most important parts in the business plan and to highlight the most significant issues in the plan, **a conclusion** is made.

In **the Appendices** the figures or the presentations of persons within the management team should be Conclusion, and appendices

Some sections may be merged, such as product and market, however, there can also be some new topics which are not mentioned in the list above (Finch, 2006). To keep a clear structure some things

may be repeated in the report. For example the things explained in the introduction and/or background is often repeated further in the report, which is fine as long as it is not explained in details ones more.

5.10 Business Plan

The business world has become increasingly uncertain, which has made so that some of the assumptions that a business plan is based on are likely to have become invalid before the plan has been circulated (Graham and Zehle, 2009). However, even though the future is uncertain and hard to predict, those being asked to finance or approve a project will almost constantly ask to see some form of business plan. The business plan is some kind of reassurance for the stakeholder that the managers have thought through how the market may evolve and how their strategies and tactics could be alter, depending on how the future will be. Nevertheless, by planning and identifying future risks and opportunities, the business can act immediately to help create the most favorable future outcome (Graham and Zehle, 2009).

There are a lot of different activities that has to be dealt with and considered when executing a project. To clarify their importance and urgency they can be divided into a matrix, as shown below:

	URGENT	NOT URGENT
IMPORTANT	<p>QUADRANT I</p> <p>Crises</p> <p>Pressing Problems</p> <p>Deadline Driven Projects</p>	<p>QUADRANT II</p> <p>Relationship Building</p> <p>Identifying Opportunities</p> <p>Business Planning</p>
NOT IMPORTANT	<p>QUADRANT III</p> <p>Some Reports</p> <p>Some Meetings</p> <p>Popular Activities</p>	<p>QUADRANT IV</p> <p>Tidying the Desk</p> <p>Some Mails</p> <p>Pleasant Activities</p>

Table 5.7 Time Management matrix

Businesses with a poor planning process are usually dominated in Quadrant I activities. This is a result of that they have to constantly react to the events that they are ill prepared to. Due to the fact that they are frequently reacting to new problems it is hard to move forward, which makes it unlikely for the company to achieve even short-term goals.

By making a business plan, it is easier to stay out if Quadrant I activities and to achieve the objectives that the company wants to reach. Business planning is a Quadrant II activity, which means that it is not urgent but important. Initially, however, the only way to create time for business planning is by eliminating activities in Quadrants III and IV. As a result of effective planning, the number of Quadrant I activities will eventually diminish (Graham and Zehle, 2009).

5.10.1 Competitor analysis

It is significant to a company to have knowledge about their competitors to even be able to be a threat to them. A great way of getting a competitive position is to make a competitor analysis. The key factors that have to be considered in a competitor analysis are:

- Current strategy or positioning
- SWOT (Strength, Weaknesses, Opportunities and Threats)
- Possible Changes in the Strategy
- Reaction to changes in your business strategy
- Financial Strength
- Operational Strength

The analysis of the competitors is far less detailed than the one that is from your own business. However, any business strategy should demonstrate an awareness and understanding of the competition. The analysis of competitors also provides benchmarks against which a business plan can be measured.

5.11 The Product Development Process

Managers who initiate a movement towards time compression, face an inescapable dilemma, which is how to achieve faster cycles for the long run without being badly damaged by work interruption in the short run (Clark and Wheelwright, 1994). The most common way for companies to cover their delays and errors is by having slack resources and loosely fitting interfaces. However, the delays and errors that occur when a company begins to compress its cycles can rarely be fixed as quickly as the slack is minimizing in a rapid pace. To reduce the lack of slack there are some arrangements that could be done. For example a simulation of the new procedures before they are fully implemented, or having temporary buffers of material or information can be done. It is critical when managers keep pushing the change process and do not disrupt their efforts when problems arise.

It is common that the managers that have been working with implementing product development processes numerous of times easily get stuck in their own pattern (Clark and Wheelwright, 1994). However, starting up a project has no fixed way to follow, some modifications are always needed. So to avoid having the same pattern to different projects, a company may create new leaders and empower people who are attuned to the new direction that the company has to take. Another non-traditional way is to have apprenticeship systems.

5.11.1 Product Development Teams

Companies usually have product development teams to deal with the product development process. The team is often a combination of work teams and problem solving teams that create new designs for products or services that will satisfy customer needs (Griffin and Moorhead, 2009). Work teams, are according to Griffin and Moorhead (2009) mostly permanent and they do the daily work as in comparison to the problem solving teams that are temporary and just attack specific problems in the workspace. However, product development teams are similar to problem solving teams because when the product is fully developed and in production the team may be disbanded.

5.12 The Lean Product Development Process

When developing a Product Development Process, the Toyota Product Development System (LPDS) can be followed (with some modifications suitable for the own company). It consists of three subsystems, People, Process, and Tools and Technology Systems, as shown in fig. 5.8 below. These subsystems are then defined further into thirteen principles (Liker and Morgan, 2006), which are explained here below:

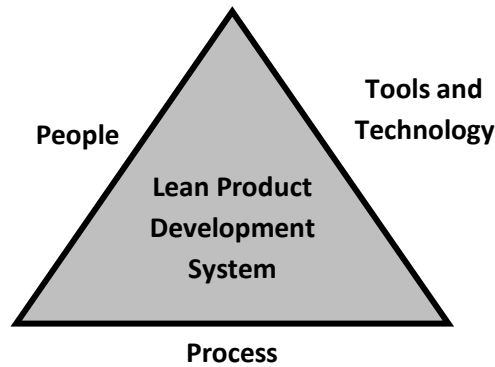


Fig. 5.8 The Lean Product Development System with its three subsystems

5.12.1 The Process Subsystem: LPDS Principles 1 to 4

The first subsystem is **processes**, which comprises all the tasks and the sequence of tasks required to bring a product from concept to start of production. This is a part of the technical system.

Principle 1: Establish Customer-Defined Value to Separate Value-Added Activity from Waste

In a lean system the customer is always the starting point. By defining what a customer values, waste is defined. The activities that take time and money but does not add value in a customer's perspective is waste. Within Product Development there are two wide categories of waste (Liker and Morgan, 2006).

1. **Waste created by poor engineering that result in low levels of product or process performance:** This is the most destructive waste. The best antidote to this category of waste is a deep and concrete knowledge of how to create customer-defined value at each level of the organization, a hierarchy of value. Toyota employs tools and methods to achieve this understanding and create value and objective alignment throughout the program team.
2. **Waste in the product development process itself:** Insights from queuing theory and Product Development Value Stream Mapping (PDVSM) can help to combat these wastes.

Principle 2: Front-Load the Product Development Process While There Is Maximum Design Space to Explore Alternative Solutions Thoroughly

The best time to explore alternatives for the product development is by far in the early stage in the product development stage (Liker and Morgan, 2006). Toyota has developed a number of methods and techniques for effectively front-loading its product development process with integrated cross-functional engineering resources that focus on resolving major engineering challenges while the maximum possible options are still available.

Principle 3: Create a Leveled Product Development Process Flow

When the value is defined and the majority of engineering and design challenges are resolved, lean product development requires a waste-free process to speed the product to market. Toyota utilizes the powerful perspective of the knowledge work job shop to level workload, create and shorten management event cadence, minimize queues, synchronize processes across functional departments, and reduce rework to a minimum (Liker and Morgan, 2006).

Principle 4: Utilize Rigorous Standardization to Reduce Variation, and Create Flexibility and Predictable Outcomes

To reduce the variation while preserving the creativity during the product development process is a great challenge. That is why Toyota standardizes lower-level tasks, which creates higher-level system flexibility. According to Liker and Morgan (2006) there are three broad categories of standardization at Toyota.

1. ***Design standardization:*** Toyota achieves this through common architecture, modularity, and reusable or shared components.
2. ***Process standardization:*** Toyota accomplishes this by designing products and building foot printed manufacturing facilities based on standard manufacturing processes.
3. ***Engineering skill set standardization:*** At Toyota, this provides flexibility in staffing and program planning.

The standardization provides for example the company to create highly stable and predictable outcomes (with both quality and timing) in an unpredictable environment.

5.12.2 The People Subsystem: LPDS Principles 5 to 10

The ***people subsystem*** covers recruiting, selecting, and training engineers, leadership style, and organizational structure and learning patterns. This subsystem and its principles cover the elusive thing called culture, which can be quite encompassing as it entails the organization's shared language, symbols, beliefs, and values.

Principle 5: Develop a Chief Engineer System to Integrate Development from Start to Finish

Toyota has a chief engineer who is responsible for and can tell the exact status of any given project. The chief engineer is not just a project manager but a leader and technical systems integrator. Although many companies have someone with the title of chief engineer or program manager, these individuals are often relegated to the role of project manager, managing people and timing but not serving as chief technical architect. The unique role of Toyota's chief engineer is to be the glue that holds the whole Product development system together (Liker and Morgan, 2006).

Principle 6: Organize to Balance Functional Expertise and Cross-Functional Integration

To succeed with any individual program there has to be a synergy between functional excellence and specific disciplines (Liker and Morgan, 2006). It is a problem that has to be dealt with, to get success.

Principle 7: Develop Towering Technical Competence in All Engineers

Technical excellence in engineering and design resources is fundamental to lean product development. Toyota begins with a rigorous hiring process and then designs a career path that emphasizes deep technical skill acquisition within a specific discipline, focusing on mentoring of critical tactical skills that are required for engineering excellence. The principle of *genchi genbutsu* (actual part, actual place) at Toyota pushes engineers to get their hands dirty and go directly to see for themselves how the work is getting done and what the problems are (Liker and Morgan, 2006).

Principle 9: Build in Learning and Continuous Improvement

To get the most sustainable competitive advantage for a company is to have the ability to learn and improve. At Toyota, learning and continuous improvement are a basic part of day-to-day operations. Toyota, a leader in gathering, diffusing, and applying performance-enhancing information, recognizes the benefits of learning and maximizes its impact company-wide (Liker and Morgan, 2006).

Principle 10: Build a Culture to Support Excellence and Relentless Improvement

According to Liker and Morgan (2006) it can be said that the DNA of Toyota is a composite of very strongly held beliefs and values that are shared with successive generations of managers and working level engineers. The culture of Toyota is supporting excellence with clearly defined values and beliefs that compel the organization to work harmoniously toward common goals.

5.12.3 The Tools and Technology Subsystem: LPDS Principles 11 to 13

The third subsystem consists of the *tools and technologies*, which speaks for itself what it is.

Principle 11: Adapt Technology to Fit Your People and Processes

Mistakes often occur in companies when they attempt to use a fixed framework when they are trying to achieve high levels of performance within the product development. Therefore, it is significant to take the time and effort to make sure that the technology fits and enhances already optimized and disciplined processes and highly skilled and organized people. According to Liker and Morgan (2006) an effective product development system prioritizes effective process and people subsystems in first hand and secondly the technological accelerators that leverage specific opportunities.

Principle 12: Align your Organization through Simple, Visual Communication

To avoid time presuming problem solutions Toyota uses simple, visual methods for communicating information. This is often just limited to only one sheet of paper, which consists of four minor variations for proposals, problem solving, status up dates, and competitive analysis (Liker and Morgan, 2006).

Principle 13: Use Powerful Tools for Standardization and Organizational Learning

A well-known principle of *kaizen* is that you cannot have continuous improvement without standardization (Liker and Morgan, 2006). This is because then the learning could extend from program to program.

These then are the 13 principles that comprise the model of a Lean Product Development System.

5.13 Developing successful products

To be able to reach success in the business world, companies constantly are operating in a state of innovation in terms of products they manufacture. They frequently are introducing new products or modifying already existing products and improving existing products as needed and desired by the customers. The product development process can be described as a process that consists of four different generic expressed stages; conceptualizing, designing, producing and selling a product (a more detailed process is shown in fig. 5.9).

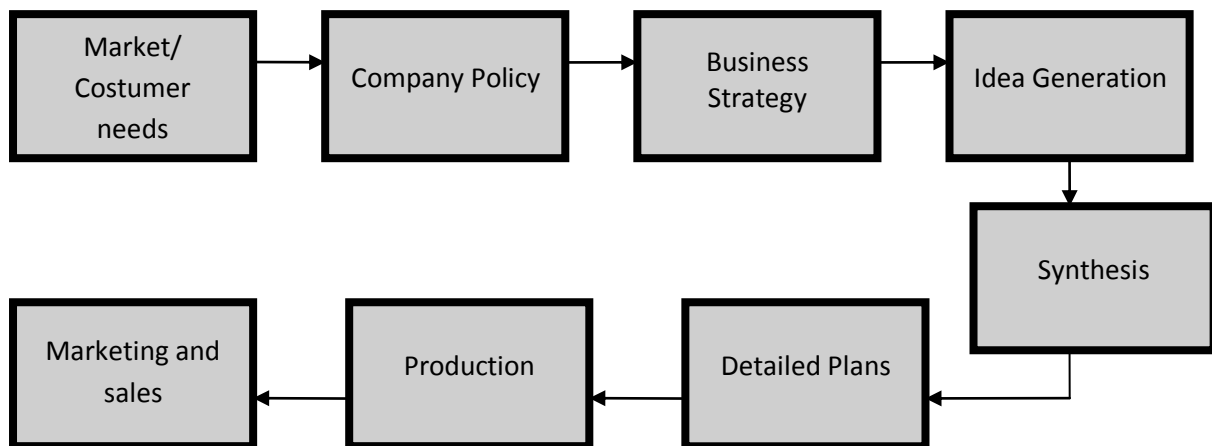


Fig. 5.9 The Product Development Process for success

According to Desai et. al (2007) the key in new product development is the information that indicates what the people wants, what features that are desirable but can be sacrificed due to production price, what features that are considered essential, what price they are willing to pay, current and potential competitors, and the likely changes in the market size. A product development strategy that is not based on customer needs will most certainly fail. To succeed, a company must develop and market new products. Some of the factors that should be taken into considerations for developing a successful process are (Desai et. al, 2007):

- To provide value for the money
- Have quality in comparison to the competitors
- Meet customers' need more fully then the competitors and have unique features
- Have highly visible useful benefits
- Developing a throughout understanding of the nature of the market
- Understand the competition
- Devote resources to activities that determine customers' wants
- Develop relationships between product attributes and user needs
- To have a list of product attributes ranked from **essential** to **desirable**

5.14 Why product development projects?

In some cases entire business strategies defining an organization's future can be built on a new product. Two examples of that is (Thomas, 1993):

- Predicted rapid market acceptance of a new computer work station promises to lift a manufacturer's technological reputation to new heights.
- Projected profits from a new line of health beverages suggest that a food company and its stock price will be raised out of the doldrums.

However, the launch of a product does not always live up to the expectation for business strategies. Although the prescription for success, which is to consider the crucial factors such as having strong leadership, good management, cross-functional teams and new product champions, the actual implementation can be difficult. A few questions that should be taken into considerations are (Thomas, 1993):

- How does the interruption of organizational processes by new products affect individual career patterns?
- What are the incentive systems that will motivate highly qualified individuals to join high-risk new product development teams?
- Where in the organization should the new product development be located (internally or externally)?

Requirements of an understanding of critical organizational processes, such as strategic choice influence, communication, decision making, resource allocation and implementation are needed to be able to resolve organizational issues that are related to the new product development.

5.15 The Generations of Product Management

The Product Development Management has changed since it initiated as figure 5.10 shows. This is common and significant to be able to adapt to the changing environment. In the 1990's, time-based strategies changed the competitive balance within many industries while some competitors improved their time to market (TTM) drastically through new management practices (McGrath, 2004). This has lead to that even more companies adapted these practices to be able to survive. However, since the environment is continuously changing, new generations with new methods need to be developed. According to McGrath (2004) it is going to be the generation of Product Development Management that is coming. That means that the focus is on productivity, which is to develop more new products than the competitors with a lower investment.

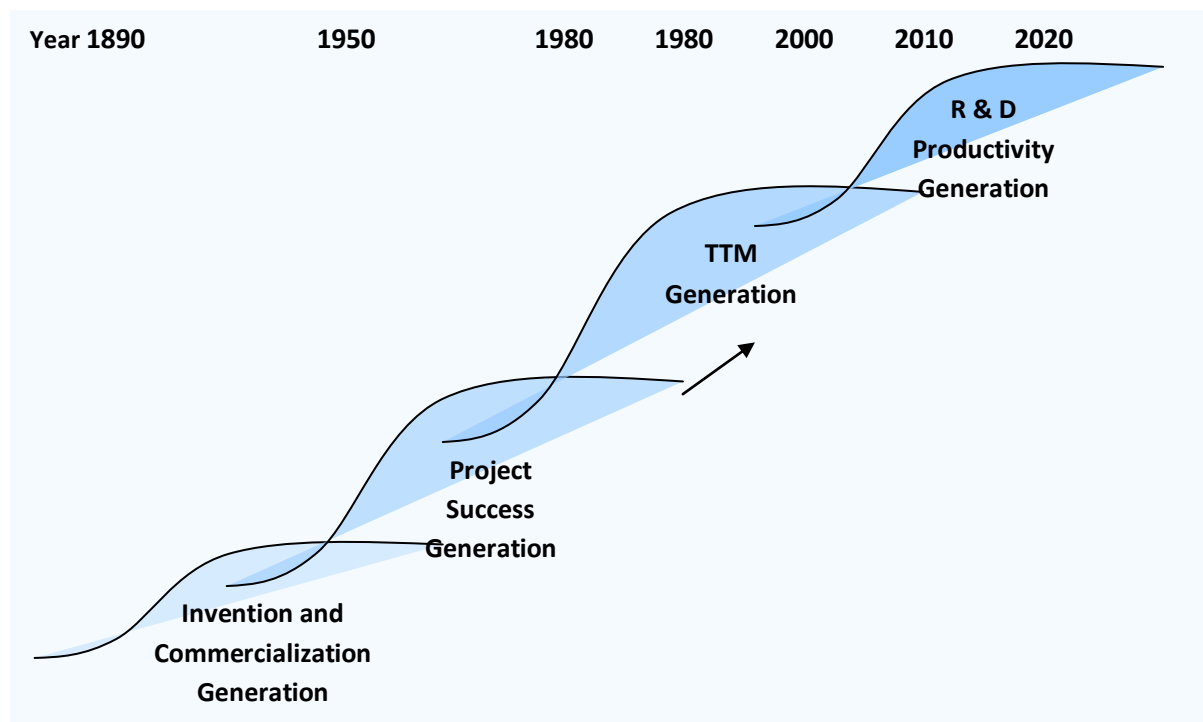


Fig.5.10 Four Generation of Product Management

5.15.1 The new Generation of R&D Productivity Generation Process

In the new generation Development Chain Management (DCM) will provide a better analysis than during the TTM Generation. That is because it is going to be based on actual project information instead of a collection of summary information from a diversity of projects (McGrath, 2004). The Research and Development (R&D) Productivity Generation Processes, according to McGrath (2004), look as what is shown in figure 5.11 below. DCM systems are described as, according to McGrath (2004), as the integrated systems that automate information flow, visibility, and decision making. This enables an entirely new level of R&D performance. They are integrated across the whole enterprise, which means that they are network-based applications and **not** desktop applications, such as some project planning tools that are used individually.

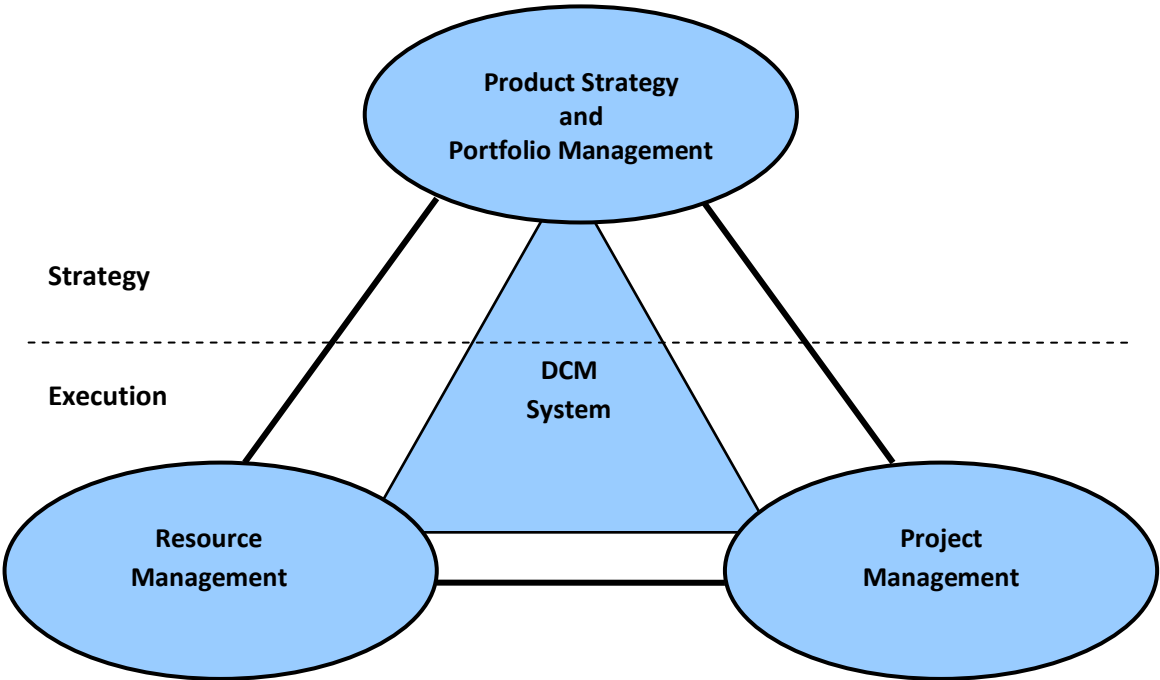


Fig. 5.11 An overview of R&D Productivity Generation Process

The **Resource Management** is the management of the company’s investment in development resources, which is primarily the people needed. As fig. 5.11 indicates Resource Management focuses on execution. In the new generation utilization is a key word. By utilization reporting, and the ability to manage R&D utilization, it composes a critical underlying capability in developing resource management (McGrath, 2004).

The **Project Management** system broadly includes a range of applications that support the advanced Project Management practices. The most critical applications are enterprise project planning systems and project network systems, since they provide the foundation for DCM.

Due to that companies in the TTM- Generation were analyzing the summary of a diversity of projects, they often ran into limitations quiet quickly. However, the DCM systems will, as mentioned before, provide a comprehensive **Portfolio** and analysis based directly on actual project information.

5.16 The Cultural differences

Germany is according to Hofstede and Hofstede (2005) a masculine, individualistic country with high uncertainty avoidance. They look at the organization as a well-oiled machine and prefer structure at their workplaces.

They highly appreciate punctuality. Their high level of uncertainty makes them support a need for a more detail plan when they are going to execute something such as a project. The score that Germany has for power distance is low, which means that they place more trust in the subordinates in comparison to countries with high power distance do.

The preferred configurations of organizations are to have a professional bureaucracy, standardization of skills and an operating core.

The greatest difference between Germany and Sweden is that Sweden is a very feminine country with weak uncertainty avoidance. This means that Sweden think more about giving personal service, making custom-made products and are focusing on nurturing and cherishing the relationships they have. Germany on the other hand is more about mass-production, working for the thrill of the challenge, earnings, recognition and advancements.

6. Research Methodology

This chapter presents the different methodologies that are used to reach the aim of this dissertation and what kind of data that is the outcome from the different methods. There are some explanation of the opposite methods that was not used so that an understanding on why the certain methodology was chosen. The methods and kind of data presented are primary and secondary data, quantitative and qualitative methods, different kinds of interview structures and questionnaire formulation. The Psychological approach that was used in this dissertation is presented.

6.1 Deciding the suitable techniques to use

According to Sandhausen (2000) in deciding which techniques to use the focus is primarily on the nature of the information desired and the people who would presumably provide this information. Questions to be considered are; to what extent is the desired information objective? (such as demographic characteristics in prospective markets), subjective? (such as attitudes and behavior patterns in these markets), future-oriented? (such as changing information needs), or oriented toward past experiences? (such as attitudes toward existing methods of generating information) Moreover, what is the degree of validity and reliability that would be required should also be taken into considerations.

6.2 Primary and Secondary Data

Primary Data is a direct collection of information from respondents (McNeil, 2005). The methodology that is used during the collecting of data can be whatever attitude that is appropriate for the information gathering. **Secondary Data** is according to Tuma (1971) related indirectly and indicate only potential events.

It is hard to decide when to use which of these data due to the fact that there is no visible trend to when primary or secondary data have been used (Tuma, 1971). However, it is suggested that secondary data are used more frequently in comparison to primary data. This because that most primary data are rarely complete and hence indirect information is gathered as a supplement to the primary data. Table 6.1 summarizes the differences between primary and secondary data.

PRIMARY	SECONDARY
<ul style="list-style-type: none"> • Direct collection of information from respondents using whatever methodology appropriate. - Can be: <ul style="list-style-type: none"> • Customized: Tailored to individual client needs; • Syndicated: Several clients jointly undertake research using an independent researcher and share results (or different elements); • Omnibus: A survey covering several (unrelated) topics for different clients conducted on a regular basis (quarterly, monthly) by research agency. 	<ul style="list-style-type: none"> • Often called 'desk research' or 'searching around for data'.

<ul style="list-style-type: none"> • Commissioned direct by client or agent. 	<ul style="list-style-type: none"> • Uses published accessible sources (public, private, government, corporate).
<ul style="list-style-type: none"> • Unless specifically released by clients, the data are owned only by research sponsors rather than being available for public review. 	<ul style="list-style-type: none"> • No direct collection of information from respondents in the market place in question.
	<ul style="list-style-type: none"> • Different methods can be used.

Table 6.1 The differences between Primary and Secondary Data

6.3 Quantitative

Quantitative studies are mostly used when theory are being exercised deductively and placed toward the beginning of the plan for a study (Wisker, 2001). It is mainly used when the objective of testing or verifying a theory is done rather than developing it. The researcher advances a theory, collects data to test it and reflects on the confirmation or disconfirmation of the theory by the results.

6.4 Qualitative

The qualitative research provides an explanation for behavior and attitudes (Wisker, 2009). The initiate stage is to gather detailed information from participants and forms this information into categories. Thereafter broad patterns, theories or generalizations are then compared with personal experiences or with existing literature on that topic concerned.

6.5 Differences between Quantitative and Qualitative

When choosing whether to use quantitative or qualitative research methods it should be based on an informed understanding of the suitability of that methodology for a specific research. According to Burns (2000) it should be the research problem that should determine the methodology. There is no generic method that works for every research. The differences between quantitative and qualitative methods are shown in the table below.

Quantitative	Qualitative
Fixed	Flexible
Hard	Soft
Objective	Subjective
Abstract	Grounded
Value-free	Political
Survey	Case Study
Hypothesis testing	Speculative

Table 6.2 The differences between Quantitative and Qualitative research methods

6.6 Interview techniques

According to Kvale (1996) an interview conversation may reveal great information since the researcher listens to what people themselves tell about their lived lives (experiences). As Kvale (1996) mentions an interview is literally an *interview*, an inter change of views between two persons conversing about a theme of mutual interest. Interviews can be executed in different ways, using different kinds of techniques such as, *structured*, *semi-structured*, and *unstructured interviews*, which are presented here below. This is used due to that the outcome will be different using dissimilar interview techniques.

5.16.1 Structured interviews

Macan (2009) mentions that there is a great variability among researchers in what they meant when they indicated that their interview was structured. Researchers sometimes classified interviews as being “unstructured” or “structured,” although the components of the interview that led to such determination varied. Other general labels used to describe structured interviews included: “situational”, “behavioral”, “conventional structured”, and “structured situational.” Some researchers highlighted specific components of structure to provide justification for their determination of structure (Macan, 2009). To reduce confusion about if an interview is structured or not there should be a common taxonomy and measure of interview structure. After establishing a common definition and comprehensive framework of interview structure, a measure of these elements needs to be developed. In creating a measure, the relative importance of components needs to be described conceptually and could be determined empirically.

5.16.2 Semi-Structured interviews

Semi- structured interviews provides both quantitative and qualitative data (Crouch and Housden, 2003). As the name may reveal this is an interview method where structured questions are combined with “open-ended” questions. These questions are easy to design and to ask but require more from the respondent answering. It also entails a recording from the interviewer. The interviewer may be required to encourage the respondent to think about the questions by using probing questions. This demands a higher level of technical expertise from the interviewer in comparison to fully structured questioning.

5.16.3 Unstructured interviews

When using unstructured interview methods the interviewer only have a topic guide or checklist of questions that must be asked or just subjects that must be covered (Crouch and Housden, 2003). These kinds of interviews are often used in industrial marketing research. The data collected is qualitative data. This data is hard to compare to each other, because the answers may vary a lot.

5.16.4 Telephone questionnaires/interviews

Telephone questionnaire is a low-cost interview technique. According to Crouch and Housden (2003) the type of questions that should be used is brief questions. That is because it only requires brief factual answers that the respondent can give accurately without much thought. It should be questions that starts with; Do you...?, Don't you...?, Have you...? or Haven't you...? This due to the fact that the telephone calls is going to interrupt the respondent in the middle of doing some other activity. Open-ended questioned should therefore not be used.

6.7 Philosophical Approach

The Philosophy of Realism was the approach used in this thesis. Philosophers that profess realism typically believe that truth consists in a belief's correspondence to reality. That what we clearly and distinctly perceive is real. According to Devitt (1997) realism requires that we know the unknowable and speak the unspeakable. This thesis is about getting the answers to get the knowledge about the unknowable.

7. Analysis for the Locknuts

This Chapter presents the result from the questionnaires. It gives answers on which types of companies that uses locknuts and what criteria's that the customer's have when purchasing locknuts. It mentions some competitors within this branch and the main strengths and weaknesses that SKF possesses.

7.1 The Customer's selection criteria

The main areas that the component, locknuts, is sold to are: Engine Companies (Heavy, General, Electrical, Agriculture, Machine tools, Demolition) Manufacturing Shops, Maintenance Companies and Pump Companies. The application field is such diversity. For example locknuts may be used in engines and an engine consists of so many parts that are loose that need to be tightened. The same goes for the parts of a production line.

The main criteria's that the customer is considering when purchasing a locknut is that when they are buying a small batch of locknuts their biggest aspect that they consider is that the component is of high quality. However, if their purchasing a bigger batch they still wants the high quality component, but then the price has also become a great influence. Another aspect that they are taking in consideration is that the locknuts should be easy to mount.

7.2 The Competitors

SKF has a range of competitors within this field, and those that were mentioned were; PTI, ABEG Group, Schaeffler Group, SPIETH, MFO, NTN/SNR and HSP (Appendix I). Due to that it is such a small but significant part, the locknut, it is difficult to be unaccompanied with a certain version of it for a longer time. This means that everyone has something to provide for the different applications that the customer needs the locknut for, whether it is for a part that needs to be secured in a production line or in an engine.

7.3 SKF, Strengths and Weaknesses

The main strengths that SKF possesses, is that their components consists of high quality materials, that they give good support when the customers are asking for help on choosing the most suitable locknut for their applications.

The most customers thinks that the availability for SKF components are good, it is easy to find what is needed for the different application fields, and that the assortment is great, which is supported by the fact that no one mentioned that there was any type of locknut that is missing from the SKF assortment. However, the weakness is kind of unified, and that is that the price could be lower. Sometimes it is double the amount in comparison to some of the strong competitors for the same locknut (type and size). For example NTN/SNR has an average of being 10% cheaper then SKF, and MFO is 50% cheaper (example, KM9 50 pieces from SKF costs 2.99, while MFO are offering the same for 1.42). Furthermore the market discount that SKF gives are around 75%, while German competitor (German Manufacturer) has a discount of 80%. It can generic be expressed that competitors of SKF within this component is 15% cheaper than SKF. This is also supported by the respondents on the surveys, since they find that the price is a very significant part when the customers are searching for the component that they need. Sometimes it is that significant so that it affects the outcome of on which brand the customer buys their locknut from. They simply choose a cheaper version. However, this is more common when they want to buy bigger batches, as mentioned before.

The results regarding on which locknut that is the bestselling one in Germany where kind of equal for some of the types. The questionnaires show that the KM locknut is slightly more popular in comparison to the others in the assortment of SKF, closely followed by the KMK and KMT locknuts. Moreover, SKF has a great relationship with the distributors. Most of them have regular contact between each other.

8. The Lean Product Development Process

In this Chapter the Lean Product Development Process is introduced. This is a process that SKF is using for starting up projects. All the way from the initiate stage to the following up of the projects is presented. Also the meetings that are mandatory in this process are discussed.

The process that the company uses for initiating and conducting projects is inspired from the Lean Principle. The projects aim is to develop new products, new variants of an existing product, build up a new development processes, or modifying the existing development process. However, this principle can also be used within research related projects, as when a company wants to gain new knowledge within different fields. The Lean Product Development Process is supposed to lead to shorten development cycles, better flow for new/modified products, which leads to higher grade of customer's satisfaction. The principle supports; communication, coordination, flexibility, complexity, problem-solving, decision-making and knowledge sharing. This theory (Lean Product Development Process) is recently (2 years ago) adapted at this company.

The principle is used due to that companies are often complex, which leads to that the communication flow within the organization goes slowly and often misunderstandings will then occur, and the decision making process also is slowed down sometimes very significantly. By using a method that engages everyone that is involved to the project the complexity reduces and it becomes more effective. Some of the other **problems** that this method helps to **reduce** are:

- The **Delayed Projects** – If a project is postponed it may lead to that the company misses to launch the product when the customer's demand is at its greatest and the profitability is at its highest.
- The **Bad Knowledge Sharing** – If only a small group of people knows what is going on and they have to explain it to the individuals one at the time, it is a great chance that it leads to misunderstandings and that the project will get the wrong result.
- The **Product on the market with Bad Profitability** – The Profitability is influenced by the cost of the developing process, price on the product, the volume, and lacks on the quality. The prerequisites for the profitability are created in the product development stage.

Before SKF starts with the Product Development Process and begins with the initiate stage, The Product Plan, it is decided by the marketing department with some discussion with the engineers on which projects that they should execute. This result is then sent to the product development department that does more evaluations on the project, such as a QFD (Quality Function Deployment) analysis. The QFD analysis is a method that makes the product development process more effective. It is focused on the client's needs, and compares it to the product functions that are needed, to gain the greatest customer satisfactions.

Then these projects that they are going to execute, they need to be approved and ranked. This stage is called the Portfolio Planning.

After this the projects are delegated to teams and individuals that get their own responsibilities fields within the different projects that are need to be executed. The tasks are broken down into activities. The ongoing projects each have one board for itself, which gives a great overview on what is happening within each project. The boards are dealing with issues such as, the problems that have occurred, the resources available for the projects and a visibility view on where the project's is at.

To be able to minimize the problems and to be able to deal with them in the initiate stage, morning meetings every Monday that takes approximately 30 minutes is executed. There the issues are brought up to the surface and dealt with immediately. Questions that can be asked are such:

- *What have you done since the last meeting?*
- *What will you do until next meeting?*
- *Is there anything hindering you from executing your task? What? How can that be solved?*

The first two questions give an insight on how the project is proceeding, while the last one becomes a base for the problem-solving. It is significant to deal with the problems in the initiate stage so that the project can proceed smoothly.

By having the project on display (keeping it visual) it is easier for everyone to get an overview on what is going on in the company and to involve everyone engaged to the projects (see fig. 9.1). This principle also supports a new way of thinking. Instead of sitting and just hearing about the problem and most likely find it impossible to solve it is better to visualize the problem so that everyone involved with the suitable competence can help with the solution. To get to the solutions the participants initiate activities or workshops. Furthermore, visual communication gives groups of people a more accurate perception of reality.



Fig. 8.1 How a meeting may occur

The room is available for everyone in the project so if anything is unclear they can go in there to watch and discuss. There are also meeting that can be there daily if the tasks are smaller and that they can deal with it daily. Then they have a task board looking like the figure below.

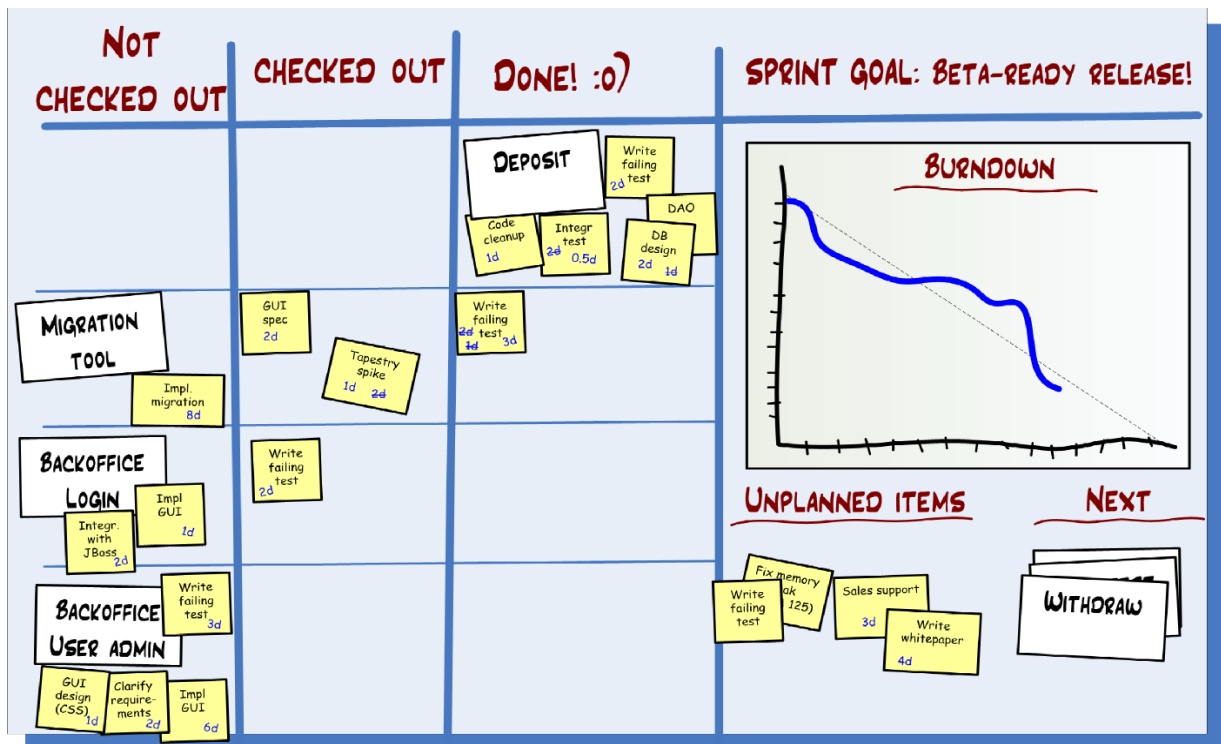


Fig. 8.2 The task board

The assignments are ranked, so the one on top of the right side is the most important tasks, and then in this case it is the tasks related to the migration tools that are the second priority and so fort. The 'not checked' column is things that nobody is working on today. 'Checked out' are thing that somebody is working on today. 'Done' is as it says things that nobody will work on anymore, due to that they are all done. To see how the assignments are minimizing a plot is manually drawn after the daily meeting.

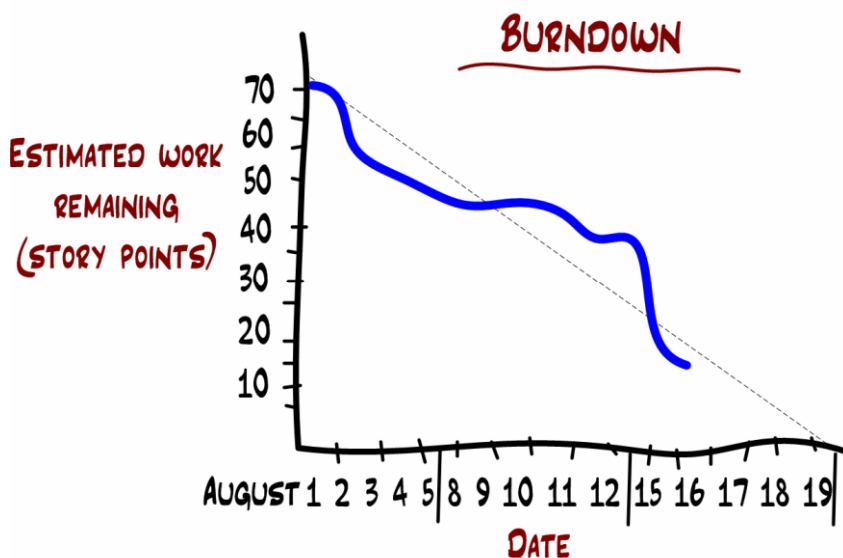


Fig. 8.3 A close up on the Burndown chart

The Burndown chart should be as close to the line decreasing with a straight line downwards. If it is high above that line it is a sign that the tasks are too many and if it is lower than it with a deeper fall. It is an indication that the tasks are done to rapidly.

To follow up and to be able to analyze the result for the project they are using a key ratio that is called New Market Offer (NMO). A person does the selling forecast every year after that the product is launched and this forecast is then followed through each month during a five year period of time.

9. Discussion

This chapter discusses the information gathered in the previous chapters. First the research regarding the locknuts is revealed. Secondly the Lean Product Development Process analysis is presented and in the end the culture differences between Germany and Sweden is briefly discussed.

9.1 Market Analysis

Locknuts are used to many different application fields. It is a significant component, due to that there are a lot of small parts in the industrial environment that needs to be fastened (tightened). It can also be used companies and application fields such as, in machine tools, maintenance companies and pump companies. It seems to be the companies that are manufacturing components like bearings that are producing locknuts as well. Due to that they are easy to produce the competition is huge. As soon as a competitor explores a new revolutionary locknut principle or finds a way to reduce the production costs of them, but still keep the quality at a high level, the competitors adapts it to their organization. However, one thing that the company that actually explored the new principle is to get a patent, but when the time expires the competitors are fast to adapt it to their own organization.

However, during that time they can establish themselves and becoming a greater competition since if they have developed a great new component with greater benefits then their competitors they may be able to get even more end users. By the time that the patent has expired the end users maybe do not see any advantages on changing back to their old supplier. That is if they are satisfied with the new supplier. So in that way it can be seen as an advantage.

The difficulty is to know what the customers want to be able to get this advantage since none of the distributors mentioned that they felt that there were any locking principles or locknuts missing. All of them were satisfied with the assortment available on the market. More specific they also told that they did not feel that SKF was missing any type of locknut in their assortment neither. Those that are using the locknuts are finding what is needed for the application fields.

The only thing that was unified by the distributors was a weakness for SKF and that was the price. So if they want an even stronger position within this field they have to find a way to produce cheaper locknuts without losing the quality of it. It could be a new way of producing them or a cheaper kind of material. However, the researcher do not think that it will add too much value, since SKF already has a leading position regarding the bigger components such as conveyors and bearings. Of course this is just assumptions after getting the answers from the distributors and receiving a hint that it is a hard component to get a grip on. Since they are small and the specific application file d is hard to summarize, it could not be found on which exact place locknuts are mainly used.

SKF should keep up producing the high quality product, which seems to be one of the things that they are famous for. It does not seem to be any greater advantages to produce a new locknut, since as mentioned before the customers seemed to be satisfied with what SKF can offer. They should also keep up the good support that they give the buyers. Due to that when the competition is as big as it is, the difficulty is to compete with the component. It is then better to make an effort on having a great knowledge about what they have to offer so that they can support the customer when they ask for advices.

If the communication level between supplier and customer is high, it develops a trust between them as mentioned in the literature part. With trust then the commitment will be stronger and the uncertainties between them will reduce, because they have developed a long-term relationship. With another word, the customers know what suppliers can offer to them and consequently the supplier knows what they are expecting from them.

9.2 The Lean Product Development Process

The principle that SKF is using when they initiating a project are influenced by the Lean Principle and is even called for the Lean Product Development Process. There are very obvious similarities to the original Lean method that is developed by Toyota. However, they have as so should, adapted it to their organization. The principle is not a method that should be followed as a fixed frame. It is only guidelines and recommendations that should be adapted to the organization that it is going to be used in. This is due to that not every organization is functioning in the same ways because the companies do not have to be in the same field. It can for example also be used in IT companies.

At SKF they want to visualize the process that needs to be done. They want everyone that is involved in the project to be “on the same page” so that the misunderstandings on what that has to be done are reduced or even none-existing. This is something that is presented as a significant part in the Lean principle. By involving everyone and reducing the misunderstandings the project can move forward more smoothly in comparison to if everyone had to be notified individually and then the information may have varied. Then the project result would have been bad, since the persons involved did not work in a unified way. The project therefore has to be visualized and everyone should know the main goal and the sub goals that have to be passed to reach the main goal.

They are also working in a way so that the waste is reduced. By having the morning meeting every Monday they are able to deal with the problems as soon as they initiate. However, this was something that the participants first were a bit skeptic about, since they did not know how all these questions could be dealt with during such a small amount of time. They had to be proven wrong. It is better to show the doubtful ones that it works rather than just arguing about it. Show is better then tell.

The meetings are not long, so that everyone can participate. They take approximately 30 minutes. That is enough to get through the status of the projects. Everyone gets notified on where they are in the project and sometimes when problems occur they discuss on why they cannot proceed as planned. Then as many persons that is needed to solve the problem deals with it, and when it is unraveled then the project can proceed again. This reduces the accumulative that the problem may cause. Status update is something that is mentioned in the Lean principle, so that the involved persons can discuss what the next steps are and if there are any problems hindering them to proceed in the project.

To keep a record on what they have done and how they did solve it, make it easier to solve it the next time it occurs. This is something that Lean is mentioning, which is called to learn and improve. Learn from your mistakes, see figure below.

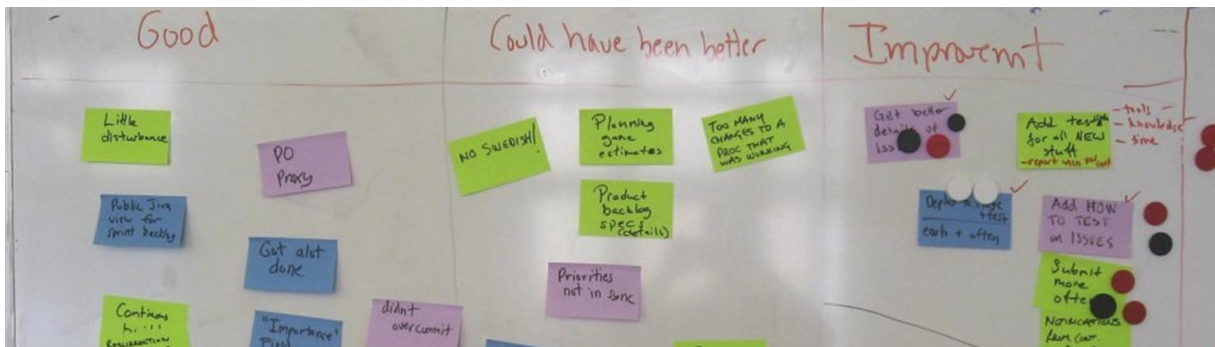


Fig. 9.1 Evaluation on what that has been done

Lean also brings up that it should have standardization for the lower-level tasks, so that the system gets more effective on the higher levels.

It is of great importance to have a strategy to how to start up projects and to create new products to be able to be a good competitor. It is also significant to have it to be able to adapt to the changing environment.

9.3 Cultural Differences' impact on Research Studies

Hofstede and Hofstede (2005) mentioned that Germany is a masculine country, which means that the employee gets motivated of recognitions and possibilities for advancements. Moreover, according to Hofstede and Hofstede (2005) the Germans like to work after standardizations and they have a low Personal Distance Index (PDI). That Germany is a country with a low Personal Distance Index (PDI), means that within their organizations they have a high level of trust. This is something that the researcher experienced.

When the researcher wanted to get help with how the interview would be conducted and get the information on whom to interview, the Sales Manager in Germany was contacted. The Sales Manager then gave the researcher two names to his subordinates. These two persons are in that position that they report to the sales manager and they are the ones that have the direct contact to the distributors in Germany. It was therefore up to them to decide in which way the interviews would be conducted. The Sales Manager had given them free hands.

10. Conclusion

This chapter concludes the discussion and gives some recommendations on how to proceed with a project dealing with this subject and if it is worth the effort to actually do that.

Regarding the locknuts SKF should keep up the producing of locknuts that they are doing today. There were no compliments needed on the existing assortment, the quality and service was outstanding. However, if SKF want to improve their status within the locknuts field they should consider finding a cheaper way to produce the locknuts. They could maybe find a cheaper material that has the same quality as the material they are using today.

If the company wants more information, a thorough research should be executed with more detailed questions. The interviews should be executed as a face-to-face interview, since it is then easier to ask follow-up questions so that the interviewer gets enough information to analyze.

Concerning the lean principle, it is a principle that has impacted the company in a positive way. By just making some easy changes, such as having the process visualized and having mandatory morning meetings that deals with the problem at an initial stage and involves everyone connected to the project, the wastes are reduced and the process flows more even and effective.

Finally, when a research is to be done in another country it is important to know how to deal and to respect the cultural differences.

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12. Appendices

Appendix A – KM/KML Locknut and the principle for Locking Washer

KM/KML – with Locking Washer

The KM(L) with combination with an MB(L) locking washer and key way is idyllic for effective locking.

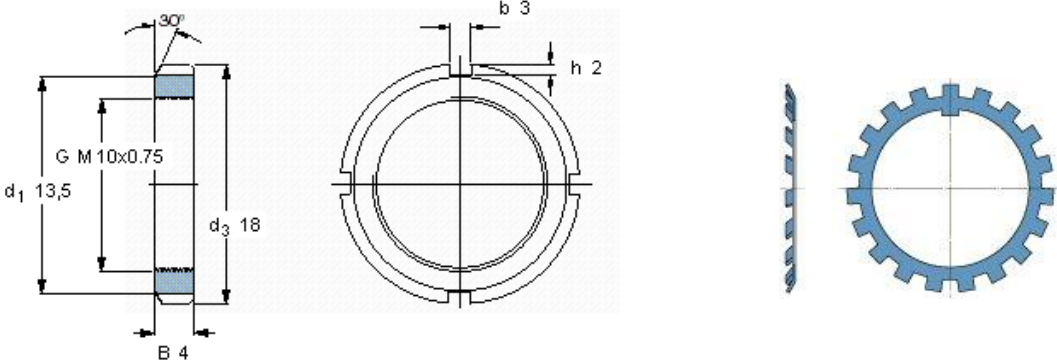


Fig. 12.1 The KM(L) Locknut and Locking Washer

Lock nuts with Locking Washer

An external locking washer is used when locking the KM/KML nuts. The inner tab is fitted in the keyway in the shaft, which prevents the lock nut from turning. One tab is bent into place in one of the lock nut slots see fig. 12.2.

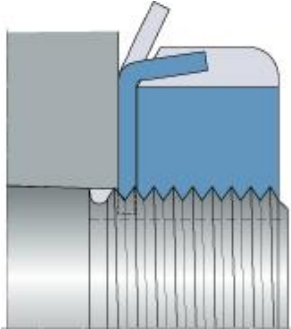


Fig. 12.2 Locking Principle for Locknut with Locking Washer

Appendix B – HM/HML Locknut and the locking principle with Locking Clip

HM/HML – Locking Clip

Lock nuts in the HM(E) 30 and HM 31 are locked by an MS locking clip consisting of the clip, a hexagon headed bolt and a spring locking washer.

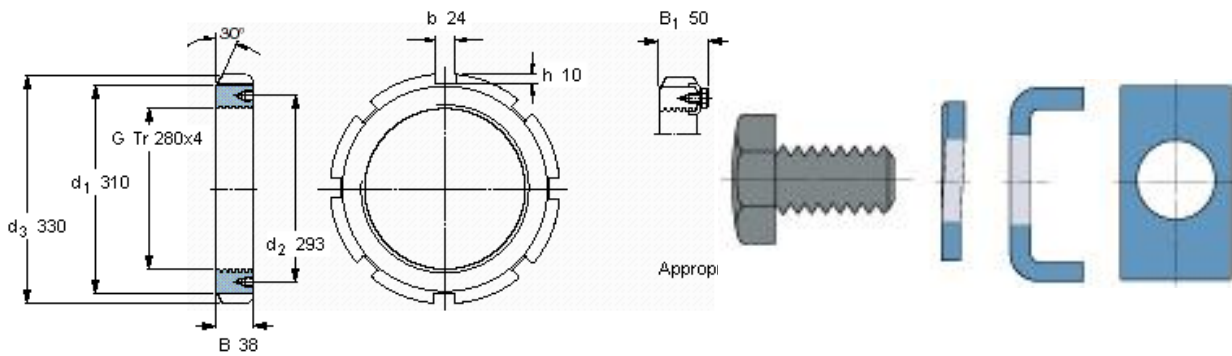


Fig. 12.3 HM/HML Lock nut and Locking clip

Lock nuts with clip

Locking clips are attached to the nut using a bolt to engage a slot in the nut and a keyway in the shaft. Locking clips are used with lock nuts in the HM 30 and 31 series see fig. 12.4.

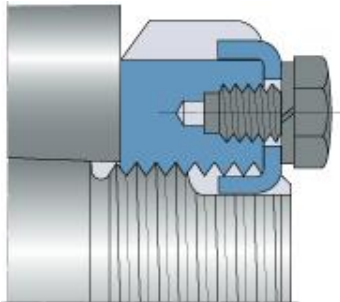


Fig. 12.4 Locking Principle for Locknut with Locking Clip

Appendix C – KMFE Lock nut and the locking principle with Locking Screw

KMFE – new locking principles

The KMFE lock nuts have new locking principles.

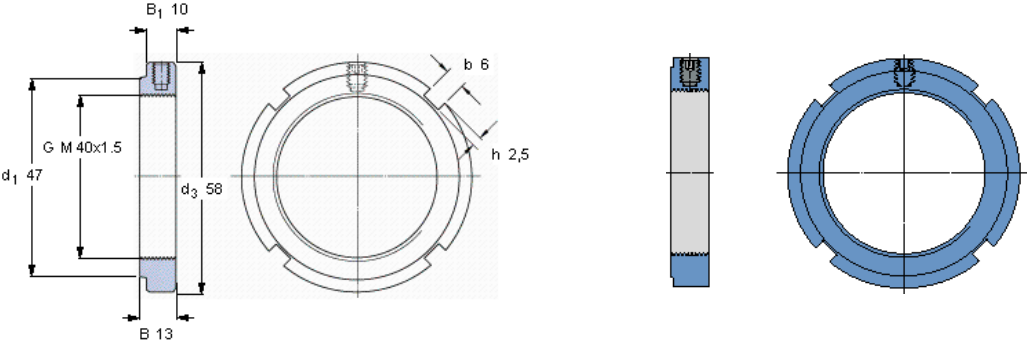


Fig. 12.5 The KMFE Locknut

Locknuts with Locking Screw

This method is used for KMFE, which is a lock nut based on the KM-series. The screw deforms the inside edge, securing the lock nut in place. Neither additional locking washer nor a keyway in the shaft is required. The KMFE nuts can be re-used.

The KMFE nuts have slots in the outside diameter so that they can be tightened using a hook or impact spanner. A hexagonal wrench is needed to tighten the grub screw as shown in fig. 12.6.

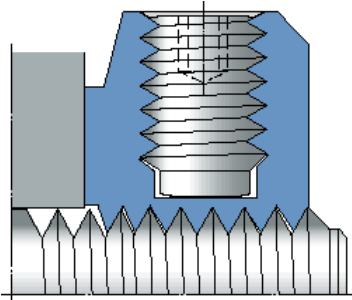


Fig. 12.6 Locking Principle for Locknut with Locking Screw

Appendix D – KMK Lock nut and the locking principle with Integral Locking Device

KMK – Simple Mounting

The KMK lock nut is great to keep the mounting simple.

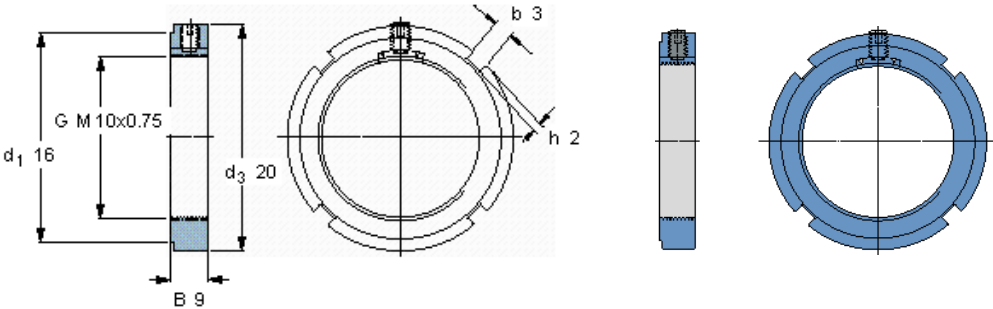


Fig. 12.7 The KMK Locknut

Lock nuts with Integral Locking Device

KMK lock nuts are locked with a locking device. The screw pushes the insert, which locks the nut into place. Axial forces are carried by the entire length of the thread (see fig. 12.8). Mounting and dismounting are simple and the axial location effective and reliable. Neither additional locking washer nor keyway in the shaft is required. The KMK nuts can be re-used.

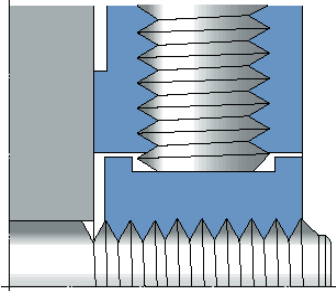


Fig. 12.8 The Locking Principle for Locknuts with Integral Locking Device

Appendix E – KMT/KMTA locknut and the locking principle with locking pins

KMT – Simple Mounting

The KMT lock nut is perfect to use to get a high precision. It is the most widely used standard industry lock nut. These lock nuts do not require keyway and are applied with a locking pin.

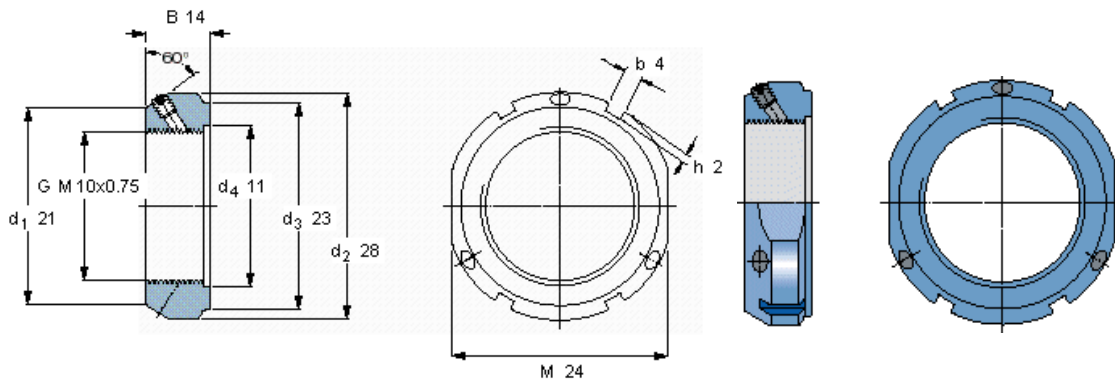


Fig. 12.9 The KMT Locknut

KMTA – Compact Design

The KMTA lock nut is ideal for compact designs.

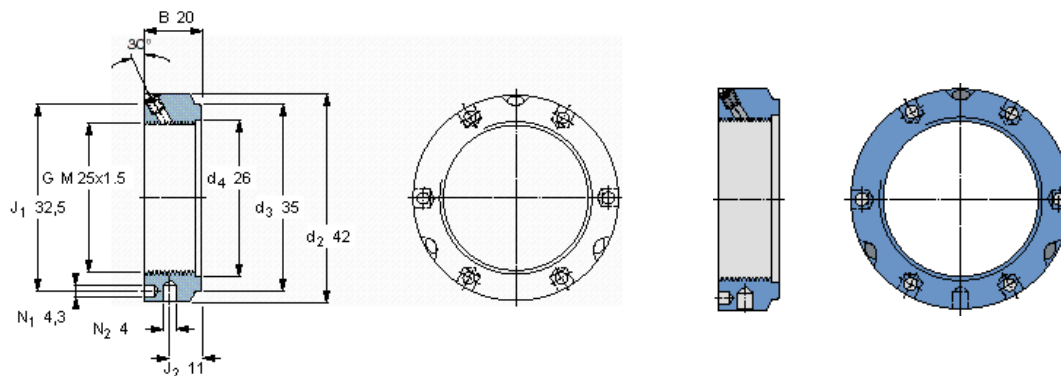


Fig. 12.10 The KMTA Locknut

Locking nuts with Locking Pins

KMK/KMTA is unique and high precision lock nuts, which are locked with locking pins. Precision lock nuts have three locking pins equally spaced out, which enable the nut to be accurately positioned at right angles to the shaft or they can be used to adjust for inaccuracies or deviations of other components which are to be located on the shaft. These pins are pressed against the shaft by grub screws. The screw pushes the pin into the thread, securing the lock nut in place (as shown in fig.

12.11). This makes that the lock nut can withstand great axial load and high speed, which makes that it virtually has no run out. The pins are arranged at the same angle as the thread flanks. The precision lock nuts are available in two designs as been shown above (KMT and KMTA).

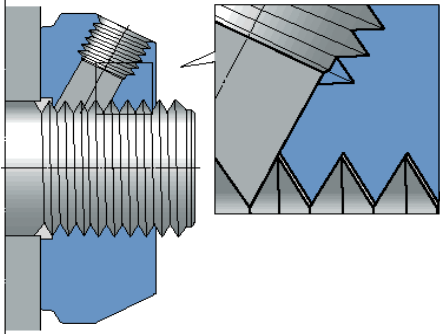


Fig. 12.11 The Locking Principle for Locknut with Locking Pins

Appendix F - HMS Lock nut and the locking principle with Internal Clamping Bolt

HMS

The essential advantages of the split HMS lock nut, in comparison to the most common locknuts, are as follows:

- No keyway in the shaft is required, thus making the overall design more robust and reduce manufacturing cost
- Easy to mount, this is especially important where large-size nuts are concerned. Mounting and dismounting can be facilitated by expanding the slot using the clamping bolt.
- There is no problem with fretting corrosion when dismounting, as the ring body can be slightly expanded.

HMS lock nuts from SKF are suitable for the same applications as the HM lock nuts with locking clip. They can be used to:

- Axially locate large-size bearings or other components
- Secure a withdrawal sleeve with a mounted bearing, or axially locate other large-size components, e.g. gears or flywheels, on shafts. As already mentioned they are in service in wind turbines. However, they should not be used at all to drive up bearings onto tapered seatings, even if the SKF oil injection method is to be used.

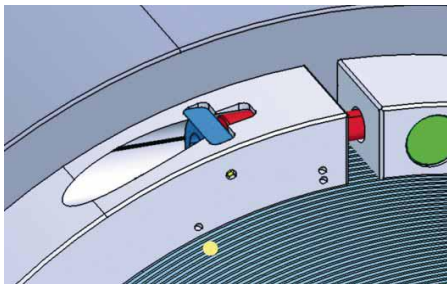


Fig. 12.12 The HMS Locknut (both of the pictures)

KMFE, KMK, KMT/KMTA and HMS do not require a keyway and they are unique for SKF. Moreover there are also hydraulic nuts that are meant to facilitate bearing mounting and dismounting. The medium that is used to push a piston is oil.

Locking with the Internal Clamping Bolt

The HMS locknut is secured by tightening the internal clamping bolt. The clamping bolt closes the gap, securing the lock nut into place as fig.12.13 shows.

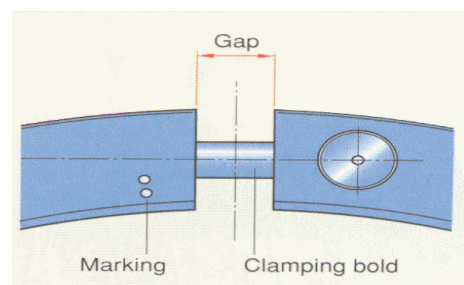
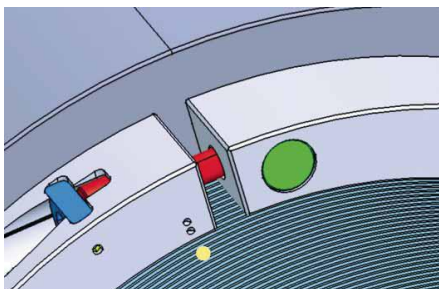


Fig.12.13 Locking Principle for Locknut with Internal Clamping Bolt (both of the pictures)

Appendix G – The interview questions to the distributors, in both English and German

The Customer

- To whom do you sell locknuts? Type of companies, products, etc.
An wen verkaufen Sie Kontermuttern? Welche Arten von Unternehmen, Produkte, etc.
- May I have the names of some customers for SKF *and competitors*?
Können Sie mir einige Namen von Kunden von SKF geben oder Konkurrenten von SKF?

The sourcing process

- Do the customers often request a specific locknut or do they ask you for alternatives?
Fragen die Kunden oft bestimmen Kontermuttern oder werden Sie auch nach Alternativen gefragt?
- Do you know what criteria the customers' mainly go by when they purchase locknuts? Price? Previous experiences?
Wissen nach welchen Kriterien die Kunden entscheiden, wenn es um den Kauf von Kontermuttern geht? Zum Beispiel der Preis oder vorherige Erfahrungen.
- When customers' buys a locknut, do they search for a specific brand?
Wenn Kunden Kontermuttern kaufen möchten, fragen sie nach bestimmten Herstellern?
- How important is the price?
Wie wichtig ist der Preis?

SKF as a supplier of locknuts

- What kind of locknut is the best selling one from SKF?
Welche Kontermutter verkauft sich von SKF am besten?
- Which brand do you sell most of?
Welche Marke verkaufen Sie am meisten?
 - To which segment?
An welche Branche?
 - Why do you think it is so?
Warum glauben Sie, dass es so ist?
- SKF Strengths and Weaknesses?
Was sind SKF's Stärken und Schwächen?
- Where (in what products) is it (the locknut) mostly used?
Wo (in welchen Produkten) wird sie (die Kontermutter) am meisten verwendet?

- Do you feel that there is a certain type of locknut missing in the SKF assortment that the end users are asking for?

Meinen Sie, dass im Sortiment von SKF eine bestimmte Art der Kontermuttern fehlt, die von Kunden nachgefragt wird?

- How is your contact with SKF?

Wie stehen Sie mit SKF in Kontakt?

- Can I get your retail prices for locknuts for competitors and SKF?

Können Sie mir Ihre Preise für Kontermuttern von SKF und zum Vergleich die Preise der Konkurrenz geben?

- Which is the strongest/biggest competitor that you sell locknuts to within your geographical area?

Wessen Kontermuttern verkaufen sie am meisten in Ihrer Nähe und an welche Art von Unternehmen verkaufen Sie meistens?

I understand the purpose of this research and agree to participate.

Ich verstehe den Sinn dieser Untersuchung und möchte teilnehmen.

Appendix H – The interview questions to the end users, in both English and German

Distributors

- What distributors are you buying locknuts from?
Von welchem Händler beziehen Sie Kontermuttern?
- What is the most important reason for choosing a certain distributor?
Welches ist das wichtigste Kriterium nach dem Sie Händler auswählen?

Sourcing process

- What does the buying process look like?
Wie läuft der Kaufprozess ab?

Suppliers

- How much interaction do you have with your suppliers of locknuts?
Wie viel Interaktion haben Sie mit Ihrem Zulieferer?
- What is the reason for choosing a certain distributor?
Was sind Gründe für Sie, sich für einen bestimmten Distributor zu entscheiden?
- Do you get application advices when buying locknuts?
Erhalten Sie Anwendungshinweise, wenn Sie Kontermuttern kaufen?
- Do you feel that you get enough technical support (do they have enough competence? Are you pleased? Why? Why not?)
Finden Sie, dass sie ausreichend technische Hilfestellung erhalten? (Ist ihr Zulieferer kompetent genug? Sind Sie zufrieden? Warum? Warum nicht?)
- Where did you find the information about the locknut?
Woher haben Sie Ihre Informationen über Kontermuttern?
- Are you pleased with the availability of the assortment?
Sind Sie mit dem Umfang des Sortiments zufrieden? (Zugänglichkeit? Zufriedenheit?)

Requirements on locknuts

- What are your main problems concerning locknuts?
Was sind Ihre häufigsten Probleme bezüglich Kontermuttern?
- How often do you replace a locknut?
Wie oft tauschen Sie Kontermuttern aus?
- What is the most common reason for changing/replacing a locknut?
Was ist der häufigste Grund für den Austausch/das Wechseln von Kontermuttern?

- How often do you buy new locknuts?
Wie oft kaufen Sie neue Kontermuttern?
- Do you feel that there is some kind of locknut missing in the SKF assortment?
Finden Sie, dass seine Art von Kontermutter im Sortiment von SKF fehlt?

- I understand the purpose of this research and agree to participate.***
- Ich verstehe den Sinn dieser Untersuchung und möchte teilnehmen.***

Appendix I - The Competitors and what they have to offer

- **PTI** -> Locknuts with Washers
- **ABEG Group** -> Locknuts with Washers
- **Schaeffler Group (INA & FAG)** -> KM, KML, HM, HMZ

- **SPIETH** -> MSR/MSA, MSW with clamping screw, MSF
- **MFO** -> KMT/KMTA, HMT, HM
- **NTN/SNR** -> Self locking precision nuts, tightening nuts, Locknuts with Washers
- **HSP** -> KM, KML, HM, HML