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Success within Front End of Innovation

Recommendations for enabling creation and development of ideas at Atlas Copco, Construction Tools

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Abstract

Several researchers talk about how the greatest source of competitive advantage is a firm's capability to be innovative, and it is a fact that economic growth is built upon innovations and ideas. Ideas belong to the early activities of innovation processes, which can be defined as the front end of innovation (FEI). FEI has clearly been stated to be crucial for the innovative performance of firms, but yet an area which many companies often lack of handling in a structured way.

What need to be considered for a successful FEI has laid the foundation of this thesis. The aim with the thesis is to investigate what are key success factors and common pitfalls for processes and activities within the FEI, and how these can be handled by management. The thesis is also investigating how ideas and innovations can be measured in order to take the right decisions for different types of ideas by a suitable level of decision-makers. The thesis was carried out as a case study at Construction Tools division at Atlas Copco who had expressed the same demand as many companies appear to struggle with: a structured FEI. The goal with the thesis is therefore to propose recommendations towards a successful FEI, including structures, methods, and tools for the case company. In order to do so, twelve semi-structured qualitative interviews with internal employees followed by ten semi-structured qualitative interviews with external companies in different industries and sizes were conducted. Along with the case study, a literature study was also performed.

The collected data were analyzed and benchmarked towards the literature and the research questions, which resulted in several conclusions which are both general as well as organizational specific for the case company. These are amongst others: *a structured innovation portfolio management including clear budget allocation and innovation strategy*; *enabling a creative culture*; *separating staff for conducting work regarding disruptive ideas; involvement by top management in the development of ideas.*

Keywords *Management Control, Fuzzy Front End, Innovation Management, Measurement, FEI, Ideation, New Product Development*

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Sammanfattning

Flertalet forskare pekar på att bland det viktigaste för ett företag att vara konkurrenskraftig handlar om deras förmåga att vara innovativa. Idéer hör till de tidigaste aktiviteterna i innovationsprocessen, vilket kan definieras som förutveckling som har visat sig vara tydligt avgörande för företagens innovativa prestanda.

Vilka faktorer som företag måste överväga för en framgångsrik förutveckling har lagt grunden för detta arbete. Syftet med projektet är att undersöka vilka framgångsfaktorer och vanliga fallgropar som förekommer i det tidigaste skedet i produktutvecklingen och dess tillhörande aktiviteter, samt hur dessa kan hanteras och påverkas av chefer. Projektet undersöker också hur idéer och innovationer kan mätas för att beslutsfattare ska kunna fatta rätt beslut kring olika typer av idéer. Projektet genomfördes som en fördjupad fallstudie hos Construction Tools divisionen på Atlas Copco som uttryckt samma problem som identifierats hos andra företag: bristen av en strukturerad förutvecklingsprocess. Målet med projektet är därför att föreslå rekommendationer till en framgångsrik förutveckling som inkluderar strukturer, metoder och verktyg för uppdragsgivarna. För att möjliggöra detta genomfördes tolv halvstrukturerade kvalitativa intervjuer med interna medarbetare på uppdragsföretaget, följt av tio halvstrukturerade kvalitativa intervjuer med externa företag i olika branscher och av olika storlek. Kombinerat med fallstudien genomfördes också en litteraturstudie.

Den insamlade datan från intervjuerna analyserades och jämfördes mot litteraturen och forskningsfrågorna, vilket resulterade i flertalet slutsatser som både är generella samt organisatoriskt specifika för uppdragsgivarna. Dessa innefattar bland annat *vikten av en strukturerad innovation- och produktportfölj, innehållande en tydlig budgetallokering och innovationsstrategi; möjliggörandet av en kreativ kultur; att separera personer för att enbart arbeta med disruptiva och radikala idéer; aktivt deltagande av ledande befattningshavare vid idéutveckling.*

Nyckelord *Management Control, Fuzzy Front End, Innovation Management, Measurement, FEI, Ideation, New Product Development*

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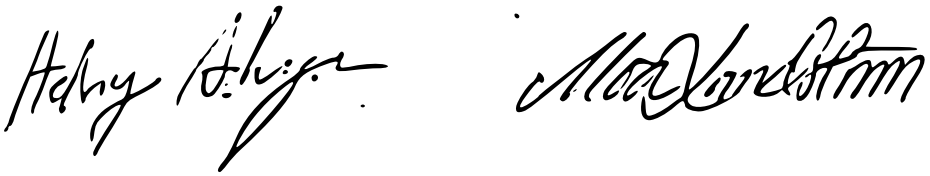
Lastly, we want to express our gratefulness to the Ethiopian ancestors who were the first to investigate and recognize the energizing effect of the coffee plant, as the beverage created from it has been out of value during the conducted work.



Hedvig Ahlgren & Moa Landström

Stockholm, May 2017

TABLE OF CONTENT

1. INTRODUCTION

This chapter describes the background, purpose, and limitations of the thesis in order to provide the reader with an understanding of the conducted work.

In today's society most industries are changing faster, the market expectations are high, and the fierce competitive pressure is constantly present which means that companies need to be able to innovate on different levels and speed (Tidd, 2001). Chesbrough (2003) as well as Schilling (2013) talk about how the greatest source of competitive advantage is a firm's capability to be innovative. Further on, it is a fact that economic growth is built upon innovations (Jalles, 2010; Killen et al., 2008). Several different definitions for innovation can be found in literature, and for this report the definition by Schilling (2013) will be used for the term Innovation: *"The practical implementation of an idea into a new device of process"*. The initial part of the innovation chain, as mentioned in the definition, starts with ideas. Ideas can emerge and be developed during the early activities of the innovation process, and these activities and stages can be defined as the front end of innovation (hereinafter referred to as FEI). FEI has clearly been stated to be crucial for the innovative performance of firms (Kijkuit & Van Den Ende, 2007; Koen et al., 2001; Reid & De Brentani, 2004), and it is therefore critical to have a clear and structure way of working with it that suits the specific company.

Despite the cognition regarding the importance of a structured way of working with FEI, it has been found that many companies struggle of handling this matter (Koen et al., 2001). One challenge with this area is how to manage it right for the specific company and their environment and industry. While some organizations have a high demand to innovate and come up with completely new solutions in order to survive in their industry, others have a lower need to innovate and will survive by just improving their existing products. Hence, what has been clearly shown through research is that companies which put down effort in terms of time and resources into their early phases also have a higher quality of new products (Koen et al., 2001; Kijkuit & Van Den Ende, 2007). FEI is more of a exploratory nature compared to the later stages of product development (Stetler & Magnusson, 2015), and important factors which affect the execution of the activities and methods within the FEI are management control as well as suitable measurement for judging ideas. In theory, many attempts have been made to conclude a common framework for best practise (Koen et al., 2001), but as there are many dimensions of innovation it is a difficult task. Important areas, such as idea management, decision-making, measurement, and cross-functional collaboration, have been identified to be important in understanding what happens in the early stages and how it can be handled.

The case study was performed at Atlas Copco, which is a Swedish industrial company that consists of five business areas divided into total 16 divisions[1]. One of their product companies, which is included in the division Construction Tools, is situated in Kalmar, Sweden, and is considered to be the innovation center of the whole division. Their latest innovations are successful and come mostly from technical ideas or from specific customer demands. Although, presently their FEI is of ad-hoc nature, being undefined, lacking

[1] http://www.atlascopcogroup.com/se/about-us/our-business (2017-05-15)

structure, methods, suitable measurements, etc. The product company in Kalmar therefore desires to implement a well-structured process which will help to keep track of as well as securing ideas for their future innovations.

1.1 Purpose

The aim with the thesis is to investigate what are key success factors and common pitfalls for processes and activities within the FEI, and how these can be handled by management. The thesis is also investigating how ideas and innovations can be measured in order to take the right decisions for different types of ideas by a suitable level of decision-makers. The goal with the thesis is therefore to propose recommendations towards a successful FEI, including structures, methods, and tools for the case company. The recommendations presented in this report are of general characteristics and can therefore also be useful for companies within other industries.

1.2 Limitations

- This master thesis is conducted at KTH Royal Institute of Technology during spring semester 2017
- The thesis will run during 20 weeks
- A total amount of ten external companies will be interviewed
- Implementation will be held outside the thesis
- No workshops or experimental work will be included to try the suggested process at the case company
- The suggested recommendations for FEI will be primarily designed to suit the product company located in Kalmar

2. LITERATURE FRAMEWORK

This chapter will present the literature framework, divided into the areas Front End of Innovation, Management Control, and Measuring Innovations and Ideas. The chapter also includes the research questions for the thesis.

In order to obtain a comprehensive understanding of FEI, a theoretical study is obtained to investigate what has been found in academia regarding processes, activities, and tools that are related to the area. There are four main areas within this chapter. Primarily, Innovation Management is presented to outline necessary terms and definitions to give the reader a common understanding of the subject. After that, FEI is examined to outline important findings within the area. Next subchapter follows is Management Control, which includes findings regarding the importance of managers and their structures. These are examined to gain a more comprehensive understanding of their roles and applied structures and methods in which they are responsible for regarding FEI. The last subchapter is about Measuring Innovations and Ideas, which has shown to be a crucial part of innovative ideas and FEI. Initially, there is a need to first address some basic knowledge about innovation management in general and conclude upon definitions of certain terms.

2.1 Innovation Management

As the name reveals, innovation management is about how to manage innovation performance, both regarding products as well as organizational matters such as processes and business models. Although decades of research have been performed, there is no clear framework of "best practise" for innovation management. Tidd (2001) means that there is no "one size fits all" of managing innovations as there are many factors to consider. As industries and companies differ in terms of need for innovation, technological and market opportunities, and organization specific characteristics, it becomes difficult to create one common formula. In order to know how to manage innovation, it is important to first differentiate the levels of innovations that exist. For example, both Schilling (2013) as well as Crossan and Apaydin (2010) talk about the distinguishment between different types of innovations, which most commonly are divided into incremental, radical, and disruptive innovations.

2.1.1 Incremental and Radical Innovations

Incremental innovations are often built upon existing products and knowledge, and often include smaller changes or adjustment of current products (Schilling, 2013). Radical innovations can be seen as new to the world of the specific company, and can include fundamental changes and a clear distinguishment from a company's existing way of working, both regarding processes as well as products. Hence, a radical innovation can depending of the case be defined as new to an industry, new to a company, or new to an adopting business unit (Nagji & Tuff, 2012). What is radical for one company can be less radical for another, which means that the term is relative and can change over time (Katila, 2007). As an example, Katila (2007) brings up a wide array of different definitions of technical radical innovations in categories which are *industry, organization, user,* and *technologically.* Innovations that are radical for an *industry* bring previous technology obsolete and impact on

new market power, whereas radical for an *organization* means that new technology for them might be well known by other organizations. Third, *user*-radicalness is when an innovation fulfills a customer need significantly better than previous products. Last, *technological* radical innovation is when a total new way of building a technology is acquired and changes the way a product is composed, which can appear disruptive to the persons who are experts in the previous technology.

An issue which is brought up by Crossan and Apaydin (2010) is the difficulty of handling both incremental as well as radical innovations at the same time within an organization. The term *ambidextrous organization* is brought up by Tushman and O'Reilly (1996), and is about how a company is able to both work with incremental projects as well as radical and disruptive projects simultaneously. They mean that for companies to remain successful and competitive, the company itself as well as its managers needs to be able to work ambidextrous in order to implement incremental innovations as well as revolutionary change in terms of radical innovations when needed depending on the market. Result shows that the companies who launch successful products or services often tend to be ambidextrous (Tushman & O'Reilly 1996; Nagji & Tuff, 2012). There are suggestions in how a company can achieve this, where one for example is to separate different business units or creating smaller satellite groups which can focus on projects that are more radical without being disturbed by the daily business and routines. Although, many companies still struggle with how the different ways of working can exist simultaneously within the organization.

2.1.2 Disruptive Innovations

A third type of innovation which is mentioned by Schilling (2013) is called disruptive innovation, or disruptive technology. An innovation is disruptive when it meets the same market needs but with a completely new technology which has been developed based on new knowledge. There are many examples of when disruptive technologies have entered a certain market and completely ruined all existing competition in time when the technology has been adopted by the majority of the market (Chesbrough, 2003). One example is when the compact disc replaced the vinyl records, and then again when the service of Spotify replaced the compact discs and CDs (Schilling, 2013).

Many companies miss out on disruptive innovations because of difficulties estimating and interpreting future markets which do not exists yet. It can also be because of heavy dependency of existing customers and suppliers why a company fails to adapt to a new arising technology. Chesbrough (2003) talks about how to handle, what he refers to as "False Positive", ideas that turn out to be bad projects but initially looked promising, as well as "False Negatives", which are ideas that once got rejected due to high risk and uncertainty, but later showed to have made great profit if implemented. The reason why false negatives occur is mostly because of incorrect judgments of the commercial value, where products or services which are closer to existing core business often get prioritized as they can show more accurate and faster Return Of Investment (hereinafter referred to as ROI). Judgment and selection of ideas will be discussed further in subchapter 2.4.

Bower and Christensen (1995) present a method including a few steps to be able to spot disruptive technologies. First, it must be looked over which of the many upcoming different technologies can be a threat to the existing products. One approach is for the marketing,

financial, and R&D-departments to have a common discussion about any of the threats together. If the departments disagree, it is often a sign that the technology is disruptive and top management should explore it further. Next step is thereafter to ask the right questions to the right people about strategic importance. The wrong people to ask here would be the established customer as they are not good at judging and valuing disruptive technologies. Therefore it is a challenge to identify the new initial market. New tools and methods for identifying them must be used. Instead of looking at the existing market, the managers must create information about who the potential customers would be, what the right price would be, and most importantly how the performance of the disruptive technology brings value to these new customers (Bower & Christensen, 1995).

2.1.3 From Idea to Commercial Product

The definition of innovation used for this report states that innovation is the practical implementation of an idea into a new device of process. Björk and Magnusson (2009) mean that in order to turn knowledge in the form of an idea into an innovation, the idea has to be made explicit so that the knowledge can be shared with other organizational members to be able to start executing upon the idea. What needs to be addressed is the definition of an idea, where the definition made by Gakidis and Marina (2001) will be used for this report and goes as follows:

> "*Ideas are meant to broadly include intangible concepts and intellectual property, including business ideas, technical ideas, invention disclosures"*

A common process which is widely used for executing this practical implementation of an idea is the New Product Development (NPD) process. It normally consists of several well-set activities for firms to deliver new products or services to the market, starting from an idea and ending in a commercial product launch and should involve all necessary departments within the organization. Normally, NPD is combined with a Stage-Gate model, which is an example of such well-structured process which consists of different stages which all ends with gates where decisions are made. Another process for driving innovation is Agile Process Management. According to Bider and Jalali (2016), agile development is related to the adaption of processes to more permanent changes in the business environment, which means both being able to adapt to external environmental changes as well as being able to discover new opportunities which will appear in the dynamic world for launching a completely new product or service. They also mean that becoming agile requires a structure that allows discovering changes and opportunities fast and react upon these accordingly. Cervone (2011) means that agile project management highlights two important concepts where one of them is to minimize the risk focusing on short iterations based on defined deliverables. The other concept is that direct communication with partners in the development process is strengthened, instead of creating larger amount of project documentations. The author means that both concepts help a project team to adapt quickly to the unpredictable and rapidly changing environment and requirements which most development projects are carried out through.

Some companies choose to have every step from idea to commercial launch included in their NPD process or agile process, hence, it is common to have activities and processes which are not as well-structured before the two mentioned processes; *the front end of innovation*, as presented in the introduction referred to as FEI. FEI, sometimes called the Fuzzy Front End,

is the most initial part of handling innovations and is for example by Koen et al. (2001) defined as the activities that take place before the formal and well-structured NPD starts. This is also agreed upon by Ahmed (1998) who means that innovations can be divided into three phases, where the first phase includes idea generation which he refers to as "the fuzzy front end". The second and next phase after this includes the more structured methodology, also here example of the Stage-Gate model given. Finally, the third and last phase involves commercialization, i.e. to actually make the idea practically feasible.

There are many important and critical factors which have been addressed in literature regarding FEI. To fulfill the purpose of the report, the focus will lay upon these early phases of innovation in order to examine and investigate critical factors, such as idea management, culture and climate as well as cross-functional collaboration.

2.2 The Front End of Innovation

As earlier mentioned, FEI can be defined as activities that together form a process where ideas are created and further developed and, according to Khurana and Rosenthal (1998), ends with the go/no-go decisions for the start of a project. This definition means that the front end finishes when a business unit executes to launch and fund a NPD project, or decides to stop further project development. A disagreement of this definition has been found in the article by Koen et al. (2001), as they mean that many projects receive funding also during the front end. Kim and Wilemon (2002) define the front end as:

> "*...the period between when an opportunity is first considered and when an idea is judged ready for development"*.

For this report, this definition will be valid for what will further be referred to as FEI. The front end has been found to be important for the innovative performance of firms, both to gain competitive advantage and also to obtain a more efficient product development process (Kijkuit & Van Den Ende, 2007). The result from a survey sent out by Koen et al. (2001) to 23 companies, in order to determine the proficiency of NPD and the front end, shows that one contributing factor that may account for the high level of innovation in these companies is the proficiency of the front end rather than proficiency of NPD.

Koen et al. (2001) define three phases in front end that represent the major phases that all ideas go through before they considered financing. The three phases, which are defined as the generation, development, and evaluation phase, are interdependent and not necessarily sequential. For the idea generation phase, the most important activities are the problem identification, problem structuring, and idea formulation. Since the idea generation often takes place close to unconsciousness, both the problem identification and structuring are not always explicit (Koen et al., 2001; Karlsson, 2014). In the development phase, the idea moves into a detailed proposal, from being only a short description. In this phase, response generation and concept development are the two most important activities and as the aim is to clarify the key issue research through literature and consultation of colleagues are important. For the idea evaluating phase, screening and decision-making are the two most important activities, and this is often based on personal opinions of the decision-maker (Koen et al., 2001). This phase will be further elaborated in subchapter 2.4. Boedderich presents in his article from 2004 the importance of keeping the very early stages of the innovation process

structured systematically. There has to be a balance between creative scopes and well-structured idea pipelines within the first phase of the innovation process. For managers to make decisions of how to allocate Research & Development (R&D) budgets, vague and immature ideas need to be developed into applicable project proposals.

It has been found that little research on best practices for the front end has been made (Murphy & Kumar, 1996) and that there is a lack of a common language or uniform definitions of the key elements within those activities (Koen et al., 2001). Koen et al. have also found how the activities in the front end often are chaotic, unstructured, and unpredictable. In contrast, this is not the case for NPD, where considerable literature exists on best practise before and within the process (Reid & De Brentani, 2004). This supports the conclusion that the front end appears to represent the major area of weakness in the innovation process. This gap leads to the first out of in total three research questions:

RQ1: What are important factors for success in Front End of Innovation?

Following subchapters will therefore examine critical areas within FEI such as idea management, culture and climate as well as cross-functional collaboration which have all been shown to be crucial factors for the success of FEI.

2.2.1 Idea Management and Ideation

Schilling (2013) means that innovations begin with new ideas, and ideas themselves are fostered by creativity. Creativity is the ability to produce work that is useful and new to the world. What companies often want to embed in their organizational culture is the individual creativity as their overall creativity level will not be higher than the creativity of the employees. Although, in order to create innovation, the ideas must be implemented into new products or processes to become an innovation. Therefore, a firm's most important task is to support creativity as well as expertise and tools which make it possible to turn promising ideas into successful projects. The organization's creativity is a function of the creativity of the individuals within the organization and a variety of social processes and contextual factors that shape the way individuals interact and behave (Leonard & Sensiper, 1998). Thus, the structure, routines, and incentives of the organization are very important factors for also enabling individual creativity. Further down, examples of several different idea management methods and tools will be explained.

Carrier (1998) talks about one of the earliest documented programs for this purpose, the “Suggestion Box” which was created by the founder of National Cash Register (NCR), John Patterson. Each idea from the box was rewarded by 1 US dollar. The program was seen as revolutionizing by that time, where one third of all the submitted ideas was adopted. At organizations today, more updated and modern versions exists and are often called “Idea Box”. The benefit with using an idea box is that it contains a broad scope of ideas and that they can be constantly updated both anonymous and non-anonymous (Carrier, 1998). Furthermore, idea boxes are easy and cheap to implement but does only tap into the very first step of an individual’s creativity (Björk et al., 2014; Schilling, 2013). Björk et al. (2014) talk about two issues with using such system. Primarily, an issue is how the employees should be motivated to contribute with ideas to system as it might not be easy. Secondly, ideas themselves will not be enough, as there always have to be a matching need. Therefore, firms

need to manage the demand side of ideation to secure that ideas which will enter the system are desired by the organization and have a better chance to become innovations. Honda of America utilizes an employee driven idea system (EDIS) where employees submit their ideas. The ideas are evaluated by an amount of managers who submit the ideas and are responsible of supporting the chosen ideas from concept to implementation. By this system Honda of America has reported that more than 75 % of all the ideas are implemented (Gorski & HeineKamp, 2004). A third system is one implemented by one of the largest holding banks in the United States, Bank One, which is called "One Great Idea". Here employees can access the company's ideas repository through the company's intranet, where they can submit their ideas and actively interact and collaborate on the ideas of others. These types of systems are used by a broad range of companies and can be called online idea management system (Schilling, 2013). Through this active exchange, the employees can evaluate and define their ideas to improve the fit with the diverse needs of the organization.

Another firm that has developed a system for capturing employee's ideas, but also integrated a mechanism for selecting and implementing ideas, is Google. They also utilize an online idea management system where employees can upload their ideas for new products and processes to a company-wide system base where every employee can view the idea, comment on it and rate it (Schilling, 2013). Their organization for innovation involves many different actions and steps throughout the time to foster innovation. At 2008, the company was suffering from hierarchy and bureaucracy and wanted to maintain the feeling of a small company. In this belief, Google organized their engineers into small technology teams with considerable decision-making authority. Every aspect of their headquarter was transformed and design to foster communication and collaboration, for example their own cafés and shared offices with couches. Their former CEO Erik Schmidt remarked that they had tried to avoid a divisional structure which prevents collaboration across units, which according to him is extremely difficult and require a lot of management (Schilling, 2013). Hence, it becomes an open culture when allowing informal ties which drives collaboration. If the people are well aware of the values of the company, they should self-organize to work on the most interesting problems. Another key success factor for Google is their system which require all the technical personnel to spend 20 % of their time on innovative projects of their own choice, which they call the "Innovation Time-off". It was not only implemented with the purpose to create slack for creative employees, it was also an aggressive mandate that employees develop new product ideas (Schilling, 2013).

A method for creating ideas is called Innovation Jam and has for example been picked up by both IBM and Volvo Group (Bjelland & Wood, 2008). The main advantage of the method is to have a collaborative and time specific idea generation, as it is often outlined for 48 hours where both stakeholders and employees are gathered to go through different steps in order to come up with ideas and solutions connected to several topics or areas. The purpose is to give people a sense of participation and that they are being listened to, and as well to generate valuable ideas. All the ideas are submitted online where senior executives go through the different ideas. Normally they try to identify key ideas which can be put into coherent business concept, and an important factor is also to identify people which managers believe have the right expertise to execute upon the ideas. This system has many advantages and has shown that a well-designed online program can generate many valuable ideas. Although, it has also shown disadvantages such as the amount of management required to go through all the material in order to find the key ideas. It is a good way to manage massive online conversations, but it may not turn out to be the best for every large group (Bjelland & Wood,

2008).

With all this being said, there are a lot of methods and processes that are used for idea generation and handling of ideas, such as innovation jam, idea boxes, and interactive idea systems. Choi and Thompson (2005) show in their study the benefits of bringing in several perspectives into these activities, i.e. to collaborate across the border of knowledge. How well this collaboration is carried out and the conditions surrounding this very often lands in the company's culture and the working climate in which the employees are expected to collaborate. Considering this, the next subchapter will bring up how important factors regarding culture and climate can influence the success of FEI, followed by more information regarding cross-functional collaboration.

2.2.2 Culture and Climate

As presented in earlier subchapter, and also argued by Paulus and Nijstad (2003) as well as Ahmed (1998), the source of continual change, such as new ideas coming into a company, lays upon creativity. Ahmed argue that for companies to become innovative it requires an organizational culture that makes the employees strive for innovation, meaning it demands much more than only simple resources. Saleh and Wang (1993) presents three assumptions of the basis for effective innovations; entrepreneurial strategy, organizational structuring and group functioning, and organizational climate. They mean that those three factors together affect the innovation in organizations, which for example means that the climate of an innovative organization has to be in harmony with the managerial structure and the intrapreneurial orientation. How to develop the organization's climate is not an easy question to solve. Some organizations such as Hewlett-Packard, Motorola, and Intel have invested in creativity training programs with the purpose to raise the creative potential embedded in the employees. Such programs encourage managers to develop verbal and also non-verbal indications that signal that each employee's thinking and autonomy is respected and valued. This has shown to lead to shape the creative culture and are often more effective than monetary rewards, which has shown to at some points undermine creativity by encouraging employees to focus on extrinsic rather than intrinsic motivation (Schilling, 2013). These programs also often incorporate exercise that encourage employees to develop different solution for a scenario, using analogies to compare a problem with another problem that shares similar structure to see the problem in a new way. Ahmed (1998) bring up the insufficiency for companies to simply decide to be innovative, and explain how these decisions need to be supported by actions that generate an environment which makes the employees comfortable with innovation and in turn create it. Saleh and Wang (1993) further present what they mean are the main factors in developing the organization's climate, which include the beliefs and expectations from top-management together with a reward system attached to them. They mean that a reward system to emphasize a climate where a friendly relationship between colleagues exists and a climate which is open and promotive is an important element. To be noted here is that the opinions about reward systems to strengthen the creative climate differ, as presented earlier by Schilling (2013) who means that reward systems at some points undermine the creativity, while according Saleh and Wang (1993) and Song et al. (1996) it influences the climate on an innovative organization. When the system premium factors such as risk taking, willingness to change, and long-term focus, it was found to be an effective tool to support the expected behaviors and to develop the desired climate.

Since a group exists of different individuals, the group's creativity and ability to innovate lays

upon the individual members in the group. Choi and Thompson (2005) compare in their study the difference in creativity within groups where the members have remained the same over different tasks, with groups where the members have been changed from one group to another. Their experimental studies show that the groups where the members changed across topics generated more ideas and a broader scope of different types of ideas, compare to the static groups. Furthermore, it was also found that the new members added to the group were the ones who increased the creativity of the old members who remained in the same group all the time. Although, by only making one group aware of the other groups ideas by including a member from another group, did not enhance group creativity. Choi and Thompson rather suggest that it was the interactions with the new member that might be what resulted in the increased creativity. The outcome of the influence also depended on who the new members were, i.e. the quality of their personal creativity (Choi & Thompson, 2005). This study brings up the potential benefits of implementing changes on the social-organizational level during collective ideation. At the same time as a creative culture and climate has been found to foster new incentives, it has also, according to Ahmed (1998), been found to foster the cross-functional collaboration. With the benefit found of bringing in several perspective into FEI, the next subchapter will investigate further what role cross-functionality plays in the early stages of innovation.

2.2.3 Cross-Functional Collaboration

Besides Choi and Thompson's (2005) study, there are several other studies that show the importance of a cross-functional coordination and collaboration between different departments and how this is a crucial part for success of the development processes, including the front end (Song et al., 1996; Souder, 1981). Moenaert et al. (1994) suggests that a key task during the front end is to reduce uncertainty, and one of their suggested ways to achieve this is by encouraging closer communication between R&D and marketing. Björk and Magnusson (2009) studied the correlation between the quality of the idea and the social connectivity by studying a company which had used a well established information technology system which collected ideas from employees. Their findings clearly showed that a certain level of network connectivity, i.e. how different individuals within the organization, had a positive impact on the quality of the idea. The individual's possibility to connect with others departments could be facilitated by creating arenas and meeting points where exchange of information and knowledge regarding innovation can take place. The importance of social networks is also agreed by Kijuit and Van Den Ende (2007) who show how social networks play a key role in the earliest phases of the product development. Also Karlsson (2014) strengthen this and means that individuals need support and involvement of others within the organization to develop and implement successful ideas. Examples of enabling this can be by creating and supporting communities, using common idea generation techniques, increasing formal collaboration between individuals from different departments, and improving sharing of information through idea databases and knowledge management systems (Björk & Magnusson, 2009).

Problems and challenges in the R&D/marketing interface have been demonstrated within a number of companies and organizations of different size and characteristics (Souder, 1981). It is in the study by Souder presented how conflicts between these two groups can severely hinder new product processes. To find a way of handling the collaboration it is important to understand the reasoning behind and the problematic around this. Song et al. (1996) presents five factors that have been found to be the most often occurring barriers of integration

between the two groups, as a result from interviewing marketing and R&D managers. These five factors include lack of trust or respect from members of other units; different ideologies, languages, goal orientations; lack of formalized communication structure; lack of physical closeness; and finally, a lack of managerial support. In terms of the second factor as a barrier to integration, the one about different ideologies, languages, and goal orientations, the necessity and desirability of still having different perspective and orientations between the R&D and marketing groups has been brought up by Souder (1981). With that being said, it is important to find a balance in the differences and similarities and to use that in the right way to the company's advantage.

What ever methods and processed used to achieve climate and creative culture for supporting cross-functional collaboration, a large responsibility lays upon management. As it often is management's responsibility to encourage and set up suitable activities, the next subchapter will treat different areas connected to how management control can contribute to the success of FEI.

2.3 Management Control

Management Control is defined as coordination, resource allocation, motivation and performance measurement, is are often explained through management control systems (Maciarello & Kirby, 1994). There is a lot of literature trying to examine the correlation between product innovation success and management control. Nilsson et al. (2015) talk about how companies must develop and assist different types of work within the organizations, and suggest managerial implications for management control connected to innovation. Critical factors for management control regarding FEI are decision-making and innovation portfolio management, and will therefore be further explained in the two following subchapters.

2.3.1 Centralization versus Decentralization

Decisions that are made in the front end of a project can for example be value propositions, target markets, product costs, and functionalities, which are all important factors when it comes to the success rate for an innovation (Poskela & Marinsuo, 2009). Managers' ability to influence these decisions is extensively high in this phase, but involvement tends to be heavier in later stages of the product development cycle when problems more often occur. Poskela and Marinsuo also mean that a lot of literature regarding management control is referring to the same principles for product development projects as for the front end-phase, even though these are of different nature in terms of activities and risks, which creates confusion.

Reid and De Brentani (2004) outline and review the decision-making in the front end for discontinuous innovation. They mean that incremental innovation uses the capabilities that already exist in the company, while discontinuous innovation makes companies search for new skills and come up with new problem solving approaches to develop new technical capabilities. They mean that the flow of information is very unstructured and brought into the organization by individuals who have been exposed to external environment, and this information will eventually flow towards corporate level. They propose a serie of three critical decision-making interfaces where the first one occurs between individuals and environment, which also means that the decision-making lays on an individual level. The

second interface happens between the individual gatekeeper and the organization, where information flows from one person into the company. Also here, the decision-making is on an individual level. The third and last interface, project interface, is where information comes from the organization into a project, and the decision-making is made by management (Reid & De Brentani, 2004).

Burgelman (1983) means that if an autonomous strategic behavior can exist, it needs to be accepted by the corporate management and integrated into the concept of strategy in order to allow it to happen. This means that middle management provides the top management with the opportunity to rationalize successful autonomous strategic behavior. The autonomous behavior has been noted to increase knowledge creation as an internal impulse for growth. The executors need to receive some level of freedom in action in order to implement their ideas with the support from the company. Adams et al. (2006) mean that organizations need to be able to provide sufficient freedom to allow this exploration to create possibilities, but still keep a level of control to manage innovation in an effective and efficient way.

When project-related communication, decision-making, and power is concentrated to few individuals in the top management of the organization, or belonging to the top of the project team, it is called *project centralization* (Moenaert et al., 1994). Centralization, or the level at which organizational decision-making takes place, has even a minor influence on the information exchanged between R&D and marketing only during the planning phase of new product development (Song et al., 1996; Moenaert et al., 1994). As presented earlier, the interaction between R&D and marketing and the importance of a well-functioning collaboration within those functions is discussed in the study by Song et al. They present how a higher level of decision-making during the early phases of the product development may decrease the interaction and places barriers to the development of trust that is needed between the functional units. These are barriers that in turn lead to a decrease of information being exchanged. According to Moenaert et al. (1994), it is expected that if the communication flows between R&D and marketing always goes through the top of the organization, the result is a severe loss of awareness of the other function. Furthermore, Song et al. (1996) presents three characteristics of centralization of decision-making: prior supervisory approval on actions; discouragement from individuals making their own decisions; and supervisory approval on small matters. Gakidis and Mariana (2001) also contribute to the argument that centralization regarding decision-making has many negative effects. What many corporations have set on place is a small group of people who works as the “decision-committee” of top management, deciding which ideas will go further or not. They mean that a company can be directly harmed by having a set of managers who take all decisions regarding ideas. This is due to that the positions of the managers often can be threatened by the raise of new technologies because it might bring their expertise obsolete. What is suggested is that people who have understanding for the nature of the idea as well as the right competences should be selected for different scenarios, which would mean having several committees depending of the ideas that will be presented.

Although, earlier mention was the importance for a company being able to focus on both incremental as well as radical projects. Both Tushman and O’Reilly (1996) as well as Nilsson et al. (2015) mean that the most important responsibility of handling both short- and long-term innovations to enhance strength of the company and allow discontinuous innovation to grow lay completely upon management. This means that managers need to be involved when deciding which projects to continue with regarding different levels of innovations, which can

be seen as contradictory to disadvantages presented above regarding centralized decision making. This complexity leads to the second research question:

RQ2: At what organizational level should decision-making for different types of ideas lay upon?

One of the most concrete tools runned by management where decisions are made is product portfolio management, which can also be referred to as "Innovation Portfolio Management". Keeping a structured and well-executed portfolio can play an important role for decisions regarding the long time survival (Nagji & Tuff, 2012), and will therefore be further explained in the following subchapter.

2.3.2 Innovation Portfolio Management

It is a challenge for companies to handle the balance between the different types of innovations. Companies should invest in a large spectrum of risks and rewards and should carefully balance their investment and resources in order to stay profitable as well as staying competitive in a longer perspective (Nagji & Tuff, 2012). Khurana and Rosenthal (1998) as well as Nagji and Tuff (2012) talk about the importance of a well structured innovation portfolio to become successful with innovation management. They also state that the companies with the highest innovation track records also have a well planned balance between different types of innovations, which is strengthened by the study made by Killen et al. (2007), as it shows a correlation between success of new products and the performance of a product portfolio management. The analysis on innovation investment shows that firms that outperform other companies allocated their investment in a certain ratio: 70 % on core (incremental innovation), 20 % on adjacent (radical innovation) and 10 % on transformational incentives (high risk radical innovation, or disruptive). Obviously the ratio differs depending on which industry the company competes in. For example, industrial manufactures often have a strong portfolio of core innovations complemented with a few breakouts, while technology companies spend way less resources on improving existing products and more into transformational as their industry is eager for the next radical release (Nagji & Tuff, 2012).

Day (2007) refers to what he calls the "Big I" projects, which are projects which are either new to the company or the world that push a company into adjacent markets or novel technology and can help organizations close the gap between revenue forecast and growth goals. He means that if more high-risk projects are foreseen, it can strangle potential to growth. In the article, two different tools are presented which are "Risk Analysis" and what is called "R-W-W" (real, win, worth it). Risk analysis gives the companies the opportunity to have an overview on how much risk is divided between the projects and innovations they are currently working with, as well as helping proceeding the probability to success (Day, 2007).

Referring back to Chesbrough (2003) and what he calls "False Negatives" in his article regarding open innovation, companies that do not dare taking risks or look outside the current business will most likely miss out on these opportunities, which can be very harmful. Therefore, it is up to the decision-makers, in other word the people that have been assigned to decide which ideas to bring forward or not, to make sure to evaluate ideas depending on their nature and allocate resources for both short and long term. In the next subchapter,

measurement and evaluation of innovations and ideas will be presented more in detail to give an idea of how it can be done in practice.

2.4 Measuring Innovations and Ideas

Researchers have found the importance for firms to evaluate performance, where for example Cordero (1990) presents that companies that evaluate their performance in a formal and systematic way is also the firms with the highest performance. The same connection has also been brought up regarding a firm's innovation performance and its ability to measure that (Wallin et al., 2011). However, to measure ideas and innovations and to see the relationship between innovation and performance is, might because of the unpredictability of innovations, found to be difficult (Tidd, 2001). Another reason behind the problematic of measuring ideas is that innovation, by definition, is something novel, and involves producing qualitatively new performance outcomes (Smith, 2005). The novelty can certainly include new product characteristics that are measurable to some extent, but the aspects of novelty which are especially difficult to measure are the multidimensional novelty in aspects of learning or knowledge organization (Smith, 2005). A need for distinguishing between what can be measured and what cannot be measured in innovation is therefore brought up in the article by Smith.

Although the difficulties of measuring innovation, Tidd (2001) presents two approaches for an organization to perform this measurement. The first one uses indicators such as number of patents taken and the amount of new products being announced. The other way of measuring innovation includes a broader range of indicators, such as the proportion of personnel within technical, design, or research areas, as well as the proportions of profits from new products launched during the past years. What indicators to look at and to value depends on in which industry and in which sector the company operates, which means that there are no single best measure of innovation (Tidd, 2001). Both Jalles (2010) and Katila (2007) agree that the use of patents can be a way of measuring innovation in economic growth. According to Jalles, patents can either encourage or discourage innovation, depending on different conditions. Patents affect innovation and diffusion processes depending on the patent regime and particular features within this. There are many different patent-based measures of innovations that have been used, all from counting the amount of patents and the years of renewal, to the number of countries in which the patent is applied for (Lanjouw & Schankerman, 1999). Another way brought up by Lanjouw and Schankerman when measuring innovation through the use of patents is by measuring the number of patent claims, where the number of claims is proposed to show the size of the innovation. Patents provide a relatively objective measure in terms of measuring technologically radical innovations (Katila, 2007), since patents by definition include technologically novel knowledge.

Since companies that are able to produce radical innovations are more likely to become new leaders as radical innovations increase firm performance and competitive advantage (Katila, 2007), the measurement of such innovations is especially important to study. Companies have measured radical innovations through using a variety of different methods, however, this is an area in which little work has been done, and there is no commonly accepted way of measuring the radicality of an innovation (Katila, 2007). Some of the methods used have been through qualitative interviews to determine the most radical innovations in a firm, through interviewing experts or managers (Green et al., 1995). This makes the measurement

very subjective, as it is partly based on judgment from managers, experts, customers, etc. Qualitative measurements have also been combined with quantitative data, such as performance improvement data. Apart from resulting in a subjective evaluation, these kinds of measurement seldom characterize which of the four types of radically, i.e. industry, organization, user and technological as earlier discussed in subchapter 2.1, that the innovation belongs to. Katila (2007) means that it is difficult to draw any conclusions based on the methods of measuring when the type of radicalness of the innovation is not distinguished.

For incremental innovations, calculation of Net Present Value (NPV) and ROI are commonly used and are seen as thoroughly appropriate (Nagji & Tuff, 2012). Furthermore, Nagji and Tuff present how this is not applicable for radical and disruptive innovations, due to the impossibility of requiring the right customer input, which is needed in those kinds of traditional financial metrics. Christensen et al. (2008) have found that many managers in successful companies find it difficult, or even impossible, to innovate successfully, which they in their article tries to understand the reasons behind. The authors bring up three paradigms within the area of financial analysis and decision-making that they have found to be widely misleading and misapplied when working towards successful innovations. The first one is the method of discounting cash flow to calculate the NPV of an initiative. One reason behind this is the difficulty in predicting future cash flow, especially those generated by disruptive investments. Another error made by companies is to assume that the performance level will persist indefinitely into the future, if they chose to not go with the investment. It has been found that a decline in performance is what rather would be the result from the do-nothing scenario (Christensen et al., 2008). The second paradigm Christensen et al. present is related to fixed and sunk costs, and how the way of considering these when evaluating future investments makes managers use assets and capabilities that are likely to become out-of-date. The third paradigm is about how managers pay less attention to the company's long-term health, because of the pressure to focus on short term stock performance (Christensen et al., 2008). The problem of focusing on the wrong things is also summarized by Cordero (1990) who bring up how many organizations mainly focus on resources and outputs, such as speed to market, the number of new products, and R&D expenditure. Cardero means that with this type of focus organizations tend to ignore the important processes in-between. Also Karlsson (2014) mean that the increasing focus upon short lead time and speed to market can distract teams from working upon ideas. This is also agreed by Wallin et al. (2011) who also bring forward the problem with focusing on financial metrics. They mean that past performance often is a bad indicator of future success, and that companies does not necessarily have a high innovative capability only because of a successful business.

This subchapter has highlighted the importance and difficulties when it comes to the measurement of innovations, especially radical and disruptive innovations. Another important aspect that comes *before* the innovation has been developed far enough to make it comparable on a profit level, is when it is still in the idea phase. Measuring the idea itself is needed to facilitate the decision-making process, which have from the management point of view been brought up in subchapter 2.3. Decision-making in terms of knowing how to evaluate an idea dependent on its nature and to make several ideas comparable to each other will be further elaborated in the following subchapters.

2.4.1 Idea Matureness

Karlsson (2014) focuses in her study to complement previous research by focusing on idea maturity in R&D projects and how these can relate to the selection of ideas. Karlsson means that R&D teams are highly responsible for generating and developing ideas, and a problem which is brought up is how many companies reject ideas which are not developed enough and end up with only low-risk ideas. Also, if novel and creative ideas are rejected on a regular basis it will in time cause a lower contribution with those types of more radical and disruptive ideas, which will decrease the firm's innovation capability.

One main finding which was found during observation of the screening and evaluation of ideas in the study by Karlsson (2014) is how the maturity of ideas is a relative measure. It was found that ideas were often compared to previous cases, both failed ideas as well as implemented projects. This can potentially lead to an unfair screening, as novel ideas might be perceived as too complicated to implement if compared to already existing projects, and will therefore be stopped. Another result that came out from the study was the importance of being aware of and take into consideration different dimension of the idea such as production knowledge and time, cost issues, as well as customer need and value. An issue which occurred in one project was when the team had focused too much on only gaining knowledge about technical aspects regarding cost reduction. What appeared later on was that no investigation about customer value or needs had been done, which became a problem. What Karlsson (2014) therefore suggests is that screening of ideas needs to consider not only the idea but also the contextual issues such as priorities within the organization as well as timing in the market.

One way of keeping track of maturity level of the ideas in a certain environment is also mentioned by Karlsson (2014), called Readiness Levels. Readiness Levels, is a collective term which describes the maturity of an idea within a certain area such as technology, market, customer etc. The most common one is Technology Readiness Levels (hereinafter referred to as TRL) which only looks at the technological stages an idea can proceed within. TRLs are a systematic measurement system that supports the assessments of the maturity of a particular technology which can be used for comparing different types of technology (Mankins, 1995). The concept originally comes from NASA, and which was implemented during the 90's to assist as a management tool for technology planning within the organization. In Table 1 the different TRL's are described.

Table 1. Different TRL described by Mankins (1995)

TRL	*Definition of Level*
TRL 1	Basic principles observed and reported
TRL 2	Technology concept and/ application formulated
TRL 3	Analytical and experimental critical function and/or characteristic proof-of- concept
TRL 4	Component and/or breadboard validation in laboratory environment
TRL 5	Component and/or breadboard validation in relevant environment
TRL 6	System/subsystem model or prototype demonstration in a relevant environment (ground or space)
TRL 7	System prototype demonstration in a space environment
TRL 8	Actual system completed and "flight qualified" through test and demonstration (ground or space)
TRL 9	Actual system "flight proven" through successful mission operations

Karlsson (2014) means that the maturity of an idea measured by Readiness Levels can drop if the intended environment will change, but also if the frame of the idea development will change.

The next chapter will further elaborate about the process of evaluating and taking decisions regarding ideas.

2.4.2 Decision-making: Evaluating Ideas for Selection

Research suggest that the success of a company does not necessarily depend on whether the company got the best or the largest amount of ideas across the branch, but rather knowing how to best use and implement the ideas (Magnusson et al., 2014; Zerfass, 2005). As an important part of this comes the decision of which ideas to continue with and which ideas to kill, and how to decide upon this is found to be a major challenge (Magnusson, et al., 2014). As presented in subchapter 2.3.1, managers most often have a great responsibility and ability to influence the decisions being taken within FEI, as well as during the later stages of the product development process. However, how the ideas get evaluated can be done in several different ways and there are a number of systems for evaluating ideas and also systems for idea approval. Descriptive surveys are found to be examples of how this evaluation has been performed and is presented in several studies (Magnusson et al., 2014). A critical factor that is important to consider during the evaluation of ideas is the time-related aspects, for example particularly evident when a company needs to ensure that they are first to market with a

specific product or service, which thus is made possible by a rapid processes. With this said, using several different criteria for evaluation and decision-making can be too time-consuming and knowing which ones to use when and how is therefore crucial. What Magnusson et al., present in their article from 2014 that decision-making for new product ideas is based on intuition. They mean that since intuition demands less resources it can be used for decision-making instead of criteria-based assessment as long as the assessor's expertise is validated as well as the instructions are set depending on if the judgment is of incremental or radical formation. Furthermore, Magnusson et al. conclude with five criteria that are used by experts when conducting an intuitive judgment: *originality*, *user value*, *producibility*, *strategic fit*, and *profitability*. Five factors that influence the assessment were also presented, and these are *existence, cluster, legitimacy, simplicity,* and *trend* (Magnusson et al., 2014). Shah et al. (2003) proposes four aspects to consider when measuring an idea: *novelty*, *variety*, *quality* and *quantity*. These four aspects assume that there are two or preferable more ideas available to be compared to each other. "Novelty" is a measure of how unusual or unforeseen the idea is compared to the other ones, whilst the "Variety" rating applies to an entire group of ideas where the probability of finding a better solution to a given problem is considered among the ideas. "Quality" measures how close the idea is to meet the given specifications, meaning that the feasibility of an idea is measured. Lastly, "Quantity" measures the total number of ideas generated, saying that the more ideas being generated the better is the chance of good ideas.

Depending on the characteristics of an idea or initiative, i.e. if it is an incremental or radical idea, different methods of measurement should preferably be used in order to not miss out on "False negatives" (Chesbrough, 2003; Karlsson, 2014). Martinsuo and Poskela (2011) talk about the advantages and disadvantages between formal and informal evaluation idea and concept selections. Formal selection is more fair for the idea generator as it compares the projects clearly together, although the benefits with informal evaluation are the open ended questions which enables a creative conversation where different perspectives can be brought in. Also Koen et al. (2001) states that the evaluation of ideas in an early stage should not be as strict as compared to later in product development projects. Common criteria and factors used for evaluation are company strategy, resources, markets, technology, and risks. These criteria should be communicated clearly to the employees, so they know what to present and work towards regarding ideas and concepts.

For incremental ideas, financial metrics such as NPV and ROI, are seen as an appropriate and applicable way of measuring the idea (Nagji & Tuff, 2012). Since ideas often get evaluated and selected by a group of people, as described earlier often set up by managers at different levels, the success of an idea may depend on things not related to the idea itself, but rather related to the approach and methods of the group that is evaluating that specific idea (Gakidis & Mariana, 2001). Gakidis and Mariana present a system for evaluating and promoting ideas within an organization, which allows a measure of interactions among many individuals. Apart from including a system for determining the relevant people who would be best suited to take part of the decision-making activities, their presented system also includes a way of value each idea in an objective manner. After a number of ideas get submitted, each idea is presented to the selected persons who value the idea initially. An example of how the idea could be valued is through the sum of the capital used multiplied by the estimated cost of resources needed (hourly wages), divided by the total equity turnover of all transactions. An important advantage of this valuation is that it gets beyond rating ideas by similarity and/or popularity, but at the same time the rating gets limited to the person's experience around the idea. In addition to the valuation of the idea, the system includes a means to risk assess to

determine the spreads of the valuation made by each person within the decision-making group. Gakidis and Mariana's proposed system continues with having the idea sent to another person for a second evaluation, where they mean that on average an idea gets valuated by five different persons. The persons within this system can chose to be anonymous to encourage the diffusion of ideas. Finally, it is the administrator of the system who decides which ideas to pick depending of the previous valuation (Gakidis & Mariana, 2001). This system of idea selections requires a large amount of ideas available to an organization.

As stated earlier, the characteristics of the idea affect the way the ideas get evaluated and measured. Using financial metrics for radical ideas is by Nagji and Tuff (2012) not seen as an applicable way of measuring those kinds of ideas, as it requires assumptions that is difficult to make for something that new. They mean that using such metrics too early in the idea process can lead to great ideas being killed. For this reason, Nagji and Tuff means that companies should combine the use of noneconomic and internal indicators for the decision-making in the earliest stages. What noneconomic indicators could be are not explained and remain somewhat "fuzzy".

Martinsuo and Poskela (2011) means that even though different sets of evaluation criteria have been adopted in organizations for screening ideas and concept, there is not enough evidence of the actual benefits of using such criteria for seizing the right strategic opportunities. Combined with the lack of defined methods and tools for measuring radical and disruptive ideas in literature, the third and last research question becomes:

RQ3: How can ideas that are radical and disruptive in nature be evaluated and measured?

3. METHODOLOGY

The methods used to gather the information necessary to reach the goal of the thesis are described in this chapter.

As the nature of the research of the thesis is qualitative, some guidelines and directives were studied in how to execute and design a case research. For example Voss et al. (2002) state that when building the research in theory, it needs to have a prior view of the constructs or categories which will be studied as well as their relationship. Further down, the chosen methodologies which have been used for this thesis will be presented more in detail to given an overview of the conducted work.

3.1 Literature Study

The literature study was conducted with the purpose of finding the factors already identified in previous studies, which should be taken into consideration in the design of a FEI process and recommendations regarding such process. The literature study was performed in the subjects of innovation management, front end of innovation, management control, and measurement. The literature study is primarily based on scientific articles published in magazines and books, which were obtained through searches in various databases. The keywords used when searching in the databases were, among others *Management control, Fuzzy front end, Front end of innovation, Innovation management, Idea measurement, FEI, Ideation, Decision making and Cross-functional collaboration.*

3.2 Research Design

A case study approach has been used to conduct the work for this thesis. Case research has, according to Voss et al. (2002), been one of the most powerful methods to apply when developing new theory, and uses case study as a basis. For this report, a framework for the intended study was initially developed which explains the main things that will be investigated as well as key factors. The next important step was to state the initial research questions which back up the proposed study, which are of importance as they define the focus from the start and guide the collection of data. What has happened during the time-frame of the report is that the initially research questions have changed, which Voss et al. (2002) mean is a strength as it can allow the development of more knowledge. Based on the initial research questions, a theoretical framework was developed to better understand relevant areas by previous research. When the questions connected to the research questions were defined and gathered into a conversation guide, twelve semi-structured qualitative interviews with internal employees at the case company were first conducted, followed by ten semi-structured qualitative interviews with external companies in different industries as well as sizes. The collected data were transcribed, and coded into different categories to allow a chain of evidence to be established, which importance also has been brought up in the article by Voss et al. Based on the codes, the data were analyzed in order to be able to answer the three different research questions to finally end up in several conclusions. These parts will be presented in detail in the following subchapters.

3.3 Interviews

Primarily, twelve qualitative semi-structured interviews with managers and employees within different departments at Atlas Copco, Kalmar, were held. The aim with the interviews was to get an understanding of how the work is carried out by mapping the current processes, but also wishes and expectations of the employees at this level about the future process, as well as current problems regarding the initial phases in the product development process and also to see what has been best practice in previous projects. See Table 2 to understand which position within the company that the interviewees possessed together with location for their daily work. The conversation guide can be found in Appendix 1 and each interview went on for approximately 45 - 60 minutes. The majority of the interviews (10 out of 12) were held in Swedish, which means that most of the citations presented as a part of the result have been translated into English by the authors.

During development of the deliverables and the conclusions, a second iterations of interviews were conducted with four interviewees. The role of the interviewees for the second round were two product development managers, project leader, divisional D&D manager as well as a development designer. Conversation guide for the second iteration can be found in Appendix 2. The second iteration of interviews was done with the purpose of validating and verifying the first round of result and conclusions.

Table 2. Roles and locations for the interviewees at the case company

	Position & Location
Interviewee 1	Manager , Kalmar
Interviewee 2	Manager, Kalmar
Interviewee 3	Non-manager, Kalmar
Interviewee 4	Manager, Kalmar
Interviewee 5	Manager, Kalmar
Interviewee 6	Non-manager, Kalmar
Interviewee 7	Manager, Kalmar
Interviewee 8	Manager, Kalmar
Interviewee 9	Manager, Kalmar
Interviewee 10	Non-manager, Kalmar
Interviewee 11	Manager, Essen
Interviewee 12	Manager, Essen

Further, qualitative semi-structured interviews were also held with innovation managers, or employees with similar competences, at ten external companies which all are active in

Sweden as well as international. The interviews with external companies were conducted to gain knowledge about their best practices and known pitfalls within FEI. The companies chosen were based on a variety of industries, both similar to the case company as well as for example software companies. The size of the companies was both similar to the size of the case company as well as smaller and larger. The reason for selecting the different companies was to get an understanding of how similar companies within the hardware and engineering industry conduct their work within FEI, but also to see how different industries such as software companies go about with innovation as the pace on their market is faster and therefore require a different way of working with the front end compared to the previous mentioned industry. The sizes of the companies in terms of employees differs from 5-10 employees to about 200 000 employees, and accordingly gives a broader understanding of how the way of working with innovation can differ depending on size. Also, the companies are also a mix between Business to Business (B2B) and Business to Customer (B2C). Each interview went on for approximately one hour and the conversation guide can be found in Appendix 3. Only one interview was held in English, whilst the rest of the interviews were held in Swedish. The interview guide in English can be found in Appendix 4. The companies interviewed are presented anonymous in Table 3.

Table 3.The external companies for the qualitative interviews

	Industry	***Size (amount of employees)***	***Business or Consumer***
Company 1	Hardware Engineering	40 000 - 50 000	B2B/B2C
Company 2	Consumer Goods	40 000 - 50 000	B2C
Company 3	Consumer Durables	10 000 - 20 000	B2B/B2C
Company 4	Hardware Engineering	5000 - 10 000	B2B
Company 5	Finance	1000 - 5000	B2B/B2C
Company 6	Home Appliance	50 000 - 60 000	B2B/B2C
Company 7	Software	100 - 500	B2B
Company 8	Software	1000 - 2000	B2C
Company 9	Software	1 - 5	B2B
Company 10	Retail	150 000 - 200 000	B2C

3.4 Observations

As a part of the data collection, personal observations from the thesis workers were collected by being present at the product company for three weeks. The observations were carried out both by simply being on the site, i.e. to be able to take part and listen to the daily work, as well as by participating in total four meetings such as pulse meeting, update meeting and improvement meeting. Notes were kept during participating the meetings, as well as a living

document where findings and observations regarding the daily work at the site were collected. The purpose of visiting the product company was to get a better picture of how the actual work is done in practice, and also to follow up some of the findings from the interviews. By observing the company from the inside, a different perspective was gained to clarify the picture given on the basis of interviews.

3.5 Internal Material

During the thesis, internal material from Construction Tools Atlas Copco was received and studied in order to gain a comprehensive understanding of important factors such as business strategy, current processes and divisional structure.

3.6 Data Analysis

All the interviews were transcribed and coded in order to organize and sort the data for analysis. One important part when transcribing is to make sure that the transcript is complete, i.e. to include everything such as all the answers as well as all the questions, and to not leave out anything that may seem unimportant (Thornberg & Charmaz, 2014). After transcribing the interviews, a summarization was made for each of the external interviews to provide a valuable understanding of the content before the actual coding could take place. Derived from this summarization, together with the conceptual framework and the research questions, the pre-set codes for the external interviews were set. These were set to be cross-functionality; idea generation; idea owners, incremental, radical and disruptive ideas; management control; decision-making and measurement; culture and climate; and lastly technology push versus market pull. These codes were decided upon to make sure a comprehensive understanding of the present situation was gathered as well as best practise and common pitfalls for FEI within each of the external companies. For the internal interviews, some of the codes were also pre-set based on the conceptual framework and the research questions. These were management control; best practices; pitfalls; and idea generation. During the beginning of the coding some other common areas also revealed, which therefore were assigned appropriate codes. These codes that emerged with a desire to cover all the important information were: culture and climate; strategy; and cross-functional. The transcripts for both the internal and external interviews were coded using Microsoft Word and Excel.

3.7 Evaluation of Methodology

The general research methodology for the thesis has been defined as exploratory, where the ultimate goal has not been to verify or falsify hypotheses, but to instead acquire an in-depth understanding of the subject in order to answer the three research questions. An alternative method could have been to collect only quantitative data from a broader perspective, such as a larger number of external companies, in order to strengthen the results by getting more opinions. However, this method was not considered appropriate as the subject in question concerns factors such as culture and climate, which will not be gathered to the same extent as in a qualitative manner.

Since a partially open questionnaire was used for both the external as well as the internal interviews, the answers to some questions affected the next question being asked. As a result,

all companies or interviewees did not receive exactly the same questions and thus did not comment on exactly the same things. For one interviewee getting a certain question, the answer could be used as a result, while for another interviewee not getting the same question, no result in either way could be drawn regarding the specific topic. This means that some of the conclusions are less generic due to this matter than others. What needs to be addressed is that conclusions are not drawn by one single respondent, but are rather strengthened by several respondents and/or literature.

The interviews were held relatively early in the process, which means that the literature framework was not fully developed. If the interviews would have been conducted when the framework was further developed, some questions could have been more direct and even more linked to the research. Although, the benefit of early interviews has been that interesting and important areas have emerged from interviews which have been further investigated in the research in parallel. This would not have been possible due to time constraints if the interviews were held at a later stage, so it stands clear that there are advantages as well as disadvantages with both ways. Furthermore, since the majority of the interviews were held in Swedish the result has been translated by the authors which might have led to changes in word choice from the original. A way to avoid this and to get the quotes formally cited would have been to keep the interviews in English right away. However, a choice was made to hold the interviews on the interviewee's mother tongue in order to make it easier for the interviewees to express their opinions and thereby gain more information.

Due to that most of the results of this report are based on individual perspective and opinions from the interviewees at different companies, it is difficult to know to what extent the result and conclusions are replicable. It is most likely expected to be a slightly different result if there were other individuals as well as other companies interviewed. Regarding external validity, it is interesting to understand to what extent the result of the study can be generalized to other organizations and situations (Bryman & Bell, 2015). As the different companies interviewed differed both in terms of industries, size, and B2B/B2C, the presented result could therefore possibly be used in a variety of industries. For this reason, it was an actual choice to interview companies in different industries in order to come up with general conclusions and gain a broader understanding about the subject. Also, as most of the conclusions for a general practice are of an overarching managerial nature, they can be seen as suitable to a wide range of different companies and industries.

Regarding reliability, it is difficult to claim whether the results and conclusions of this report are stable enough as they have not been tested at any company. Although, once again it can be argued that as the different external companies were chosen from a variety of industries and with different sizes, the conclusions can be seen to some extent as reliable. If there is some reliability, it also presumes to some extent to be valid (Bryman & Bell, 2015).

4. ATLAS COPCO CONSTRUCTION TOOLS KALMAR

This chapter describes the current situation at Atlas Copco Construction Tools at Kalmar, including the current processes, business strategy, and the result from the internal interviews.

Atlas Copco is a Swedish industrial company which consists of five business areas divided into a total of 16 divisions. The product company (hereinafter referred to as PC) in Kalmar is included in the division named "Construction Tools", and has been owned by Atlas Copco since 1975 where the previous company produced hammer drills. There are four other PC's in the division, which have slightly different products. What in academia is defined as R&D, is in Kalmar referred to as Design and Development (D&D). The main D&D center for the division is located in Kalmar where they streamline some of their innovation directly to the other PC's within the division for production. The majority of the top management are located in Essen, Germany, including the marketing department. Also their Customer Centers are located in other countries.

Today, their product portfolio consists of hammer drills and breakers, which are both pneumatic, hydraulic, petrol, and electric driven devices. They have three different product areas that the D&D teams are divided into, which are light hydraulic products, hand-hold products, and light compaction products. Further down, information regarding the PC in Kalmar is presented, starting with mapping out their current process as well as company structure.

4.1 Current Processes and Structure

Since January 2016, a new NPD process was introduced to the employees in Kalmar. The purpose of the new process is to make visible for everyone at what stage a certain project is at, who is responsible for what, and what needs to be delivered at what time. The new process is a stage-gate model, which includes five stages and gates (Figure 1). Every stage consists of several deliverables and the responsible for each one of them are divided between the different departments.

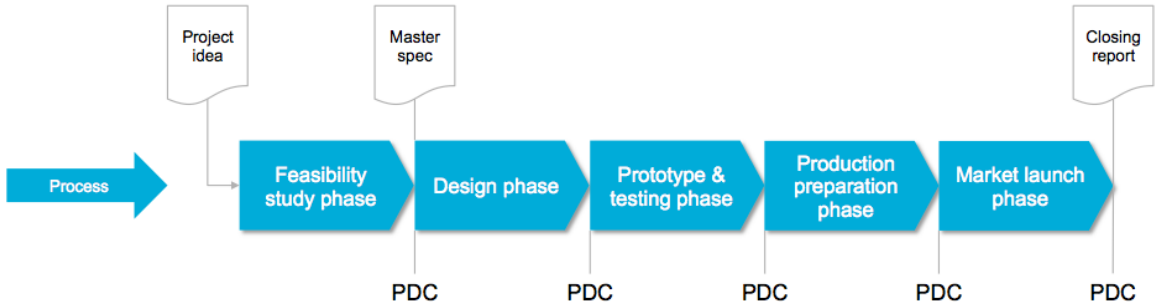


Figure 1. The NPD process for the product company in Kalmar

After introduction of the new process, several workshops have been hold with the purpose of teaching the employees how the process will work and how it will assist their work. Since the beginning of 2017, it was decided that all current projects would be transferred to proceed

after the new process. Therefore, during spring 2017 two projects are running in the new process at the later stages of it. Although, no new project has been initiated from the very beginning of the new process until February 2017.

When a new project is initiated, a project group with a project leader is decided upon. The project leader comes mainly from D&D and the group includes responsible from each department; D&D, marketing, production, lab, sourcing, as well as Construction Service. Every gate is closed by a Product Development Council meeting (PDC), which consist of the project leaders for the different on-going projects, the Vice Presidents as well as the President. To see how the divisional structure is organized, see Figure 2.

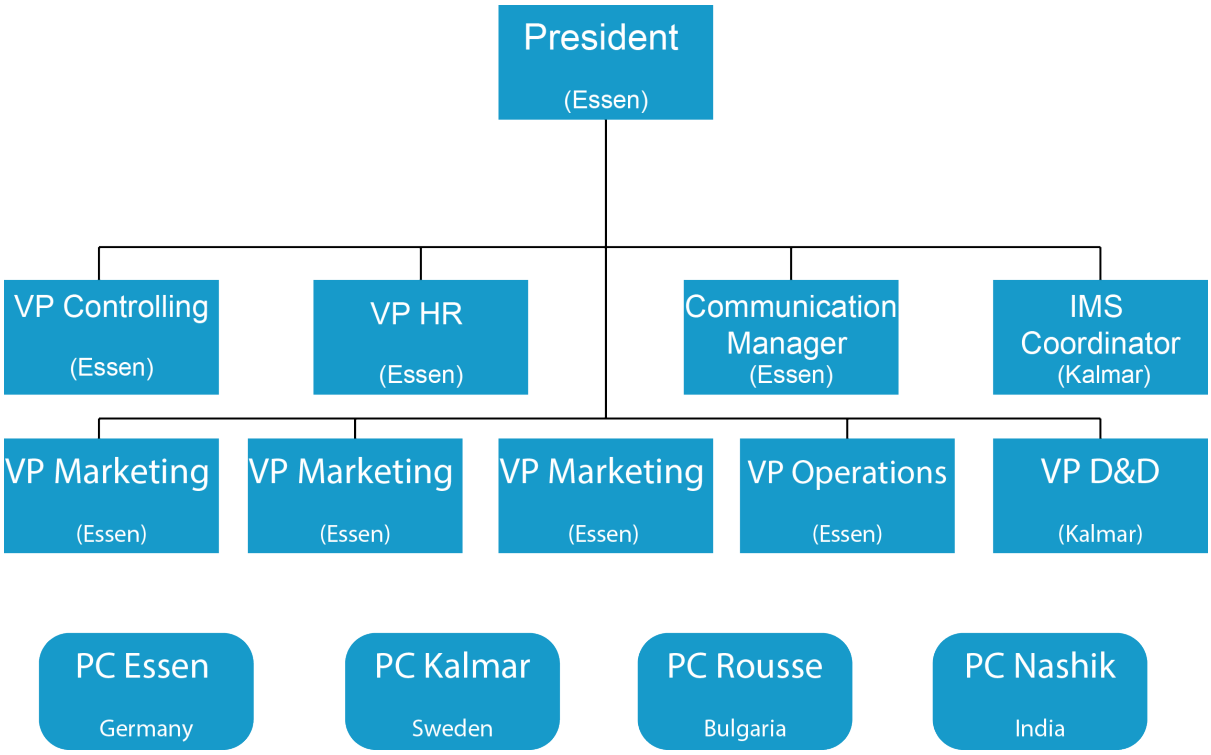


Figure 2. The divisional structure at Construction Tools, including the four product companies (modified from internal material Atlas Copco)

4.1.1 Routines

Within the three product groups, different meetings are integrated in their way of working. Every week there is a meeting called "pulse meeting", with the purpose to discuss and update everyone about current status of the projects across the different product lines. The meetings are lead by the project leaders with current projects, and present are also managers of each product area, lab manager, production engineering and representatives from sourcing.

Once every second week, each group have their own update meeting where each member bring up their ongoing projects and discuss related problems that have occurred with the rest of the team. This provides the team members an opportunity to bring up learning with the aim to share it with the others. These meetings follow by what is called "Improvement meetings", where each member within the group is assigned a task connected to improvements in one of the following areas; Personnel, Quality, Cost, and Leverage. During these meetings, every

member raises their task for improvements, and when finished gets designated a new task from a list where suggestions for improvements are listed and prioritized. The purpose of this is to constantly improve the way of working and doing things, and also teach each other about new learning that have been required connected to their task. No deadline is set to finish a certain improvement project, since these projects are done parallel to the normal work.

Apart from the formal meetings, the groups also have more informal meetings, often including breakfast or such. These take place once or twice every second month, and are an opportunity for sharing knowledge and insights in a more relaxed situation.

The steering group for Kalmar consists of a D&D, sourcing, production, manufacturing, HR and financial managers as well as the General Manager of Kalmar. They meet a few times a year to discuss strategy and future plans.

4.1.2 Customers

Today the main segments of customers are renting companies and retailers. These differs a lot in size as it can be anything from bigger renting companies or retailers working with large customers, or smaller firms which only buy a small amount of products. The end-user therefore becomes either employees at larger companies or private smaller companies which only rents the machines for a limited time. The customers are distributed in different places of the world, and the relationship between Kalmar and them normally goes through the Customer Centers. Their tasks are to sell the product, teach the customers how to use the product and collects feedback regarding it as well as reporting problems about existing products back to the production companies.

The market department in Essen travel to the different customer centers where feedback is received and collected. In some cases, meetings with the end-users of the machines are organized and planned in order to conduct contextual interviews. Further, the lab department in Kalmar visits the end-users of the customers out in the field where they conduct user tests and interviews regarding their machines.

4.1.3 KPIs

There are two main KPIs linked to the NPD process in Kalmar. These are delivery precision and lead time difference. The two KPIs are supposed to balance each other, since the first-mentioned describes how many of the gate closures are done within planned time, and the second describes the size of the possible deviation. The balancing mechanism means that even if a very high delivery precision is obtained, a deviation in time would not be found in that KPI, but instead discovered it in the measurement of lead time difference.

4.1.4 Patents

The division normally acquires two to three patents yearly, depending on ongoing projects. In some project though, six or more patents have been acquired for one single project. The division does also buy patents when using known knowledge.

4.2 Business strategy

The overall vision[2] for Atlas Copco globally is:

"To become and remain First in Mind—First in Choice® for all stakeholders"

The vision for the Kalmar division is "*To be the leading factory within the division for the delivery of products and services in demolition, construction, and mining applications*". The vision includes achieving long-term profitable growth by producing in a sustainable, safe and environmentally friendly manner, with high quality, on time and at the lowest possible cost. The growth will also be achieved by effectively and in the shortest possible time develop and production launch new products, and continuously develop and utilize everyone's competence.

An amount of eight core values were brought forward by the managers and employees together to secure that the way of doing things always is striving towards the vision. Some of the values are for example: *Leadership; collaboration; Learn & Improve; Customer's need; Transparency.*

4.3 Result from Coding the Internal Interviews

The most important findings that emerged from the internal interviews are presented in the following subchapter, divided from the coding. There are a total of eight categories, where each one include information of how the certain subject is carried out as well as the interviewees' thoughts and opinions related to this.

4.3.1 Idea Generation and Development

Until today, the generation and development of ideas has been of an unstructured nature within the product company in Kalmar. The ideas can differ from improvements of existing products, to new material or completely new products. Anyone should be able to bring forward an idea, although, in current situation the responsibility mainly lays upon employees working with design and development. When it comes to how market driven- or technology pushed ideas are balances, different opinions exist. Interviewee 2, 3, 4 and 5, all from the D&D-department, means that the majority of the ideas that have resulted into projects and products are technology pushed, while interviewees from the marketing department means that the ideas that are brought forward today are equally split between 50/50 regarding technology pushed and market pulled.

There are two ways of collecting possible ideas which are found interesting for the company. One is through structured idea generation, and the other way is to be able to capture ideas that emerge on a more random basis. Interviewee 1 and 3 means that many ideas occur in corridors and at common "coffee machine talk", but in most cases nothing more is developed after the initial conversation. Seven out of ten interviewees express a need for a set process, where it is clear at what stage an idea is at and have straight guideline's of what's need to be done in order to either go to next stage or stop with the idea.

[2] http://www.atlascopcogroup.com/en/about-us/strategy-and-priorities (2017-05-15)

One attempt has been made where a development manager brought a team together consisting of development designers as well as personnel from the laboratory. The manager had divided different areas where ideas should be collected within, such as "product", "technology", and "knowledge creation", and during a whole day, the participants got to generate ideas within the different areas and pitch them to the rest of the group. In total, around 70 ideas were collected and gathered into an excel sheet. Another manager (interviewee 5) uses a method called "Technical Roadmap", where he collects different concepts and ideas regarding new technology to visualize how different ideas within the product ranges could be developed in what time. The roadmap is updated on a quarterly basis, and the managers makes sure that once a project has ended, the next idea should be ready to start being developed. He means that it can work as a tool to visualize the upcoming technologies, and should ideally be matched to something similar from the marketing department. Although, it has not happened yet.

Interviewee 1, 3, 4, and 5 means that specifications and definitions of an idea should ideally come from marketing, as they have the closest relationship and regular meetings with customers. The development department in Kalmar means that most innovations regarding new products have emerged from a technical perspective, and have in many cases been very successful. Hence, a few other projects have turn out less successful as the targeted market haven't been as big or eager to buy the new products as expected. Many means that a few solution might have been wrong, and other features would have brought more value. This is about validating needs and having a closer contact with customer to be more certain of how products will be met and accepted by different markets, and the above mentioned interviewees means that the information should be collected by marketing. The laboratory personnel are a few times out meeting the end-users of the machines, although with the purpose to understand problems with existing products. During these sessions, a lot of feedback is received where both spoken and unspoken needs can be collected, and one of the interviewees means that a lot of different ideas appear based on those insights that can be useful.

If an employee would come up with an idea which they believe in and would like to bring further, the next step is to present it to the closest manager. If the manager believes in it, the employee is allowed to put down some time on it and investigate the idea further for a while. Hence, a problem which was expressed by 3 interviewees, at non-managerial as well as managerial level, is that pressure and time restrictions from other ongoing projects will stop the idea, as the employees simply do not have time. A non-manager stated the following to describe the situation:

> *"We want to do the projects well and get the time we need, while the management wants to get new products out as soon as possible. So you get squeezed in between"*
>
> interviewee 3

Ideas that turns into real projects need to be accepted at a divisional meeting, where top management decides which ideas can be accepted as a project or not. Interviewee 7 talks about the different steps an idea can go through. Often he gets an informal "pitch" about the idea which often just starts with some loose thoughts. Then he encourages the employee to put down some time into it to prepare a formal presentation, and if possible, prepare a few CAD drawings and simulations.

4.3.2 Cross-functional

The functions collaborating throughout different projects include D&D, manufacturing, sourcing, lab, marketing, and customer center. As presented earlier, the market department is today located in Essen, Germany. Although, before 2011 parts of the department were located in Stockholm. The customer centers are located in different countries, while the rest of the functional units can be found in Kalmar. During the interviews, most focus were put on the collaboration with market, mostly regarding D&D but also regarding manufacturing and lab. Therefore, most of the information in this subchapter will be regarding the collaboration between D&D and market, but the other departments' collaboration will also get touched upon. First, an outline on how the collaboration is carried out will be presented, followed by opinions and thoughts collected during the interviews.

Regarding the collaboration between the departments which all are located in Kalmar, i.e. D&D, manufacturing, lab and sourcing, the collaboration goes through everyday talking, both formal during the pulse meetings, PDC meetings, and project follow ups, as well as more informal during the coffee breaks or similar. As described in earlier subchapters, only representatives with interest in the ongoing project are a part of the formal meetings. The contact between D&D and marketing, as well as manufacturing and marketing, can be divided into three major touch points. Firstly, most contact is held over telephone and email, as the departments are located in two different countries. This level of contact is held on a weekly to monthly-basis, depending on level of employment. Secondly, a strategy meeting is held twice a year where the market department gets invited to Kalmar. At those meetings, the steering group, most often the VP and sometimes the product line manager are represented, meaning that not all the level of employees get to be involved. The discussions during those meetings include what has happened since last meeting, i.e. the last half a year, and what the trends look like for the future. Lastly, a product portfolio meeting is carried out once every year where representatives from the market department visit Kalmar with the aim to go through the product portfolio together with the involved employees for the concerned projects.

All the interviewees highlight the importance of having a good collaboration between the different departments, both between the ones located in Kalmar, but even more important between the market department and the ones in Kalmar. The employees who only get to meet the marketing department at the occasions they are visiting Kalmar for the product portfolio meetings express how they experience this to be not enough. These employees are not at a managerial level, while the managers who get to meet the marketing department at other occasions believe it is sufficient interaction and exchange of information.

> *"I meet the marketing department every month. We have also tried to have the product portfolio meetings twice a year per product line. The results are not the best, but at least it is a forum where you can discuss new ideas big and small"*
>
> interviewee 7

Dissatisfaction has been expressed by some D&D-employees regarding the situation with the market department located in Germany, and not in Sweden or more preferably in Kalmar. Five out of total twelve interviewees expressed opinions about less involvement from the

market department, and that they for example often come with feedback too late on the projects when the project is already ongoing. For this reason, some have expressed wishes about having at least one marketing representative sitting at the office in Kalmar, whilst some believes this to be a problem not related to the physical distance. The contact with the marketing department is by three of the employees from Kalmar considered to have become worse since the transition from Stockholm to Essen. Whether that has to do with the transfer to another country or because of new employees at the department is interviewee 3 uncertain about:

"Then, it is not sure that it is because of the transfer from Sweden to Germany. Maybe the ones that previously worked in Stockholm would have quitted anyway and new ones would come in. So maybe it wouldn't have been any difference if they stayed in Stockholm. But they were actually closer when they were located in Stockholm. But that's how it is, the ones that were in Stockholm were Swedish. It is easier to talk with someone who speaks the same language"

interviewee 3

The same interviewees as mention above state how the input from market is not enough, making the development too technical driven. Furthermore, some D&D-employees expresses how they quite often feel that they do not get the information needed from the market department, which in turn leads to the D&D-employees having to give proposals to how things could be solved or done. This reinforces the feeling that the marketing department is not involved. It should, according those employees need to be a more equal division between technology push and market pull, whilst other interviewees (one person from D&D and two persons from marketing) already see this division as fairly equal. The lack of commitment or too late involvement is one of the major weaknesses connected to the collaboration with the market department that is brought up during the interviews. Another weakness that by some can be related to the collaboration is found to be the process of going from an idea into a pre-study and further to a project. This is a phase where input from all different departments is crucial in order to make sure that all and right information is obtained to reach a successful project. One of the middle managers expresses the situation with collaboration with marketing and managers as:

"I have an idea at the moment which I believe is great. My boss also believes it is great, but marketing means that they do not know yet how to position and sell it on the market, so they have to come back to us about it. Then the idea is put in a box, waiting for marketing to do their work with it. But then, I do not know what priority this idea has to be worked further upon by marketing, so I have to go and ask my boss who has taken the responsibility to bounce this idea with the marketing department in our divisional steering group"

The overall view from sourcing (interviewee 9) when it comes to their collaboration with D&D is that they get involved too late during the projects. When projects have been brought forward with new commodities the results have been a massive job to find new suppliers which has delayed projects a lot. There is, according to the sourcing department, no collaboration between sourcing and marketing.

Market department and the departments for customer service have a close collaboration to find out what happens on the market, the large customer that will be of interest for the future etc. This means that it is mostly the customer service who are in contact with the customers

and the end users. Despite this, also employees from D&D have sometimes been in direct contact with the end users, where for example interviewee 1 and 6 describes how they have visited customers in India. Interviewee 6 also describes how the D&D-department have developed prototypes to show for the end users as a way of getting feedback for further development.

4.3.3 Strategy

The PC in Kalmar went through a period of crafting a common vision and core values during 2011-2013, which was lead by interviewee. The product company also possesses a common technology and innovation strategy regarding future products. According to interviewee 1, this strategy is not very transparent and well known throughout the organization. The product portfolio meeting that already has been mentioned is arranged once a year by marketing, where ideas both from a technical as well as market perspective are pitched. The last decision whether ideas make it forward or not lays upon the president. No set strategy regarding short term and long term is present neither a budget allocation for the different levels of innovation, although interviewee 7 means that it can easily be changed and that the top management are ready to set aside money for more disruptive and far off projects even though it contains risk.

The two marketing managers interviewed (interviewee 11 and 12) explain that during product portfolio meetings, present products are presented but also what marketing believes will be important for the future. Interviewee 11 also states that they allocate about 80 % of their time on existing products, and 20 % on new products. When a new product will be brought forward, marketing needs to convince the rest that a potential will exist, and by doing so they use some methods and tools such as NPV to calculate the pay-back which would come within a couple of months or years. Another aspect that is taken into conclusion is to make sure that the new product fits into the overall strategy of Atlas Copco. At some points, they need to pivot and think beyond the existing market. Interviewee 11 means that they would like to see more disruptive ideas, although they possess much more risk. As a marketing manager, they feel it is difficult and risky to convince the company as it is difficult to estimate a market which do not exist and to know how customers will react to such change.

Interviewee 5 from Kalmar states that there is no clear strategy for neither the D&D nor the marketing department. He means that it is unclear what are the long term goals regarding technology, as it is not defined what types of products that should be developed to gain Atlas Copco in the longer perspective. Although, different areas where the employees can see will be beneficial in a more long-term perspective are mentioned.

One of the managers means that the company in Kalmar is focusing too much on exploitation and incremental improvements. Some of the new products and ideas are radical, but he means that there is no disruptive ideas or projects at all. According to him, around 70 % of the work effort is focusing on the core business and defending existing products out in the market, and the rest of the time (30 %) is spent upon incremental and radical projects. An interviewee from sourcing express that they allocate their time differently as they only focus 20-30 % of their time on supporting existing customers, 20-30 % on new and ongoing projects, and the rest with strategic purchasing for the future.

4.3.4 Management Control

The questions regarding management control from the interview guide were mainly about how the managers steer and lead their sub employees and what is believed to be important contact points. Although, the perspective from being a manager was included into several of the other questions. As already presented in 4.1, the interviewed managers were from both D&D, marketing, laboratory and sourcing. The middle managers of the development report to the divisional manager of D&D who is responsible for the departments in the total four product company within the division and sits in Kalmar. The divisional manager meets frequently with the rest of the vice presidents from the different departments as well as with president.

As presented in 4.3.1, if an employee wants to continue working with an idea for a longer time, top management must allocate time and a budget for this. Interviewees 2, 3, 6 and 10 all states that they experience the top management to be supporting and responsive to listen to new ideas. Hence, interviewee number 2 also means that the person which will receive the proposal also needs to be open and retentive to listen to the idea at a specific time, as if not the idea might be misunderstood and stopped. Interviewee 7 means that a key role as a manager is to be responsive and fast, as if too much time passes by the idea owner will lose motivation to proceed with the idea. The manager also states that he is very consequent to never decline an idea for the same reason. He means that ideas that are not good enough will eventually stop anyways by themself.

"I cannot recall to have ever said "No, we will not do this" to an idea, at least not as direct. Not because I am afraid to say no to things, but when it comes to idea generation it is such a fundamental thing to take some time to listen to what people say, and then try out and stretch the limits of the idea."

interviewee 7

Regarding work with ideas and FEI, one of the managers stated that he himself play a crucial role to realize and bring forward a suitable way of working with it. He means that he could dedicate time to do necessary tasks such as holding idea generation sessions and reviewing and judging ideas. Interviewee 5 also means that he is responsible for similar tasks, as well as allowing his employees to work upon ideas and help them to specify and restrict the projects. Other than that, regular meetings are held which are more explained in subchapter 4.1.1. The middle managers together with the top manager are responsible for presenting new ideas at the PDC as well as portfolio meetings. As mentioned in subchapter 4.3.1 regarding ideas, these are normally judged by the top management as well as the president as they have the authority to allocate budget for projects. Hence, when it comes to smaller improvements and incremental changes when nothing more than internal resources are involved; the middle management has the power to make decisions. Mentioned by one of the interviewees was that the steering committee are unlikely to allocate a budget for disruptive idea and concept development at the current date. In the same interview, it is also mentioned that the more radical projects that has emerged during the last year have in most cases started with skunk-work from employees, and when it has been developed enough, the steering committee has been convinced to invest in the projects.

The idea workshop also mentioned in 4.3.1, was organized by a manager (interviewee 1) who

was responsible of setting the structure of the day, steer the groups in which direction and areas ideas should be generated, as well as collecting the ideas and set a structure on how these should be judged and by whom. At the time of writing the thesis, the manager has not made further steps with the collected ideas besides an initial screening, why no more information is presented.

4.3.5 Climate and Culture

Questions on how the climate is perceived in Kalmar were asked to those employees working there. The answers here were very unanimous, where the majority (clearly stated by interviewee 1, 3, 4, 5, 6, 7 and 8) believes that the climate is very good and open-minded. There seems to be a high willingness of doing "new things" within the organization and the employees see themselves as well as their colleagues as very innovative persons. A quote that sums up the majority of employees' thoughts are as follows:

"I would argue that we have the right climate for new ideas. It kind of is that culture here"

interviewee 6

The open-minded attitude leads to the feeling that discussions can be held without any problems. On the other hand, while most interviewees experience the climate as open-minded, there is also one of those employees (interviewee 1) who experience that there is quite a lot of mental resistance, meaning that there is a lot to through before anything can become something concrete. The opinions tell that there are lots of ideas, but a structured way of handle them is what is missing. As said, the employees see the climate as a very innovative climate and interviewee 5 states how:

"The key to an innovative climate is to have a process and an organization that can deal with all the ideas that is needed to have"

interviewee 1

Interviewee 2, 4 and 6 tell how they are aware of where the originate idea behind an existing product comes from, and interviewee 4 means that this is a way of knowing the company which in turn is a really important way to foster a good collaboration and understanding within the company. Furthermore, a loyalty to the employer has been expressed by interviewee 1 to affect the climate, where the interviewee means that:

"Everyone is committed to make the work turn out well, and feel very proud when the seeing the results from a product that they have been involved in creating"

interviewee 5

The personal reflections collected from the observations during the three weeks spent on site agree with some statements, but stand more skeptical to others. More casual conversations about ideas and problem-solving where overheard during breaks and in the corridor. On a couple of occasions, discussions were observed about how certain problems could be solved, which on some occasions were received with an openness, while other matters seemed to be received with a more restrictive and negative attitude amongst the peers. With this said, the observations to some extent agree with the opinions of the climate being open-minded but also wonder if this really always is the case in every situation.

4.3.6 Best practices

A successful project that was brought up by interviewee 2, 3, 5, 10 and 11 is a project that started of by a market need. The marketing department saw a clear need in South Africa where the existing products did not serve the purpose as the energy efficiency was not good enough. During the same time period, a competitor which already had a machine driven by electricity out in the market for 12 years started to step forward in the same market. A marketing manager talked to the steering group and convinced them that it was an urgent matter and that the company needed to bring forward a product within the same range as soon as possible. This started off as a project, and the company managed to launch a product some time after. What makes this project successful was because it generated a lot of new knowledge within the organization regarding a new area of technology. Interviewee 7 also mentions that in another project, the marketing department delivered very clear specifications which were based on customer needs in an early stage:

> *"I believe the input from marketing was very clear and direct as they had pointed out the most important features and insights, and we could easily together develop it together, and it was a great project"*
>
> interviewee 7

Another key success factor which is brought up by interviewee 2 and 5 is to set clear and visual goals for both FEI as well as for projects as a whole. According to them, projects that have started of with a common vision and goals have been more successful and have run more smoothly. One example where this was applied is a product which the company have won prizes for. Interviewee 3 and 5 mean that the success was because the restrictions and specifications were very clearly stated early in the project resulting in the whole team worked towards the same direction. The challenge with setting goals already in FEI is, according to interviewee 5, to set the right amount and enough restricted goals without "strangling" creativity. Also, something that is referred to as "knowledge gaps" and front loading problem solving were mentioned in the same interview. Knowledge gaps are areas where the organization have identified that they lack knowledge about. By stating these gaps, it is clear where effort needs to be put in before a project proceeds. Also, by front loading more work will lower the risk for costly and time-consuming iterations.

Interviewee 6 states that an agile way of working is beneficial when the end result is unknown. The way of working with agile methodologies has been used little within the organization before, but both interviewee 1, 5, 6, 7 and 8 are aware of what it takes to work in such manner. Further, the interviewees also mean that by doing sprints and shorter iterations, an idea or concept can be checked with regular meetings to be decided whether a next sprint is needed or not. One interviewee also talks about the problem in planning the work with a specific idea, as if it is loosely defined and not enough set, it can harm the idea as well as lower the motivation if the planning and estimations need to be to specific initially.

Last, interviewee 2 means that the collaboration with the marketing department functioned better when there was a person from the marketing department present in the projects. This has changed since 2011, as today's marketing department is only responsible for certain tasks within a project. Even if the marketing department were located in Stockholm or Essen, they could attend project meetings through phone or video conferences which the interviewee

experienced to help the project with valuable input from their perspective.

4.3.7 Pitfalls

In order to understand what is in need of change or further development different areas as well as specific projects where the implementation or the result have not become as desired got brought up during the interviews. As given by the project content, it is the FEI that is in need of improvement, also clearly stated by interviewee 7 and 2 who said that:

*"What works worst is the FEI phase, and actually **planning** the FEI phase, i.e. to know which projects to go forward with"*

interviewee 7

"We miss the very first phase as we jump into project right away which we realize in the end was too quickly and too early. If you haven't worked through the concept properly an awful lots of loops will be the result which in turn takes a lot of time. That is where we suffer today"

interviewee 2

An interesting case, raised by interviewee 2, 3 and 11, related to the implementation of the FEI phase is a project idea that got brought up during the early 2000s and which the steering group did not believe enough upon to bring forward as a project. With the idea being rejected, it was all put aside until years later when competitors came with a similar product that became extremely successful on the market. Looking back, the initial idea and the process forward can today be seen as a clear example of what has been brought up as "False negatives". Interviewee 11 interpret how this might be explained though the idea at first was too technical driven, *technology push*, which made it not possible to move forward with at that time. When the market situation later on was studied, a too slow response to the new requirements and expectations resulted in this launch being later than desirable. While this was an explanation from a representative from the market department, a contradictory explanation from a D&D-employee was instead that the initial idea got refused from the market department straight away, with no other reason than that they did not see the market potential. This also shows that it to some extent exists a disagreement between the different departments, especially the viewpoint from the marketing department and the D&D-department. The collaboration between the two departments is also found to sometimes be another disadvantage in product development.

As an addition part of this, interviewee 4 summarized another view of what have been missing in the initial phase of projects; that the technology has not been assured enough. The believe of this in the beginning has led to projects been rushed into and in the end they have realized that it did not work the way they first assumed. An employee from production also adds how they perform too little tests on their products. Interviewee 2 also explains how problem have occurred when the project moves from one phase to another, especially from the first phase to the second, but without making sure that all the knowledge in secured. The respondent means that there are usually a lot of open questions left to be answered, and highlights the importance of getting those answers before the next phase can begin. This is also one of the reasons behind the implementation of the new product development process, where the move from one phase to the next is impossible without having all the answers the

questions related to the previous phase. Interviewee 5 stated that a major prerequisite before the start of a project is a comprehensive master specification where the entire plan is presented. It is important to never start without this, which the interviewee means is their weak side.

"This is needed before the process begins, so the right things get funneled into the start of a project"

interviewee 5

A further pitfall that was brought up by ten out of twelve of the interviewees is how the projects most often get delayed. According to interviewee 3 this can be explained by a couple of reasons. First, the weak FEI phase. Secondly, projects tend to grow when the project is running. The right employees for the setup of the master specification might not be present, which results in a lot of additions along the way. According to the interviewee, more people should need to be included in the earliest stages to make the specification finalized from the beginning. Lastly, when a project is to be approved, it is mostly time and budget that it is judged upon. A fairly realistic timetable may therefore be slimmed down, which becomes impossible to keep. So, according to the interviewee, the time schedule that is presented at first might also be close to where the project ends up, making it seem like most of the projects get delayed.

5. FRONT END OF INNOVATION AT OTHER CORPORATIONS

In this chapter, the result from the ten interviews held with external companies is presented.

Employees at ten external companies were interviewed during the beginning of the thesis. The interviewees are somewhat connected to their way of working with FEI at their company, either as an innovation manager or innovation coach. Based on these interviews, every company will be presented separately first followed by subchapter 5.11 and 5.12 which summarize best practices and pitfalls regarding FEI that emerged from all the interviews. The companies will be presented anonymous.

5.1 Company 1

Company 1 is a multinational concern producing hardware as well as software, for both professional customers and private consumers, with 40 000 - 50 000 employees worldwide. The interviewee works with pre-product innovations, which according to him can be defined as "everything that happens before it turns into products". In the general product development process, the company works with agile processes such as SCRUM or Kanban, depending on the amount of knowledge around the problem and how the group is used with working.

The company possesses a clear innovation process with the aim of supporting their work, meaning that there is no obligation to follow it but exist rather as a help if and when needed. A part of this process is what they call an "innovation day", which takes place twice a year. During this day, the employees get the opportunity to do whatever they which for 24 hours, followed by a presentation of the work. What the employees do can vary, all from reading a book, learning a new coding language or investigating and testing out a certain question. The employees get rewarded after the presentation, depending on how good the idea was and how good the presentation was. The innovation days are not mandatory, but if someone chose to not participate they are not allowed to interrupt or disturb the other employees who are taking part of the day. The employees will later on get time allocated to continue the work on the good ideas that emerged from the innovation day. According to the interviewee, the management provides more of support than control during the innovation days.

All the ideas emerged from the innovation days, as well as all other ideas that gets created at other occasions, are saved in a database. All those ideas will move into some sort of backlog, where the list of things to do get prioritized every now and then. This is similar to how the general product development process works, but instead of having a backlog for about a month, the backlog for the new ideas extends for about a year. When the employee comes up with an idea on own initiative, other than from the innovation day, the idea generator presents it to the product owner or closest manager. The idea needs to be ready enough for the product owner to understand it, and if there is an uncertainty to which product area the idea belongs to or if it crosses several different areas, it must be so well formulated that the different product owners understand it and maybe also the product owner manager.

It is the innovation manager, product owner manager, and other managerial positions that decide whether an idea should be developed further or not. The product owners will come with input if the company should work with any of the ideas, for example if it fits within current projects or if a new project needs to be created. There must always be a business opportunity for an idea to move into a project. Within this, there is a jury who decides to allocate more time or not for different ideas.

The major difference between the processes for incremental and radical ideas is that the processes regarding the radical ideas are of more ad hoc nature. Those ideas are much more about talking to the right people, convince people to get time to look more into the idea, and such. The radical or disruptive ideas do not come through pushing creativity, but rather comes when they are least expected. But when they arise, as the ideas still do, it is important to have a clear system that takes care of it to make sure no ideas goes missing. According to the interviewee, most innovation at the company today is of incremental nature. For the incremental work, the employees know better who to talk to, and it will most likely be within a project in which they are already a part of.

The culture at the company is seen as very forgiving and accepting, according to the interviewee. No one will judge if anyone tries an idea and fails. Despite this, the interviewee would wish to hear even more of *"Great that you tried all those ideas, you are really good at trying new things"*, even though all the ideas being tried failed.

The interviewee pinpoints the importance of having a well-functioning cross-functional collaboration, especially between R&D and marketing. It is important for the developers to understand the needs from the environment in order to secure that what gets delivered in the end is something useful and valuable.

The best practices emerged from this interview are about forecasting and predicting the future and what is coming up next, as well as to keep track of the current and future competitors. The main pitfall regarding the innovation work is the believe of forcing innovation to come, as the interviewee expresses it: *"Innovation is nothing that can be forced at a certain time; it comes when it is ready."*

5.2 Company 2

Company 2 is a Swedish consumer goods company which was founded many decades ago. Today the company is active in several different countries at different continents and possesses around 40 000 to 50 000 employees worldwide. The interviewee at the company is an innovation manager, who is involved in the generation and handling of ideas in the early stages. He is part of a team which is involved in managing the innovation work at their company. Apart from him, the innovation team consists of a few representatives from each business area within the organization.

Since early 2011, the company decided to put effort into a software system which can help them generate ideas online through set-up questions. Different approaches has been tried of who can be in charge of framing a question and a need within the software, but what has been understood is best practice for them is when a central part, such as the innovation team, frame

a question and invite relevant competences and people who can elaborate upon it and contribute with their own ideas and thoughts. From this way of working, the team can be responsible for bridging the knowledge between the participants who are part of bringing forward ideas.

The company works with their ideas on a "need basis", which means that each idea that is generated must come from a found need from a consumer or customer. In this manner, it secures that the idea has a receiver and interest from future customer before more money and effort is put into it. Ideas are either generated through the software program previously mentioned, or from a physical workshop which takes place a few times a year and are lead by the innovation managers. The company possesses knowledge about several different tools and methods that can be used for the purpose of generating ideas, and the interviewee means that all these are suitable for different purposes, such as what level of radicalness the idea must have and such.

The company possesses a process which contains of five steps. It starts with defining the strategy based on a need, and further it moves down to discovering and research around the opportunity. After that, the ideas are generated in of the two above explained ways. Further on, those ideas that passed the first step will be further developed into concepts. What needs to be clarified and developed during this time is for example concept testing with customer, description of what problem it solves and what value it brings, the Unique Selling points, the customer segment and how much it potentially could sell.

Regarding the decision-making, the interviewee means that it should be the idea owners responsibility to take decisions around the idea for as long as possible as they are the ones who possesses most of the knowledge related to the idea. The innovation team plays a crucial role in managing who "owns" the idea and support their work, as if the idea starts with the person who is not likely to work upon the idea for a longer time, it gets more difficult to transfer the idea later on. If it starts with the right person who can bring it forward, it is more likely to succeed and be right as it is seen that many ideas "die" when they are transferred to another person or group. When a clearly stated amount of concepts are developed enough, they move to a final meeting with higher level of management, who decide upon which ideas that will be further developed. What is also mentioned regarding different levels of decision-making is that the closer the idea is to the existing technology and products of the company, the lower the level of decision-making can be. When it comes to more disruptive ideas that differ more from the core of the company, the decision-making as well as the involvement should in general be at higher level of employment.

The role of marketing is crucial for the ideas in the company, as the employees at the marketing department are the ones that need to secure the "need" and that the ideas will have receivers. What happens in most cases is that the technical development department comes up with ideas, and after that asks the marketing department to get their input and their active involvement. It is first when the marketing department has found the right information in terms of insights and need, that they will approve the idea and the work can continue. The interviewee means that if an idea is about to be a successful innovation, the balance between technology and market must be well executed and idea must always come from an insight.

In general, the interviewee also means that everyone is capable of bringing forward an idea.

The ideas that are brought forward today are not very likely to be of good quality if it is only one person bringing it forward, there needs to be a collaboration between different competences who can build upon each other's ideas and through this way of working strong ideas can emerge. As stated by the interviewee, it is up to the company to build a culture that can foster creativity and innovation, and also be accepting to failure.

5.3 Company 3

Company 3 is a Swedish manufacturing company that produces consumer durables. The company operates worldwide and possess about 10 000 - 20 000 employees. The interviewee works at the company as a director innovation manager.

The interviewee states that there is *no global* uniform process when working with new ideas and innovations at the company finalized today, but it is something they are working with creating since the importance of it has been observed. As a part of how they are working today with ideas and FEI are through multidiscipline teams who work with ideas belonging to the future. The group, consisting of people with necessary and desired competences, is put together to work with radical and disruptive ideas that are more difficult to execute upon because of new business models, new domain, new infrastructure, etc. The importance of keeping these teams multidisciplinary is highlighted during the interview, which means that the team always consists of people with knowledge of market, technicality, software, hardware, business, and product specific. The way of working within multidisciplinary teams is an important aspect to consider generally throughout the whole organization, states the interviewee. According to the interviewee it is important that everyone understands that they alone does not possesses all the knowledge. This makes it important to learn how to work and to work across the borders of competence, and also to show respect for each other’s competences. The new leaders must therefore understand the importance to give freedom to all skills but also create an atmosphere where each competence will understand that one does not have the overall complete picture.

Within the part of the organization where the function is to investigate ideas in a longer perspective, a routine is set to every Friday which starts with each and every employees presenting the “ideas of the week”. Another method used for idea generation in specific is workshops where employees with specialist knowledge get invited. Apart from the specialist knowledge, it can also be good having managers participating the workshop, to provide the manager with a deeper understanding of the idea and the underlying problem. This also facilitates the decision-making for the manager when it comes to the decision-making, since it is the managers within the different areas taking the decisions. Another important part highlighted during the interview is the importance of verifying the customer need.

The company has developed a tool to make different ideas comparable to each other. Some of the parts which they are looking into are for example the potential revenue, what is missing in the market, what the competitors are doing, and the general potential of the idea. This most often means that the idea needs to be compared at the level of income, which can be difficult with an innovative idea. More details regarding the tool were not discussed during the interview. The same applies to the tools and methods in terms of which aspects that determine whether an idea should be continued further or not. This is also something that the company has developed and is using today.

A pitfall when working with innovation is, according to the interviewee, to not keep the new idea or concept separate, i.e. when it is brought into the normal product development process too early. At the same time, the interviewee also describes how it has also been found to be a pitfall when the idea is kept separate for too long. Lastly, the importance of having a climate where skunk work is accepted is also brought up during the interview. This means for example that the ideas not always have to be gained approval for from the manager during early phases of development.

5.4 Company 4

Company 4 is a Swedish owned engineering company that has between 5000 and 10 000 employees. The person interviewed works as an innovation coach half of the time and spends the rest of the time with business development including market analysis. He is one out of three in total innovation coaches which support initiatives within the company.

A few years ago a desire was expressed by the steering committee at the company to be more innovative. Since then, several attempts have been made to figure out what the best way to go about regarding the topic would be. There is no clear standardized process which is valid for the whole organization, but the interviewee means that the way of working with innovation needs to be adapted to each department and each segment and how their way of working is designed. As this changes over time, any other process will change with it. Previously, they had a system where employees could upload their ideas, but the only person it was visible for was the "receiver", i.e. the person who will judge and elaborate upon the idea. Although, this was experienced to be too limited, so when the company later on brought in an idea management tool in the company, it was important to secure that each idea was transparent and accessible for anyone who potentially could be involved in the process.

A way for the company to collect ideas is through their idea management tool, which helps to collect ideas from different parts of the organization. What they have decided to do with the program, based on experience, is that management are the ones who starts challenges based on a need, rather than having sporadic contributions and ideas coming in without any framing. For this, they phrase an initial question which frames the area they want contribution in terms of ideas within. After that, a top management and the group of innovation managers do a first screening where they rate ideas quantitative with the help of the software program, as well as giving a qualitative personal opinion about each idea. They finally select an amount of ideas, and the ideas that make it to next step will be further developed at a second round where research is done at a deeper level. After this, a second screening is done again by top management and the innovation coaches, both quantitative and qualitative, where some ideas might be finally selected to become projects. There is also a way to contribute with ideas without any set challenges or the software program, which is through a form where certain clarifications have to be made. These clarifications includes for example explaining what problem the idea will solve, what the purpose of the idea is, what the need declared by customers or users is, and what difference the idea can make. This is also how the company has decided to define an idea.

A problem which has been experienced by the interviewee is the difficulties that may occur when an idea is transferred for further development to another part of the organization which was not part of generating the idea. Often employees tend to feel unfamiliar with the idea if

they were not initially part of it, and continue with it but with lack of motivation or simply decline to work with the idea at all. What the interviewee believes is a key factor for the success of an idea is that either the person or group who came up with the idea also are the ones who continue the work forward with it, or that a person at top management is heavily involved in the idea and can therefore support the group, both financially and with coaching to proceed.

The interviewee means that all the products that will emerge from the company out in the market need be based on and started by a need from a customer. It is the marketing department's responsibility to understand what the situation looks like for the customers, what the external environment looks like and also to understand what is important for the future. All this information should then be transferred throughout the company, so that development projects can be triggered to solve these needs. Hence, it exits difficulties to get the marketing department involved in the development process. This is something that the company tries to focus more upon and solve in a better manner to get more cross-functional teams. What is also stated regarding holistic teams is that the era when there was only a single inventor who came up with a great idea is over. The technology that is needed in today's society is more complex compared to before and must have several competences coming together to succeed, and to be secure about customer demand the need must be found. Also, the creativity must be a natural part of an organization as well as providing a structure for that to work, both in early phases as well as throughout the whole development, can work systematically.

When it comes to different levels of innovation, such as incremental and radical, the interviewee believes that it is up to the top management of the company to decide how the balance between these should look like at different times. Also, if the work tasks between these two are mixed, he believes that the incremental work will drive out and damage the radical projects, as their normal way of working is with incremental projects. The management must have an open mind, and understand the importance of both short term, and most importantly the long term perspective. He also believes that it is a crucial factor to actually decide and allocate a certain percentage of the company's resources to more radical projects in order to survive in long term.

5.5 Company 5

Company 5 is a Swedish software company within the finance sector. They possess about 1000 - 5000 employees within Europe. The person who is interviewed is partly responsible for product development within one of their segments, and focuses both on the daily operations as well as new business opportunities and how the future market might look like.

About one year ago the company introduced an idea process which is divided into three different stages; Opportunity, Discovery, and Delivery. For an employee to get an idea into the process, it always starts with a pitch, where the employee pitch for a committee which normally consist of the Chief Executive Officer (CEO), the Chief Product Officer (CPO), as well as Chief Commercial Officer (CCO). In the first initial pitch, the idea needs to be explain briefly and pinpoint the value it offers as well as what problem it solves. If the committee believes in it, a decision is made to allocate some investment for further development. After that, it is important to as fast as possible build something which can work as a "proof of concept", something that can be shown and used with contact with customers

to verify if it will be of interest and if there actually is a need for it. Normally a product manager and a software engineer will come together and create something fast. The criteria which the ideas are normally judged upon are how much time and resources that will be needed to develop the idea, how much revenue the idea can generate in the future, and how much value it can bring to the customers. The decisions are made both objectively as well as subjectively.

An example brought up during the interview is an acquisition that the company made a couple of months earlier. They saw a future trend within an area which is not close to the core of the existing business, and therefore decided that it would be a good idea to acquire a small company for this reason. The small team executes in another country, and the company has added some personnel to it. The interviewee means that if ideas and future products are too far of the core business, it is important to separate them from the rest of the companies as they do not want them to be distracted by daily operations.

Regarding the decision about whether an idea makes it further or not, normally the committee mentioned earlier is responsible for taking decisions regularly between the different stages when it comes to new ideas. Hence, if the ideas that are closely connected to the core products, the level of decision-making should lay upon the teams themselves and the top management should rather support and believe and trust in the people for doing so. One thing that the interviewee believes is key is that the top management, such as the CEO, is heavily involved in the ideas that emerge and follow the process of the ideas that goes further. He believes that the more disconnected the executives are from the ones bringing forward ideas, the harder it is to foster ideas and the more likely it is that they will be stopped.

The way that the collaboration between product developing and marketing normally works is that the product team tells the marketing team about a future product they want to work upon and make clear what the value proposition is. It is then up to the marketing team to come up with an official plan on how the new idea and product will be presented and communicated to the targeted market. The product and marketing teams meet regularly every quarter, where they talk about what is going on in the different markets, and the product team has the possibility to talk about new emerging ideas from their side. Before these meetings every employees that will take part of it need to keep themselves updated by reading at the official backlog where they can access updates about the work. Also, on a quarterly basis the company organizes so called “Hackathons”, which are full days where different departments such as product and engineering as well as sales and marketing are invited to collaborate and work upon set challenges based on ideas. Therefore, the hackathons also work as forums for the departments to meet. Although, a problem which has occurred regarding the collaboration between the technical teams and the marketing teams was when the central engineering team was located in Stockholm and developed a technical solution specifically for the UK market where the sales team was located. What happened was that misunderstanding came up during the development of the idea where sales meant that the product team did not understand the market, and the product team felt like sales did not understand the product. Due to this, the company changed so that ideas and products which are for a local market are no longer developed in the central product team, but instead closer to its actual market.

A key success factor for the company’s way of working with FEI according to the interviewee is for example to be very clear and transparent about the decision of investment

in the different projects. There can be many ideas floating around in the company, but if a decision is never made to allocate time and resources, the ideas will simply not proceed either. If decisions are clearly communicated to the rest of the organization, everyone can understand who is working with it and why the management decided to invest in it. Another key factor is to foster a culture which encourage everyone to contribute with ideas. Anyone must feel that they are in power of bringing an idea forward, no matter which education or background one has. Another factor is to proof the concept as early as possible. The faster an idea can get verified, the lower the risk is to invest in something that later will not work out as it was planned. Another key factor is to not involve too many in the earliest phases. If there are too many opinions from different departments, the idea can easily be brought down by different arguments that eventually will "kill" the idea. The work around the idea should rather start with one or two persons, that later can involve key stakeholders when needed. Lastly, the interviewee also means that one success factor for them is that their top management, such as the CEO, is heavily involved in the ideas and concepts, and the closer the connection is between decision-makers and the product team, the higher quality the idea will have and the likelihood for the idea to become a product will become bigger.

A pitfall that have happen within the company is for example the counterpart of one of the success factors, when someone continue working on an idea without validating and testing it properly. Also, when allocating a budget for a team it needs to be clear that the people necessary for bringing the idea forward will have enough time set aside for the project. If a key stakeholder is too occupied in other tasks, the project will go slow which previously has shown to be harmful. The interviewee means that it is top management's responsibility to make sure that the time and resources needed for the development of an idea exist.

5.6 Company 6

Company 6 is a company with 50 000 - 60 000 employees within the industry of home appliance. The interviewee works as an operational innovation manager, where she for example is part of a global operation team.

The company possesses several structured and well-defined methods and tools for facilitating their product development process, which partly are available to the employees through documented handbooks and guides to be found on their intranet. One of the methods connected to the work regarding more radical ideas, and therefor used in the very early stages of the product development process, consists of set questions that need to be answered before entering the actual development phase. The questions are of such content that a cross-functionality is needed to make sure all the questions get answered correctly. This means that representatives from the departments of R&D, marketing, design, and product-line are all collaborating. The purpose of the questions is to make sure that all required information is captured around the idea. This question-based tool is available online, but only visible for the employees working within the specific project. The work around radical ideas where a need of coming up with something totally new has been found to be mostly market and consumer driven. Anyhow, if it is found that the technology is missing, the development of the idea moves into more advanced development where R&D achieves technical improvement. This advanced development, which is a separate process, is still cross-functional. The overall intent is to make sure that the ideas to originate from the consumer perspective, which means that even if it is a technical development the initial idea got a consumer connection.

Several methods are used within the company with the purpose of coming up with new ideas, defining ideas, and developing the ideas. Brainstorming, storyboarding, and role-play are three examples of ideation methods. Which tool to use depends on what phase the idea is in and how much information is available around the idea. Brainstorming has been found to work best in the beginning, while prototyping is harder to do during the earlier stages. Storyboarding fits best somewhere in the middle when it is more known what the concept is about. Important to remember is to never think that only one session of any activity is enough, with for example only one day of brainstorming remains a lot of work with developing the brought up ideas further. Idea Jams is another activity that has been used internally, which means they involve the whole company where people submit their ideas based on a set theme. There has also been external crowdsourcing, for example with design students participating with their own ideas.

The interviewee claims how the challenge when working with tools is not necessarily finding the "right" tools; it is about rather finding the right way to implement it. It may take up to three years to implement a tool or method before any results can be expected out of it, why there has been a consciousness when it comes to implementing new things or changing something within the company. It is therefore again important to involve cross-functionality among the employees and to make them feel engaged.

There is no general way of storing the ideas within the company; the different functions have different ways of inventorying amongst their ideas. This makes the access limited, since it is only the people working within the function and with the specific project has accessibility. The way of measuring and deciding what ideas to bring forward is very subjective, as the decision makers are the managers within the different functions. These managers, to some extent higher level managers, build the steering committee and it is primarily the business case, what the financial model could look like, and what the ambitions are that is being considered. There are no direct differences in handling incremental or radical ideas, apart from less demand of earning potential for the incremental ones. Apart from being decision-makers, as it is the managers within R&D, marketing, design and product line who takes the decision, the role of the high level managers is also to support and push their team. It is also the manager's role to kill the ideas and innovations if they consider it not being successful enough. On daily basis, it is the more middle level managers who develop the ideas, and presents it to higher level like directors or VPs. The employees with more of a staff function do not get involved in those activities.

At several occasions during the interview, the importance of cross-functional collaboration is brought up. The importance of everyone being able to express their opinion and to not work in silence is something that is heavily pushed upon within the organization. It is also very important to make sure that everyone understands each other. The tools are available to facilitate the work, but the most important, and also hardest part, is to get the people use them together.

Some drawbacks that have been found regarding innovation work is how something that the company does not see as an innovation can be considered a major innovation for the customers. As the interviewee says:

> *"It is not what we think is an innovation or not, it is what the consumer perceive as an innovation that is important"*

This also highlights the importance of having the customers in the focus during the whole process. This is important for business working both towards customers and towards other company.

Another important factor that was brought up during the interview is the importance of front loading and that it is crucial to have alignment. Since this means that all the decisions are taken before any money have been invested, it does not only save money but also time. Also, if the front loading is *not* done cross-functional, the discussions and problems will arise later on during the product development stages, which normally is less flexible for changes.

5.7 Company 7

Company 7 is originally founded in Sweden and produces software solutions which are used by other companies. They consist of about 100 - 500 employees active in several Nordic countries. The interviewee is working as a sales manager at their office located in Stockholm.

Ideas are either driven by customer demand or from a product and technical perspective. Most commonly, ideas come either from sales or marketing, as these departments work closely together with their customers and many ideas come from conversations and interviews. The technical ideas are often more far off the current core business, and can for example be about a shift from one platform to another which requires a lot of research and new knowledge. Currently, the company possesses no standardized processes of pushing ideas forward or similar. Although, improvements since a couple of years have been made. Previously, the ideas that were brought forward often emerged from people who “shouts the loudest”, but this is not the case to the same extent today. If an employee comes up with an idea, normally a presentation is created to pitch the idea to the closest project manager. After this, the project manager will judge the idea depending on three factors:

- Customer value - will the idea be needed in order stay competitive?
- How much ROI will get out of the idea?
- How much time and resources are necessary to verify the idea?

If a decision is made to work further with an idea, a business case will be developed for a set time decided by management, depending on if it is an idea driven by customer demand or from a technical development. In the business case, it needs to be clearly defined how the idea can be developed and executed, and how it will be launched and sold during time. Also, if an idea is more radical or even disruptive, the interviewee means that top management have the responsibility to delegate which competences and resources that are needed to develop the idea as it often requires a broader scope of different skillset. Top management also need to make sure to isolate these people working with those types of ideas either part time or full time. If it is incremental ideas, the decision-making should lay at a lower level. Normally, the process when an incremental idea is brought forward is when an employee works closely with a customer. They might identify a problem or a lack in the software, and the employee brings forward a simple prototype which is tested. If successful, it is brought back to the company where it will be implemented in the program. Today, the ratio for incremental ideas for existing customers is about 90 % of the company's focus, and 10 % focus is spent on more distance and unknown markets.

The collaboration between the sales and marketing department and the development department is frequent, and according to the interviewee it is an important factor as most of their ideas are driven by customer value and need. The physical distance is a key factor, as many valuable discussions starts over a coffee or during lunch break when the departments meet. Once or twice a week, the development department organizes “sessions” for all the offices within the company, where employee from sales and marketing are invited to keep track about the latest development and give their feedback. According to the interviewee this works well, and is a key to why their collaboration works as good as it does.

A key success factor regarding their FEI, is according to the interviewee the culture within the organization. The culture allows employees to lift their thoughts regarding ideas and innovations. One example is a successful product which was developed a few years ago where the initiative came from and was driven by an employee. Further, most improvements and functions are raised and driven by ideas. Another key factor mentioned is the importance and behavior from management. They are main responsible of setting the vision, make sure that the whole organization works towards the same goals and also decides and gives time and resources for local initiatives.

The main pitfall for the company is when an idea is not coordinated well between the market and the development department. During different iterations, it can happen that the checks between the two areas get weak, and it can lead to a developed product which is not desired by a customer. Why this can happen can according to the interviewee be explained by when the development department gets too isolated and forget to update the marketing department about the progress. Therefore, the two questions: Why is the company doing this? and What value does it bring to the customer? need to be constantly addressed during the development of the idea.

5.8 Company 8

Company 8 is a Swedish software company providing services for private users within several continents, and has around 1000 - 2000 employees. The interviewee works in a role called “Difference Maker”, which on daily basis means close collaboration with the CEO.

The company has structured processes on how to develop ideas and to further elaborate the concepts. Twice a year they set up so called “hack weeks” where all the employees make a break in their regional work to participate in the development of new ideas. Before the hack weeks starts, any employee who has an idea present this idea online, with no directions or management control, to allow other employees to choose which of the presented ideas they wish to be part of developing during the following hack week. This means that a group of different people will work on a certain idea, depending on their own interest, from Monday to Thursday, followed by a live streamed presentation on the Friday. This makes the employees involved, listening to the results from all other groups. This is the only opportunity for the employees at the developing department to bring forward their ideas, since the developers seldom come with ideas. Today, the greatest ideas have been developed from a hack week of this kind. The company also encourages slack work, as it has been found that when, for example at the start of new projects, ideas seem to come up that are not related to the current project, but can be of interest for another future project. For the slack work, there are

channels and forums available for discussions, and apart from talking to the manager when coming up with an idea on own initiative, these channels are a suitable place for presenting and getting feedback on the ideas. It is important that there is time set aside to listen to ideas, because it is not only the one who control strategy that knows what actually could be possible to create. The interviewee has never taken part of group activities for ideation, or are aware of any existing ones.

When the decision shall be taken around ideas, a strategy team with representatives from all functions within the company; marketing, human resources, customers, etc. along with the steering committee and the CFO are gathered. Everyone may provide input, but it is the CFO who has the last word for the prioritization of the ideas.

According to the interviewee, diversity is everything when it comes to collaboration and teamwork in order to achieve the best results. In such a group, the people will feel secure, and when people create a safe workplace, they will also contribute with what makes them unique. This is so how new ideas actually into a company. The culture is perceived as fast moving and enthusiastic. There is an importance with an agile approach. If there is anything not working as it should, it requires to be proactive to eliminate quickly. Otherwise it costs too much money and too much time. They want the employees to feel that they can do things, and not always having to enter heavy processes as soon as they are up to something. The company believes rather that they, thus, are somewhat inefficient rather than people do not feel that they have an outlet or time for what they would like to do.

Apart from diversity, the key success factors for FEI are speed and responsiveness. The employees must dare to try and to achieve this, it is extremely important to give support. With no support given, the employees will start to believe that there is no value in their ideas, which would be the worst case scenario. And to be able to respond quickly is also very important. One way of making the employees feel safe is to provide them with the opportunity of being anonymous, for example by talking to someone who are bound to secrecy. However, the anonymity can also lead to inappropriate criticism, which in itself can create bad culture. The company also got an intern portal for learning, where the employees get the opportunity to educate oneself or to just learn something new.

The interviewee also points out the time it can take to implement new tools or processes. When they are implemented, it most often works out great. A pitfall brought up during the interview when working with ideas and innovation is to keep the thinking process too static and to have the same persons taking all the decisions. The leader has to dare to step back and trust the others, that they might be better of making the specific decision, as they might know the area best.

5.9 Company 9

Company 9 is a Swedish software company providing a system for idea development and innovation to large companies and organizations. The company consists of about 5-10 persons and the interviewee for this thesis was the CEO of the company. He possess knowledge about FEI both the company where he works at, as well as from larger firms that are their customers, and talked from both perspectives during the interview.

The way their company works with ideas does not differ between incremental and radical ideas, rather it is the forum in which they are discussed that are different from each other depending on different ideas. The incremental ideas are looked into by the product leader on its own who got the mandate to decide upon those, while the more radical and disruptive ideas are discussed during management meetings where the whole group of employees are involved. This means that for the radical ideas, it is seldom to find a specific idea owner since the ideas often grow from discussions within the group.

The interviewee states how he has come to realize that the most important factor for FEI is to get the employee in a company to find good everyday ideas, rather than looking specifically into finding the disruptive ones. He means that the disruptive ideas will eventually emerge from the everyday work as long as an open, transparent, and very inclusive management is obtained where a culture is built to make sure the employees dare to question themselves and also to question what to do and where to go. This creates a way of thinking in the organization that promotes disruptive ideas. For companies having a hierarchical organization structure, which simply controls from top to bottom with very little transparency, it does not matter if anyone asks about disruptive ideas, as that way of thinking does not exist from the beginning.

The interviewee states the importance, especially for larger organizations, to use a system for collecting ideas over time and to keep them saved. An important part for the system is to keep it the same for the entire organization. Sooner or later, there will be ideas in the system that can create enormous value, and that is why it is important to not loose them. If software is used, it is important that the ideas are captured wide, and that they are online to make them available and transparent.

The company has organized a way of prioritizing among their ideas, which basically is built up by two stages of prioritization: the most urgent concerns that have to be taken care of immediately to not hurt the customers, and an evaluation where the value created and efforts needed are weighted against each other. For idea generation, they have tested various methods, such as apps and brainstorming. This has been difficult since they are such a small organization, but through working with larger organizations they have seen that formal brainstorming can be a great way to get started. The interviewee has experienced that once an idea management system is implemented, it becomes in a way self-generating regarding new ideas. It has lead to people starting to get involved, inserting new ideas and also providing an opportunity of seeing others ideas.

Management has an enormous responsibility when it comes to generating and handling ideas. The key is for them to stimulate the organization to dare to think for themselves and give the employees the opportunity to express their thoughts in terms of being able to come up with both insight and ideas on what could be done differently or new. Responsibilities for the board members are on the other hand to ensure that there is a sustained and sustainable organization, by building a leadership providing this. This summarizes what the interviewee has found as key factors for success, where one key is a question of leadership with the aim of creating a culture in the organization that makes you dare to challenge yourself and to come up with own ideas. Another important key factor is to connect the market side with the development side in the organization. Working systematically and continuously with this and FEI in general is the third important thing. Lastly, according to the interviewee, a tool for the

development of ideas becomes very important.

A trap when working with ideas and innovation is to not have enough endurance in the organization. Also, to take a lot of shortcuts and to have parallel channels making not everything being kept in one place, despite having an idea handling system. But the worst trap is if the organization is lacking a way of providing feedback. With no feedback provided, the environment does not lead to any involvement of the employees.

5.10 Company 10

Company 10 is a company within the retail industry. The company is operating in several different countries and continents, and has about 150 000 - 200 000 employees in total. The role of the interviewee is Innovation Leader and works at the technology development at the company.

Recently, the group working with innovation from Sweden has put down effort to talk to several companies as well as universities such as Stanford and MIT with the purpose to understand what is proved to be best practice regarding innovation and idea management. Tools and methods that have been picked up during this research which they have started to use. These are for example Design Thinking, Lean Startup, Test and Learn, and Business Model Canvas, which are all tools and methods commonly used in the startup world. The interviewee means that these methods have been proven to work, and have therefore a belief that they will suit the way the company wants to work with innovations as well.

Although all the new methods, the most common way the company works with ideas and innovations until the time of the interview is what the interviewee refers to as “Slow Failure”. That means that research and pre-study during six to twelve months take place, and after that normally a project takes a couple of months. During this time, the risk of developing something undesirable for the customer is very high. The new way of working with the earlier mentioned methods should make the process faster by enabling short sprints, where an idea can run through an amount of iterations for a couple of weeks in an agile way of working. The difficulties for the company to transform into the new way of working with ideas lay mainly within the decision-making and budget process. In the current situation, it takes too long time for good ideas to be processed, and there is no budget that differs between the incremental ideas and the more disruptive ideas.

A project which is under development within the organization is to set up three different innovation incubators; one in China, another one in Sweden and lastly one in the United States. The purpose to set up these is to separate teams that can work on more radical and disruptive ideas so they can proceed their work without being questioned of what they are doing, and also to be able to apply the new, iterative way of working. Accordingly, the companies and universities that have been visited all mentioned the same conclusion: If disruptive ideas should come through in an organization, they have to be separated from the normal way of working. The reason why the incubators are located in different areas is to enable that the technical development are closer to a certain and important market, as for example the needs in China might differ a lot compared to the needs in the United States.

The decision are taken by a committee which consists of a few people at middle management level. The process for the decision-makers starts with getting the idea pitched, which together with the continuing work forward is long and time consuming. As mentioned earlier, there are no budget allocated to radical and disruptive ideas, and what seems to go through the process are only small changes on existing products. The person interviewed also means that there is no initiative within the forum to discover the "unknown". The way ideas are judged and classified between each other in the current situation is not known for the interviewee. How the ideas will be judged in the new way of working is by answering:

- How much development and resources are needed to bring the idea forward?
- In what way does the idea contribute to the organization?
- Which benefits does the idea have for the customer and end-user?

According to the interviewee, there should be no "middle hand" that are involved in the decision-making, but rather the idea owner and top management such as the CEO of a company to make the process more rapid. Also, the top management can have a better overview of what risks that can be taken and hopefully see the potential of more high risk projects easier. What is mentioned during the interview is that it necessarily does not need to cost more to a company when including more high risk project. If an idea goes through shorter sprints and more focus lays upon verifying and testing fast, the chance of getting one successful innovation out of the process has increased without a lot of resources being spent.

Finally, the interviewee also means that it is up to management to set a culture and to make sure to listen to all initiatives that every employee has, no matter at which level the employee might be. The interviewee also means that a culture where statements such as "This is the way we have always done things" exist is directly dangerous for a company's climate and potential to be creative. If the way of thinking gets to locked into current core business and products, it is hard to unleash ideas that are radical and disruptive.

5.11 Key Success Factors in Practice

What was raised during all the interviews and brought up to be of major importance for the success of FEI in general at all ten companies is the cross-functional work. The collaboration between the development department and the marketing or the sales department within the firms has proved to be particularly important, regardless of which industry the company operates in. How well the communication across the functions is executed lays much upon the company's culture. The interviewee from company 7 expressed this as:

"I think it is our culture that is the largest factor that causes people to dare to have input and to raise their thoughts"

According to this interviewee, and also agreed by all other interviewees, this is the underlying reason why the communication across the functions is carried out in the best way.

Furthermore, to foster a culture where the employees feel motivated to come with new ideas and to not be afraid of being questioned or turned down is found to be of high importance for the success of FEI. According to company 5 this could for example be done through reward systems, or, as also stated by company 1, 6, 7, 9 and 10, to encourage the employees' idea generation through supporting management. Management contributes to a very large extent

as they for example are the ones who set the vision and common goals for the company. Unless management show the openness and the culture, and work as they are a part of the organization, the employees will never follow the openness either. As interviewees from company 1, 4, 6, 7, 8 and 9 stated, it is the management who set the structure and provide the employees with opportunities such as innovation days or similar encouragement to innovate and be creative.

A method for idea generation that reappeared during several of the interviews is what at some companies is referred to as an innovation day: one day, or even shorter as well as longer period of time, is given to the employees to work with certain ideas or to come up with new ideas. This is a well-working method held at company 1, 2, 5, 6 and 9, and can therefore be seen as best practice for idea generation. Company 2 and 4 also mention that best practice during these days has been to also steer and clearly set an area from which ideas should be generated. A further best practice explicitly revealed in the interview held with company 8, 9 and 10, and implicitly from several other companies, include the importance of agile way of working. According to those companies, two of which comes from the software industry and one from the hardware industry, it is extremely important to be able to make quick decisions and be responsive to rapid changes, especially in the early phases of the product development.

"Speed is key, decisions must be made quickly, and the projects must be executed quickly. We do not want to spend years on developing new things, we just want to do it in a few weeks"

company 10

The best practice regarding decision-making was found to be that the decision-making process should be distributed where the best competences regarding the specific decision is found. This means that it is not necessarily a manager or a steering committee that are the best decision-makers, it can rather be sub-departments or highly involved individuals depending on the case. This is agreed upon by interviewee from company 2, 5, 8 and 10.

"...one of the key drivers to success is not involving too many people and layers into the entire process of innovation or getting new stuff done. Because decision by a committee, they don't work"

company 5

"We have found that the best person to evaluate an idea is that the one who evaluate the idea is the one who needs the idea"

company 2

Company 1, 5, 7, 8, 9 and 10 all describe how the decisions need to be taken higher up in the hierarchy the more resources the concerning idea requires. Decision-making is something that also proved to distinguish between whether the idea is of incremental or radical character, where the incremental ideas even more rarely require approval from anyone else but simply viewed as changes in the daily work. If the idea is more of a radical or disruptive character, the decisions are made at a higher level of management. Something else that proved to distinguish between incremental and radical ideas as a best practice concerns how they are handled and worked upon in general within the organization. In terms of radical ideas, the interviewee from company 10 states:

"The key is to get disconnected from the normal way of working"

This is also highly agreed upon from company 1, 4, 5 and 8, where the interviewee from company 5 describes how they have a separate teams for ideas that are more outside their current business scope, with the aim of not distracting the current company with "new things".

To summarize the best practices that emerged from the ten interviews with the external companies, those lay mostly on cross-functional collaboration, open culture, supporting management, agile way of working, keep the decision-making decentralized for incremental ideas and centralized for radical and disruptive ideas, and lastly to separate the radical and disruptive work from the everyday work of the organization.

5.12 Drawbacks in Practice

What needs to be addressed before the subchapter continues is that the majority of the things mentioned in previous subchapter about best practice have a contradiction which can be seen as pitfalls. Although, in this chapter the outspoken pitfalls will be brought up.

Company 1, 2, 5, 8 and 9 mention how a culture can harm ideas and innovations. The interviewee from company 1 means that it is easy for management to say that an organization has an open and accepting culture, but acting upon it is more difficult. The interviewee from this company states:

"It should be okay if the numbers from the yearly result would be negative one year, and the managers should rather act upon that and mention that at least the organization tried new projects, and even it they all failed they all dared to try and that should be a success in itself. We are not in that state yet"

The interviewee from company 8 also brings up that it can be directly harmful if a homogen group are the only ones generating and bringing ideas forward, as the mindset of the people are too similar and they will therefore not question each other. The interviewee also means that if an organization is combined with diverse individuals, the climate will become safer and through that every individual can contribute with what makes them unique and greater ideas can grow.

Another pitfall that can occur according to company 7 and 8 is when management do not listen and do not get involved fast enough when employees want to continue with ideas. Also company 10 strengthens this statement by mentioning one of their biggest pitfalls: slow decision making by management. The harm about a slow centralized decision-making committee is also brought up by company 1, 5, 7, 8 and 10. The interviewee from company 5 states:

"The sub-departments have the freedom to prioritize ideas. We as managers don't get much involved there, but to give freedom to smart people is key"

Company 5, 8, 9 and 10 brings up risk-taking and challenging the status quo. The problem with being a big organization often complicates things, as the risk taking often is very low as it is most comfortable and safe to do things as they always have been done, according to company 8. Company 9 states:

"*An organization where everyone feels that they can question both how and why a company*

do things, is often an organization where disruptive ideas are grown. But in an organization where the culture of not questioning exist, risk are not taken and therefore no disruptive ideas are grown"

Company 2 and 4 mention the same pitfall which is about "handing over" an idea. They both mean that in situations when an idea has been started by a person or a group which later on have to pass further the idea for development, the initiative on many cases stops as the receiver often experience the "not invented here" syndrome. Therefore, they mention that a key factor is to make sure that the person or group generating an idea should have the right competences to bring forward the idea as far as possible already from the beginning.

Another pitfall which is brought up by interviewee from company 5 is when the marketing department has been too far off the development department. A previous case, mentioned in the description of company 5 above, was when the departments for marketing and sales were situated in another country than the development department. The development brought forward a product for their market and misunderstandings occurred between the two different departments which was harmful for the product. Since then, the company has decided to put a development team closer to important markets in order to avoid similar situations again. Regarding cross-functionality, company 6 means that a pitfall for their organization was when they believed that only one meeting consisting of a cross-functional group where ideas are generated will be enough to assure that the idea will be successful. The interviewee means that continuous meetings must be held with a cross-functional group for an idea to be developed with multiple perspectives in order to be successful.

Company 4, 5 and 10 talk about how more radical and disruptive projects most likely will not occur if the management do not dedicate and allocate a clear budget for high risk projects. When doing so, it is according to company 5 also important that managers are transparent about how this is done throughout the whole organization. The interviewee from company 5 also states:

"I think it's really important to make clear investment decision at some points. Otherwise you will have so many ideas without anything happening"

Summarizing the identified pitfalls from the interviews, these are as follows: centralized decision committee for majority of the decisions within an organization, homogeneous groups of people for idea generation, unclear or no allocation for budget for high risk projects, conservative steering committee regarding risk taking and core business, and finally not making sure that the idea owner is the one who can bring the idea as far as possible.

6. ANALYSIS AND DISCUSSION

The aim with the chapter is to answer and conclude upon the three research questions that lay the base of this thesis. The analysis and discussion will follow based on literature and the external as well as internal interview data.

Since the aim for the project is to investigate what are key success factors and common pitfalls within FEI, this chapter will elaborate upon the findings from both literature, the qualitative interviews as well as observations regarding this subject. Initially, the first research question *"What are important factors for success in the Front End of Innovation?"* will be analyzed as well as discussed, followed by an analysis on the remaining two research questions *"At what organizational level should decision-making for different types of ideas lay upon?"* and *"How can ideas that are radical and disruptive in nature be evaluated and measured?*".

6.1 What are important factors for success in the Front End of Innovation?

From the literature study and the external interviews, a general insight found for the success of FEI is the importance of a clear and structured process to enable FEI. Boedderich (2004) mentions, there has to be a balance between a creative scope and well-structured idea pipeline. To build and keep this structural process with room for driving innovations is to work in an agile way during the front end, both found in literature and also brought up during several of the interviews. Three main areas have been found to be of primary importance for the success of FEI and to maintain the necessary structure within this phase. These three success factors, which regard supporting management, culture and climate, and cross-functional collaboration, are all connected to each other. Despite this, they will here be presented one by one to facilitate the understanding of their importance.

6.1.1 The Importance of Supporting Management

What is clearly shown both in literature and from the external and internal interviews is how crucial the role of managers is when it comes to FEI. Managers are responsible of setting structures and routines connected to FEI, but also to create the common vision and to set goals for the whole organization. Six out of ten external companies talked about the importance of this matter and how it is believed to be a key success factor for their organization.

One interesting area within the sphere of management control is innovation portfolio management, which Nagji and Tuff (2012) mean is one of the most important things to have in place for a firm in order to stay innovative and survive in the long run. As the situation is described in Kalmar, a yearly product portfolio meeting where new ideas are discussed and brought up is held. But, as mentioned by several of the interviewees, the forum is not functioning the way it ideally should do for the purpose of FEI. No budget is set for the different types of innovations, but also the technology and innovation strategy set for the product company is perceived vague and is not visualized and used the way it ideally should

be. From the external companies, company 10 mentioned how the organization must be clear why certain resources and percentage of the total budget is spent upon certain projects and if not, high risk projects are unlikely to happen. This is strongly connected to what an innovation portfolio can help organizations to achieve regarding the balance between short-term and long-term, as stated by Nagji and Tuff (2012). It is therefore clear that a structured innovation portfolio including innovation strategy can be an important factor for the success of FEI.

How the work should be carried out with ideas and FEI as a whole is also up to management to set. What has been shown during the external interviews is how four of the companies have applied an agile process, such as SCRUM or Kanban, for carrying out more uncertain tasks, and the importance of this is strengthened by Cervone (2011) who states that agile methodologies are highly suitable when the end result is unknown. When it comes to execution and when deliverables are clear, a Stage-Gate process is more suitable. Other activities and tools which are used within the scope of front end are innovation days/jams as well as hackathons, which are events where either parts of or the whole organization focuses upon ideas and challenges for a set time, normally during one day. What is beneficial regarding these activities is that management can steer which people they want to include in the idea generation, and where the focus should lay.

The task of managing development of both short-term as well as long-term ideas are mentioned to be a tricky challenge, both in literature as well as from the external companies. Tushman and O'Reilly (1996) talk about ambidexterity, which includes the way of being able to do different things simultaneously. What is stated in their article is that companies which have proven to be successful in the long run have the capability of being able to conduct work within both short-term as well as long-term projects. What Nagji and Tuff (2012) bring up regarding ambidexterity is that the different ways of working between incremental and more radical and disruptive ideas should be separated, as there is a risk of mixing the ways of working as the more organizational and incremental way of working tend to drive out the disruptive initiatives. This finding is confirmed by four of the external companies, which execute in both the software as well as the hardware industry and differs in size between 1000 and 50 000 employees. The interviewee from company 4 stated:

> *"... one pitfall is when radical innovation projects are forces into the daily operation. It might sound odd, but if you are used to one way of working it is difficult to change."*

Also, company 5 talked about an initiative which is far off their current business, which they decided to locate in another country to operate and develop the product further for future alignment with the company.

Another factor which has shown to be an important factor for FEI connected to the importance of management control is regarding decision-making and whether it should be centralized or decentralized. This will be further elaborated upon in subchapter 6.2. Another largely important factor for the success of FEI brought up during the interviews as well as found in the literature regards the organizational culture and climate.

6.1.2 A Creative Culture and Climate

For an organization to be innovative, much lay upon its ability to be creative. Examples of different methods and tools for a company as help to become innovative have been presented in the literature framework, as well as during the interviews with the external companies. These can for example be innovation jams, idea boxes, and interactive idea systems. As an important part of this, Ahmed (1998) also emphasizes the importance for a company to be aware of that much more than specific tools and methods are required for the company to become innovative. He believes that regardless of the tools, the outcome will be affected by the company's culture and climate. He brings up the deficiency for companies to simply decide to be innovative, as this decision needs to be supported by actions that make the employees comfortable with innovation and in turn create it. This was clearly agreed upon by company 1 where the interviewee stated how innovation is nothing that can be forced to come, meaning that no methods or tools will be useful if the right working environment is not generated. To foster a culture where the employees feel motivated to come with new ideas is from the external interviews found to be of high importance for the success of FEI. According to company 2, it is up to the company to build a culture which can foster creativity and innovation, and also be accepting to failure. A way that this could be fostered and which has been discussed in the literature, but with conflicting opinions, is through reward system. Reward system was brought up by company 5 to be a good way of creating an environment for innovations to come, but without any clear agreements from the other external companies. Saleh and Wang (1993) argue that a reward system is an effective tool to support and develop the desired climate when the system premium factors such as risk taking, willingness to change, and long term focus. On the other hand, Schilling (2013) means that reward systems can undermine the creativity. Comparing the ideas and projects are carried out today compared to a few decades ago, the way of working is more cross-functional and needs several competences involved rather than only an individual task. Chang et al. (2007) talk about the importance of what is called a Jointly Reward System, where teams are rewarded for their collaborative work and knowledge sharing instead of only the single inventor. This is of particular interest, as the external company 6 mentioned a similar insight:

"Historical ideas have emerged on individual basis, but it will be harder in the future to only rely on individuals... It is more difficult now a days because we have to integrate the creativity into the organization"

With this being said, reward systems have at some points been found to be successful at some companies with the aim of creating and fostering ideas, but is left with further research needed before any clear conclusions can be drawn. Other key elements for succeeding in creating an innovative climate are about maintaining a good relationship between colleagues and to make sure the climate is open and promotive, which was stated from nine out of ten of the external companies. Martines and Terblanche (2003) also conclude in their study how creativity and innovations only will arise under the right circumstances in the organization, where aspects such as norms and beliefs either can support or inhibit creativity.

According to all external interviews, the possibility of collaborating and the result coming out of the collaboration is largely affected by the culture and climate of the company. It is clear that everything is connected: supporting management, creative culture and climate, and a well-working cross-functional collaboration. With the first two being presented, the third and next success factor for the FEI presented will be regarding the cross-functional collaboration.

6.1.3 Cross-functional Collaboration

The importance of collaboration across the organizational departments or functional units was emphasized at all the ten external interviews, with no differences of in which industry the company operates. The collaboration between R&D and marketing was brought up to be of extra importance, which for example was explain by company 5 where they had to move developers closer to an important market in order to make them understand the needs from the market so that outcome of the development turned out to actually meet customer's need. Company 2 have found a solution to this through making sure that it is first when the marketing department have got the right information in terms of insights and need that the development of the idea and the work can continue. Also, company 6 described how they use set questions that need to be answered before entering the actual development phase, where the questions are of such content that a cross-functionality is needed to make sure all the questions get answered correctly. The purpose of the questions is to make sure that all required information is captured around the idea, before it develops further. Company 7 has solved the cross-functional collaboration and their physical distance between development and marketing through having online meetings once or twice a week where the development department invites sales and marketing so they can keep track about the latest developments and to give their feedback upon the latest developments. Lastly, company 3 have found a way to enable the teams that are working with radical and disruptive ideas to be multidisciplinary by always making sure that these teams consists of people with knowledge of market, technicality, software, hardware, business, and product specific.

Even though all the companies interviewed highlighted the importance of a good collaboration, this has also been found to be an area of weakness. Reasons behind the underlying barriers to integration have in literature been explained by lack of trust or respect from members of other units; different ideologies, languages, and goal orientations; lack of formalized communication structure; physical closeness; and finally, a lack of managerial support (Song et al., 1996). These five factors are truly consistent with the expressed opinions from the employees at Atlas Copco in Kalmar.

Another finding regarding the work in Kalmar concerns the information flow between the departments, where some D&D-employees expressed how they quite often feel that they do not get the information needed from the market department. One possible reason for this may be that a lot of information is transferred "top-down", i.e. the same direct contact is not available between D&D-employees and the marketing department as it is between D&D-managers and the marketing department. Referring back to the literature, Moenaert et al. (1994) argue that a severe loss of awareness of the other function or department often will become the result if the communication between R&D and marketing always goes through the top of the organization, and not directly between the functions involved. As described above, company 7 solves this through online sessions where all levels of employees are invited to participate with the aim of getting the requested information from the different departments. With this being said, a further important success-factor for FEI concerning the cross-functional collaboration is for the organization to enable the information to flow at all the levels within the organization.

One factor which was brought up by two of the external companies was the importance of making sure that the person or persons who are most likely to carry out the development of the idea and concept will already from the beginning be the idea owner. Both the companies

stated how if a person is assigned to conduct work regarding an idea which is not within the scope of competences and later has to hand over what has been developed, the initiative is likely to stop. This behavior is similar to the "Not-Invented-Here" syndrome, which in academia is defined as "a negative attitude to knowledge that originated from a source outside the own institution" (Kathoefer & Leker, 2012). The syndrome can also be applied to explain the situation where new disruptive ideas emerge within an organization. Kahtoefer and Leker (2012) have studied several papers about the syndrome, and mean that it exist three different reasons why it exist. First, individuals always strive for security, which in this case means that new technology which can threaten the existing work feels uncomfortable. Secondly, when new ideas enter the daily operations, the work routines need to be different which affect the feeling of security for individuals. Finally, they mean that when someone else comes with an idea, a group of people can feel offended if others within the organization believe the new idea is superior to their own ideas. This strengthens what is said from the external companies. Therefore, their solution of making sure that ideas will come from the right persons with the right skillset already from the beginning is seen as a key success factor.

It is clear that cross-functionality in general is seen as a key success factor for FEI as the majority of external companies mention it as well as confirmed by Choi and Thompson (2005), Song et al. (1996), as well as Souder (1981). An interesting contradiction to this emerged from the interview with company 5. The interviewee mentioned how they believe that a key success factor is to *not* involve too many people from different functions in the earliest phases. They mean that mixing too many functions will lead to too many different opinions from different departments, which in turn will result in unnecessarily discussions being held that in worst case will kill the idea. They mean that the discussion around the idea should rather start with one or two persons, and later on involve others when needed. Based on these two contradicting findings, it seems clear that it is contextual and a matter of maturity of an idea when different perspective should be brought in or not. An idea will need one or several idea owners as previously mentioned, and it seems natural that these people representing their department should have the main responsibility and opinions about the idea. In order to enhance and create cross-functional collaboration in the development of the idea, other departments could be involved and give input at selected times instead. One example of how this issue has been handled is at Toyota. In their lean development, one task is about the manufacturing department to deliver a so called "wish list" to the development department, with the purpose to make the two departments aware of each other's situation as well to enable a conversation regarding the project (Ballé & Ballé, 2005).

To conclude upon Research Question 1 *"What are important factors for success in Front End of Innovation?"*, the following areas as well as methods are seen to be crucial: set process for idea development, innovation portfolio management, agile way of working, separating work with radical and disruptive ideas from the daily operations, enabling a creative culture and climate suitable for the specific organization, set set activities for cross-functional integration, verifying customer needs and value, enabling information-flow at all organizational levels as well as making sure that the persons with the right competences who can develop the idea as far as possible will be the idea owners.

The next subchapter will analyze and elaborate upon decision-making within organizations regarding different types of ideas, with the aim of answering the second research question.

6.2 At what organizational level should decision-making for different types of ideas lay upon?

One area which has been brought up both in the literature framework as well as during the qualitative interviews is about who takes the decisions regarding ideas at different times of an idea's development. Different contradicting findings have been discovered, which will be further elaborated upon in this subchapter. Initially, the different advantages as well as disadvantages regarding centralization will be brought up.

6.2.1 Centralized versus Decentralized Decision-making

Moenaert et al. (1994) talk about the harm of centralization within an organization, in other words, when a group of divisional and top management is responsible for all the decisions. This is correlated to how the organizational structure of a company is built, but it does not necessarily mean that the more hierarchy a firm has, the more centralized the decision-making process will be. Song et al. (1996) argue that centralization has negative effects upon decision-making, and mean that the process will become slow and discourage individuals from taking their own decisions.

Six out of the total amount of ten external companies mentioned that decisions are taken at a different organizational level depending on whether the idea is of incremental, radical, or disruptive nature. For example, both company 5 as well as 8 stated clearly that when it comes to decisions regarding radical and disruptive ideas, these will always need to be pitched to a steering committee as well as the CEO to be fully reviewed and judged. Hence, if it is only about incremental changes which lay closely to the core of the business, the decisions can lay at a lower level. Company 9 means that it is very unlikely for disruptive ideas to emerge if the company controls from top to bottom with very little transparency, as the most important thing is to implement a way of thinking for the employees where dare to question how things are done and why. As the situation in Kalmar for the case company looks like today, most of the decisions where a lot of resources and money are needed to develop an idea or concept, are taken by a centralized committee. Hence, if the idea is incremental and nothing more than internal human resources are needed, the decision can be taken by either a vice president or a middle manager. One issue which is brought up during one interview held internally was the unlikeliness of the decision committee to encourage and set aside budget for disruptive projects. This issue makes it difficult to plan and allow employees to work on projects which are not seen to generate any revenues in the closest years or are far off the core business, which interviewee 7 from the internal interviews believes is a problem.

Company 3 means that higher management should be involved already initially in the idea generation in order to be well informed and have a common understanding of the underlying problem as well as the suggested solution. The interviewee from this company means that it would facilitate the decision-making as it is crucial that the ones taking decisions have the right knowledge about the ideas that they will judge. Company 5 also mentioned the importance of early and heavy involvement by management regarding ideas, as if they are not involved and do not fully understand the idea, the initiatives are likely to be stopped. Gakidis and Marina (2001) talk about the risk with letting only management take decision about ideas which they are not involved in, as the ideas might appear as threatening to their current position or that it will create a fear that their employees will not have time to work with daily

operations. Therefore, referring back to whether decisions should be centralized or decentralized, a conclusion is that decision may be centralized if management are heavily involved by activities and presence in the early stages. If not, decisions should rather lay upon the people and managers who carry most knowledge about the ideas, i.e. decentralized decision-making.

6.2.2 How to trust "the smart people"

Although some decision will have to stay at a higher level within the organization, others could remain at a lower level in order to have projects running faster. One important area which has been brought up and discussed recently in subchapter 6.1.1 is Innovation Portfolio Management. If the steering committee or top management can set a clear goal and a distinction in how much resources they want to allocate into different natures of ideas and concepts such as incremental, radical, and disruptive, the decision-making could potentially be transferred to a lower level. This is a level where people who are involved much more in the ideas can have the authority to take decisions as long as they are aligned to the portfolio and the innovation strategy.

Company 3 talks about a common scenario where more radical and disruptive ideas emerge through skunk work. They believe it is a positive thing, as great initiatives of disruptive technologies often have emerged through this way of working as it does not have to go through management initially. Also company 8 expressed a positive attitude towards the phenomenon. From the interviews at Kalmar, it was mentioned that many of their latest innovations have been developed under similar circumstances by skunk work, where the ideas have been brought to a point where they can be proved, and then convincing top management to start a project for further development. As previously mentioned, when more resources and money are needed for the development of ideas, the decision regarding that should ideally come from the centralized committee for the division in Kalmar. Hence, the skunk work proves that lower levels within the organization have taken decisions themselves in order to allow these types of ideas, which makes the existing hierarchy of decision-making questionable. Further, what is also stated at Kalmar is that no work upon disruptive ideas has appeared yet at the company, and as previously mentioned these types of ideas are unlikely to happen if there is no clear budget allocated as well as time set aside from the daily operations. Most likely, that is one of the reasons why skunk work appears at the case company.

An issue regarding decision-making is brought up by company 10. The interviewee means that it is a clear pitfall if the ones taking decisions are too far off the development, as it will make the work move too slow and it will be hard to get through more disruptive initiatives. To solve this, the responsibility of deciding should ideally lay at the team which execute upon the idea and has the best knowledge, which was mentioned by both company 5 and 8. Regarding this matter, company 5 stated:

> *"...they have the freedom to prioritize those ideas. We do not get much involved, but giving freedom to smart people is key"*

Burgelman (1983) as well as Adams et al. (2006) bring up the importance of having an accepting management force which enable and encourage autonomous behavior in order for employees to be able to explore as well as develop and implement ideas. It seems clear that top management to some extent have to trust employees at lower levels to execute and take

decisions themselves to enable such behavior and climate.

As follows, Research Question 2 *"At what organizational level should decision-making for different types of ideas lay upon?"*, the following can be suggested to answer the question: When it has to do with disruptive and more radical ideas, top management must be involved in the decision-making, where those should be involved as early as possible to fully understand the ideas for future decisions. Another possible solution is to set a clear innovation portfolio strategy, where it is clearly stated that a certain percentage can be put into radical and disruptive projects, as well as what is assigned for core business. What is possible by doing so could be that lower levels of management as well as people responsible for executing upon the idea can have the authority to take decisions at a higher rate, but also create a transparency within the organization why certain ideas are allowed to be developed and others not. Closely connected to by whom a decision should be taken is how an idea should be measured. The following subchapter will therefore look more into those aspects in the perspective of radical and disruptive ideas.

6.3 How can ideas that are radical and disruptive in nature be evaluated and measured?

Companies that produce radical innovations are more likely to become leaders as radical innovations increase firm performance and competitive advantage (Katila, 2007). Also, disruptive innovations can change a whole industry which makes it crucial for firms to be able to adapt and stay in the front of catching such wave (Chesbrough, 2003). Therefore, the measurement of radical and disruptive innovations is especially important to not miss out on these potential opportunities. Despite this importance, to measure it and to see the relationship between innovation and performance is found to be difficult, both from looking at the literature as well as a result from the external companies interviewed.

6.3.1 Measuring in a holistic way: a balance between objective and subjective measuring

For screening ideas, the process is found to be highly contextual as different dimensions are important to take into consideration. As Karlsson (2014) suggests, screening of ideas needs to consider not only the idea but also issues such as priorities within the organization, as well as timing. As brought up in the literature framework, calculations of NPV and ROI are commonly used and seen as thoroughly appropriate when measuring incremental innovations and ideas (Nagji & Tuff, 2012). Those kind of financial metrics require, among other things, the right customer inputs, which when looking at radical or disruptive innovations is harder to get and therefore makes these kinds of measurement not applicable for radical and disruptive innovations. This was for example shown to be the case for company 7, whose decisions are partly based on ROI, but together with this also judged upon time and resources needed, and a prediction on future customer value. To be noted here is this company's possession of a very narrow product, where the need of coming up with disruptive innovations is rather limited today. Another reason behind the non-applicability of measuring radical and disruptive innovations through financial metrics is the difficulty in predicting future cash flow, especially those generated by disruptive investments. Furthermore, this makes managers pay less attention to the company's long-term health, because of the pressure to

focus on short term stock performance (Christensen et al., 2008). The problem of focusing on the wrong things is also summarized by Cordero (1990) and Karlsson (2014) who both bring up how many organizations mainly focus on resources and outputs, such as speed to market, the number of new products, and R&D expenditure. The increasing focus upon short lead time and speed to market can also distract teams from working upon ideas. This was shown to be the case at several of the external companies as well as for the development work in Kalmar.

Company 5 also explained how the criteria that their ideas normally are judge upon is based on time and resources needed for developing the idea, the potential revenue for the future, and the value it can bring to their customers. These decisions are made both objectively as well as subjectively, which is seen as another key factor when measuring and taking decisions upon innovations and ideas. A similar approach is used by company 9, who do their evaluation by weighting the value created and efforts needed against each other. Company 6 clearly expressed how their decisions taken are made in a very subjective manner, as the decision-makers are different top managers within the different functions. Furthermore, company 5 also brought up how a key factor during the early phases is to not involve too many people. They mean that if there are too many opinions from different departments, the idea can easily get killed due to different arguments as the different departments will see problems from their perspective. This contradicts what Martinsuo and Poskela (2011) talk about regarding the advantages and disadvantages between formal and informal selections, where they mean that the benefits with informal evaluation are the open ended questions which enables a creative conversation where different perspectives can be brought in. On the other hand, they mean that formal selection is more fair for the idea generator as it compares the projects more clearly. For this reason, a balance between formal/objective and informal/subjective measuring is desirable.

Regarding customer input and value, it needs to be addressed that the access to customer can differ depending on who is the actual customer and end-user for the company. B2C companies have easier access to the end-user which is also the customer, while the chain of B2B companies can be quite complex. When looking at the case company for this report, the customer is not the same as the end-user which makes it more complex to fully understand the value chain and investigate needs.

Lastly, how strict the evaluation should be depends upon which stage in the product development the idea is, where the evaluation of ideas in an early stage should not be, according to Koen et al. (2002), as strict as compared to later in product development projects. To summarize, there is simply no unanimous answer to how radical and disruptive ideas should be measured and evaluated. What can be said is that a holistic approach should be taken into consideration, using both objective and subjective measuring instruments. The next subchapter will thus summarize what different measurements and aspects that have been used by companies, others than what have already been mentioned in the sections above, and how this is strengthened or contradicted by the literature.

6.3.3 Tools, methods, and criterions for measuring

As just discussed and drawn as a conclusion in the previous subchapter, there is no single best way to measure innovations. It all depends on in which industry the company operates

and what brings value to the company (Tidd, 2001). Some of the external companies interviewed have developed tools for making different ideas comparable to each other. Examples of what company 3 is looking into here are the potential revenue, what is missing in the market, what the competitors are doing and the general potential of the idea. Again, this often means that the idea needs to be compared at the level of income, which can be difficult with an innovative idea. Company 4 rates ideas quantitative with the help of a software program with the aim of a first screening the different ideas. This first screening is done by top management and a group of innovation managers, where they also give a qualitative personal opinion about each idea. After selecting an amount of ideas that will be further developed at a second round where research is done at a deeper level, a second screening is performed, again both quantitative and qualitative, with the outcome of having some ideas becoming projects.

As described earlier, the way company 6 measure their ideas is subjective, since the decision is taken by different managers at each time. Although, what they are looking at is primarily the business case, what the financial could look like, and what the ambitions around the idea are. There are no direct differences in handling incremental or radical ideas, apart from less demand of earning potential for the incremental ones. This, together with all the other above examples given from what the companies look at when measuring ideas is also brought up in the literature, where Keon et al. (2002) summarize common criteria and factors used for evaluation to be: company strategy, resources, markets, technology, and risks. These criteria should, according to the author, be communicated clearly to the employees, so they know what to present and work towards regarding their ideas and concepts.

Unlike the previously given examples of what companies base their measurement on, company 9 has organized another way of prioritizing among their ideas. This is basically built up by two stages of prioritization: the most urgent concerns that have to be taken care of immediately to not hurt the customers, and the second goes through an evaluation where the value created and efforts needed are weighted against each other. Noted here is that this company is a relatively smaller company compared to the other ones, which might be the reason for a, as it appears, easier method. Still, what it comes down to still contains information about customer value as well as resources needed from the company.

An interesting part when answering the question on how ideas and innovations can be measured for facilitating the decision-making is through looking at the readiness level brought up in the literature framework. As described by Karlsson (2014), a readiness level is a way of keeping track of the maturity of the ideas which in turn highly facilitates the judgment and decisions taken around the idea. Again, important here is to cover all different aspects around the idea, such as looking at the level of readiness within technology, marketing, customers, etc.

To conclude upon Research Question 3 *"How can ideas that are radical and disruptive in nature be evaluated and measured?*", the overall answer is that it all depends on the situation and where in the organization that the decisions are taken. There is no specific best way of measure and evaluate radical and disruptive ideas found in either the literature nor from the external interviews, which means that further research is required in the future. What can be stated is the importance to measure in a holistic way with a balance of subjective as well as objective judgments. Also, what seems to be an important factor both in literature as well as

from the interviews is that the need and value for the customer and end-user must be a central part of the evaluation. What is also stated by the majority of the external companies is that a calculation of time and resources must be presented when measuring and evaluation an idea. Although, it must be taken into consideration that it might be harmful for more radical and disruptive ideas to be discovered as they often are of an undefined nature in an early state and must be allowed to stay "fuzzy" for longer time compared to incremental ideas. This leads to a major responsibility among the decision-makers, and that is why it is suggested to follow a scale similar to the readiness level scale mentioned above to facilitate the process of decision-making.

7. CONCLUSIONS

In this chapter, the conclusions for the report will be presented.

The aim with the thesis is to investigate what are key success factors and common pitfalls for processes and activities within the FEI, and how these can be handled by management. The thesis is also investigating how ideas and innovations can be measured in order to take the right decisions for different types of ideas by a suitable level of decision-makers. Based on the literature framework, qualitative interviews, observations, and the coded and analyzed data, conclusions have emerged to answer the three research questions. In order to keep the research questions fresh in mind, they are concluded as follows:

RQ1: *What are important factors for success in Front End of Innovation?*

RQ2: *At what organizational level should decision-making for different types of ideas lay upon?*

RQ3: *How can ideas that are radical and disruptive in nature be evaluated and measured?*

The next two pages present a framework which can guide other organizations into a best practice of their FEI, followed by managerial implications which are both of general overview as well as more specific towards the case company.

7.1 Front End of Innovation - General Conclusions

The general conclusions regarding a successful FEI model is presented here related to each research question. Initially, the first conclusion is the importance of having a set process for FEI which employees can follow when generating and developing ideas. The three following tables are based on the research questions presented one at a time. What can be seen throughout all of the conclusions is that many of them are of a managerial nature. A few of them will include more information than others, more information as well as discussion regarding each conclusion can be found in chapter 6.

	IMPORTANT KEY SUCCESS FACTORS FOR THE FRONT END OF INNOVATION
1.	Set up and have a clear innovation portfolio management, including an innovation strategy and a clear budget allocation for different types of ideas (*i.e. incremental, radical, disruptive*)
2.	Use an agile way of working for ideas that are of an unclear nature
3.	Separating work regarding radical and disruptive ideas from the daily operation
4.	Enabling a creative culture and climate suitable for the specific organization
5.	Set and include activities for cross-functional integration and collaboration from the first stage of developing ideas
6.	Verifying customer needs and value, for example through regular customer visits and focus groups
7.	To know how to make distinctions for measuring different types of ideas
8.	Enabling information-flow at all organizational levels to allow communication to happen at different levels of hierarchy

ORGANIZATIONAL LEVELS FOR DECISION-MAKING OF DIFFERENT TYPES OF IDEAS	
1.	Top management must be involved in the decision-making for radical and disruptive ideas as early as possible to fully understand the problem and the idea, i.e. that if a centralized committee will make decisions, they need to be heavily involved
2.	A clear innovation portfolio strategy is needed where it is clearly stated that a certain percentage shall be put into radical and disruptive projects, as well as what is located for core business. This can serve two purposes, both to have a lower level of management and people to have the authority to take decisions and execute upon ideas and also create a transparency why certain ideas will be allowed to be developed within the organization.

EVALUATING AND MEASURING RADICAL AND DISRUPTIVE IDEAS	
1.	It all depends on the situation and where in the organization that the decisions are taken: there is no specific best way of measure and evaluate radical and disruptive ideas although it exists different ways of approaching this.
2.	It is important to measure in a holistic way with a balance of subjective as well as objective judgments
3.	The customer need and value creation must be a central part of the evaluation
4.	The calculation of time and resources must be presented when measuring and evaluating an idea.

7.2 Managerial Implications

What is clearly seen to be a key factor for the success of FEI is the role of management. Management in this case is clarified to be any person who is responsible for other employees and have to give certain indications and directions within the company. Managerial implications can also be general instructions which several individuals are responsible of bringing forward within a company.

It stands clear that management are highly responsible for setting the structure, visions and goals for the company, and also for giving directions regarding future innovations. Furthermore, management have a large impact on the organizational culture and the working climate. Listed below are suggestions on how management can create the basis of a successful FEI:

- When the managers wish to have ideas within a certain area (e.g. a certain technology, a customer need, etc.), they are responsible of setting up an idea generation session including relevant people they believe are important for the outcome of the idea. One idea generation session will not be enough, and the managers are also responsible for setting up continuous meetings for further development and evaluations of the ideas.
- It is the managers' responsibility to set up and maintain an innovation strategy and innovation portfolio, where both technical as well as marketing perspective needs to be considered. A suitable start is to first start with the innovation strategy which should be developed to both align with the business strategy but also give an indication of where the company intends to head at.
- One way of achieving a creative climate to reach an innovative culture is to hire people from different backgrounds, with different gender, age and interest, as a homogenous group will lack new input and persons who will question why things are done in a certain way.
- An agile way of working can only happen and be successful if the manager is clear about how work should be carried out. Compared to the more structured Stage-Gate process, an agile methodology such as SCRUM or Kanban differs a lot from defined stages with clear deliverables. What is out of importance is to set up the regular meetings, stand-ups and to follow up on the time frames for the different sprints. Another recommendation is to start with a few numbers of employees to carry out work through this manner, preferably full time to avoid that daily operations drives out these initiatives.
- To allocate time for a certain number of people to work with disruptive projects is a responsibility that lies upon management, as it at the same time considers budget allocation for any full-time wages that is affected.
- The management are responsible of creating and maintaining a measurement system suitable for their products/services, where ideas will be differently measured depending on the nature of the idea as well as its different stages of maturity. Management need to develop such systems which suits their organization and industry.

7.2.1 Managerial Implications for Construction Tools Atlas Copco

More detailed recommendations for activities and tools for FEI has been presented to the case company, but due to confidentially, this information is not presented fully in this report. Most of the presented conclusions and managerial implications are relevant for the case company, however, slightly more specific conclusions regarding the model will be drawn and are presented below. This is done as a lot of data from the company has been collected during the project, which makes it possible to give more concrete recommendations to them which are not as generic as previously mentioned conclusions, but rather situation and company based.

- A clear innovation strategy including directions and targets for both technology as well as market for both short-term and long-term must be developed and communicated.
- To follow a readiness level scale where technology, marketing, and customers are taken into consideration in order to include all necessary aspects.
- Steered idea generation on a regular basis.
- Software system where ideas can be visualized and put in one a more ad-hoc basis and should be kept visualized for relevant people.
- Set aside people (e.g. one or two persons) to only work with disruptive projects.

8. FUTURE RESEARCH

Previous in the report, a few areas have been mentioned where research is lacking. It stands clear that very little concrete methods and tools for measuring radical and disruptive ideas can be found. Although it is seen as being subjective and difficult to measure compared to incremental ideas, it would be interesting to find out more in detail how companies have handled this until today and more concrete tools that have been used.

Another interesting as well as important area is about reward systems for idea generation. Literature exists about the subject, but a lot of contradictions have been found which makes it difficult to understand what has been proven to be best practice. What was mentioned during analysis was the suggestion of a joint reward system, which should encourage and reward a cross-functional group instead of one single individual. This would be an interesting area for future research, where even the distinction between reward systems for incremental as well as radical and disruptive ideas could be interesting to take into consideration. This could be tested by implementing a reward system which encourages cross-functional collaboration regarding generation and developing of ideas, and after a sample time the generated ideas could be compared to the ideas which were developed before the reward system was implemented to see how the quality and amount of ideas had changed.

A third area which is out of interest is about best practice for decision-making regarding ideas. In this report, literature regarding centralized and decentralized decision-making in FEI have been presented, but also in this case the findings are contradictory to each other and it is difficult to understand to what scenarios different decisions are more suitable than others.

The proposed conclusions for this report are not yet tested at an organization, which means that their validity is not yet confirmed. Although the majority of the conclusions are highly contextual, it is still possible to form tests to examine their validity. The result is considered generalizable to some extent because different sources of data have been used, as of companies within different industries, which leads to a wider influence of opinions and experiences. Nevertheless, in order to achieve further generalization would be to interview an even larger amount of companies in several types of industries.

9. REFERENCES

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APPENDIX 1: Interview guide for internal interviews, 1st round

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Initialt under intervjun visas en bild på företagets nya produktutvecklingsprocess som används under intervjun som underlag för diskussion.

1. Hur är du involverad i produktutvecklingsprocessen här i Kalmar?
2. Vad fungerar, enligt dig, bäst i produktutvecklingen idag? Vad fungerar inte lika bra? Kan du ge ett exempel på vad som fungerar bra/inte fungerar bra?
3. Vilka är de tidigaste stegen inom produktutvecklingen som du är involverad i?
4. Vad fungerar, enligt dig, bäst i de *tidigaste* stadierna inom produktutvecklingen idag? Vad fungerar inte lika bra? Kan du ge ett exempel på vad som fungerar bra/inte fungerar bra?
5. På vilket sätt har du varit involverad/delaktig i några aktiviteter som berör idégenerering eller framtagande av nya koncept? Ge exempel.
6. Om du någon gång kommit på en idé själv som du har velat jobba vidare på, vem presenterade du idén för, hur blev du och idén mottagen och vad blev nästa steg framåt?
    a. Om idén stoppades: var/av vem och varför?
    b. Om ej drivit en idé - varför? (support, tid, engagemang?)
    c. Känner du att du har tid att jobba med egna idéer under arbetstid?
7. Känner du till hur ursprungsidéerna som har lett fram till färdiga produkter har skapats, och vem/vilka som har arbetat fram dem? Kan du ge ett exempel? Om givet exempel: vad tror du var kritiska faktorer som gjorde att den här blev implementerad?
8. Hur och när samarbetar du personligen med marknadsavdelningen? Vad fungerar bra/mindre bra med det? Kan du ge exempel?
9. Kan du ge exempel på ett framgångsrikt projekt enligt dig? Varför? Minns du var idén kom ifrån? Minns du hur ni jobbade i de tidiga skedena kring denna idén?
10. Har du några anställda under dig som du leder?
    a. Om ja -hur leder du dina anställda?
    b. Vilka touchpoints har du med de anställda?
    c. Använder du några system/modeller för sättet du arbetar?
11. Vet du vilka KPIs ni använder? Hur fungerar dessa? Vad fungerar bra/mindre bra?
12. Hur uppfattar du klimatet här?
13. Vad skulle, utifrån hur du arbetar/ditt synsätt, vara mest viktigt att ha med i de allra tidigaste processerna?
14. Vilka huvudområden ser du att ni måste vara innovativa mot?

APPENDIX 2: Interview guide for internal interviews, 2nd round

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Följande frågor ställs efter genomgång av resultat baserat på de interna intervjuerna där vad som uttryckts har fungerat bra samt mindre bra presenterats samt en summering av vad som hittats som framgångsfaktorer på andra företag.

1. Finns några invändningar på det identifierade resultatet?
   Om ja, efterföljande diskussioner kring detta.

Efter diskussion presenteras framgångsfaktorer och föreslagna lösningar:

2. Hur ser du på följande lösningar och framgångsfaktorer? Är det någon/några du ser kan fungera bra alt. inte fungera alls?
3. Om negativ respons: Varför tror du inte att de kan fungera? Hur kunde det istället lösas?
4. Hur tror du att er innovationsstrategi kan formuleras och förmedlas till organisationen, både i tekniskt perspektiv och marknadsperspektiv?

En readiness-skala för tre olika områden presenteras:

5. Hur ser du på följande nivåer inom readiness-skalan? Är det något som passar in bra hos er, och om inte, hur skulle du vilja omformulera de olika stegen?
6. Är det några aktiviteter du tror bör ligga hos andra avdelningar (t.ex. marknad/utveckling/inköp)? Iså fall vilka och varför?

APPENDIX 3: Interview guide for external companies, Swedish version

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1. Berätta om din roll på företaget, och vad du har för ansvar kopplat till innovation.
2. Hur tar ni fram och jobbar med idéer idag?

Om standardiserad process/aktivitet:

   a. Hur länge har ni jobbat enligt detta sätt, och hur jobbade ni med detta innan i form av metoder och verktyg?
   b. Vilka är involverade i den denna processen?
   c. Av dessa involverade, vilken nivå på anställning brukar involveras?
   d. Finns processen på hur ni jobbar med skapandet och utvecklingen av idéer nedskrivet? -Var och hur finns processen tillgänglig? Vilka känner till den?

Om ingen standardiserad process/aktivitet:

   e. Vilka är involverade i de tidiga aktiviteterna?
   f. Av dessa involverade, vilken nivå på anställning brukar involveras?

3. Berätta om en metod, aktivitet eller verktyg som ni försökt jobba/jobbar med gällande idéhantering som *inte* fungerar/har fungerat. Vad gjorde att det inte fungerade?
4. Om en anställd kommer med en idé på eget initiativ, hur ser processen framåt ut?
5. Hur skiljer ni på inkrementella, radikala och disruptiva idéer? (hur skiljer sig projekt i form av förbättring av existerande teknik till totalt nya produkter)? Skiljer sig processen kring hur ni arbetar för dessa tre?
6. Vilka idéegenereringsmetoder arbetar ni med/har arbetat med? Ge exempel.
   a. Skiljer ni på hur ni arbetar fram inkrementella, radikala och disruptiva idéer?
7. Hur mäter/avgör ni vilka idéer som ni ska arbeta vidare med?
   a. Vilka aspekter är med i hur ni mäter?
   b. Skiljer ni på inkrementella, radikala och disruptiva idéer efter de blivit skapade?
   c. Vem/vilka beslutar om idéerna är redo att bli projekt eller ej?
8. Hur bevarar ni idéer som kommer upp men som inte arbetas vidare med direkt?
9. Vilka ansvar har management i skapande och hantering av idéer?
10. Hur ser ert samarbete/kontakt med marknadsavdelningen ut?
11. Jobbar ni annorlunda kring marknadsidéer och tekniska idéer? Hur? Ge exempel.
12. Vad tror du är era nyckelfaktorer till framgång inom förutveckling/idéhantering? Ge exempel.
13. Vad har ni insett kan vara typiska fallgropar för att nå framgång?

APPENDIX 4: Interview guide for external companies, English version

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1. Tell us about your role at the company, and what responsibility you have connected to Innovation.
2. How do you bring forward and work with ideas today?
   If a standardized process/activity:
   a. How long have you been working in this manner, and how did you work with this before in terms of methods and tools?
   b. Who are engaged in this processes?
   c. At what level of employment are the people involved normally at?
   d. Is the process which you are working with documented and/or accessible in any way? Where and how is the process accessible? Who knows about it?

   If no standardized process/activity:
   e. Who are involved in the early activities?
   f. At what level of employment are the people involved normally at?
3. Please talk about a method, activity or tool that you have been trying to work after regarding ideas that has *not* been working? What was the cause for it to not work?
4. If an employee comes up with an idea on their own initiative, what does the process forward look like?
5. How do you differ between incremental, radical and disruptive ideas (how does different projects differ in terms of improving existing technic to developing completely new technology for the company)?
   a. Does the process differ depending on which of these three you are working upon?
6. Are you working with any idea generation methods? Please give examples.
   a. Do you use different idea generation methods depending on what level of ideas (incremental, radical, disruptive)?
7. How do you decide or measure what ideas that will continue to be worked upon?
   a. What aspects are you measuring?
   b. Do you differ differently depending of the nature of the idea?
   c. Who decides when the ideas are ready to become projects or be turned
8. Do you keep ideas that have been brought up but are not being further developed? In that case, how?
9. What responsibilities do management have when it comes to creation and handling of ideas?
10. What does the collaboration look like between R&D and marketing?
11. Do you work differently with ideas that are generated from market or from a technical perspective? How? Please give examples.
12. What do you think are your key success factors for predevelopment and handling of ideas? Please give examples.
13. What have you realized are typical pitfalls regarding success?