



UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

-GRADUATE SCHOOL-

Master of Science in Innovation and Industrial Management

Holding on to the positive aspects of being small:
A multiple case study exploring product innovation processes
in knowledge-intensive companies by incorporating the
variable of company growth

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Abstract

Innovation is essential for any organization wanting to stay competitive in the long run. (Şimşit et al, 2014). Desouza et al (2009) also point to how it is the companies with strongly built innovation processes that will take the lead in their respective industries. Freeman and Engel (2007) describe how entrepreneurial ventures by energy and luck have been transformed into growing, sustainable, lucrative companies. Managing a growing number of employees and selling of products necessitate organisational structure and business processes in order to generate internal government and external accountability. When these companies develop, grow and mature the process of innovation can decelerate (Freeman & Engel, 2007).

By focusing on what a small knowledge intensive innovative company should have in mind with regards to product innovation processes when growing, the ambition of the research is to fill a gap within previous research. Also the more general and more overlooking stance on product innovation processes aims at generating new perspectives since most innovation process research focuses on only specific parts of the process(es). This thesis aims at answering what can be beneficial to hold on to as a small company grows, as well as suggesting innovation process management methods that can be advantageous for small companies growing with regards to innovation processes.

Through a multiple-case study including eight knowledge-intensive companies of different sizes, their current innovation processes have been analysed as well as their thoughts on future innovation process aspects. What was found to be beneficial as a small knowledge intensive company to hold on to when growing is especially the advantages of close customer contact, informal and efficient communication and idea generation and creativity occurring organically. In particular the customer closeness seem to be a beneficial factor, seeing since this strength can aid in multiple innovation phases and layers.

By analysing different ways of managing innovation processes coupled with the aspects a small company might be well off aiming to keep, some approaches have been identified. Particularly promising were the two agile methods – Agile Innovation Process Management and Agile Stage Gate. These can promote the elements of among other things close customer contact and flexibility. Also Contextual Ambidexterity and Corporate Entrepreneurship might facilitate a structure which could aid in keeping the advantages smaller companies are in possession of. The former's strength is that every employee is encouraged to contribute to balancing exploitation and exploration, take own initiatives, be open to entrepreneurial opportunities and take initiatives, while the latter's strengths are a willingness to support flexibility, creativity and risk.

Note of the Authors

The authors of this report would like to thank and give recognition to, in no particular order: Firstly, a big thank you to Luxbright AB who has provided the inspiration to the research topic, and furthermore has established the framework of researching knowledge intensive companies. The ambition has been to provide useful guidance to Luxbright and similar companies which are growing. The inspiration was generated by one of the author's having an internship with the company. Secondly, an enormous gratitude to the eight companies who have lent their time and expertise to two curious students. All of the interviewees took time out of their busy schedules and gave interesting insights, advice and inspiration to put into this thesis - but also as a source of knowledge to the authors future work in innovation. Lastly, a big thank you to our thesis supervisor, Daniel Ljungberg who have lent advice and asked the right questions along the way.

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1. Introduction

The following section aims at providing a brief and general understanding of the subject, while at the same time present a status of the current literature within the subject. The specific research questions for this study will also be presented while excluding choices are explained.

1.1 Background

Innovation is essential for any organization wanting to stay competitive in the long run. Having the capability to manage innovation in a fast and flexible way is of importance for any firm wanting to gain a sustainable competitive advantage (Simsit et al., 2014). The resource-based view presents the stance that only companies having particular resources and capabilities with certain components are able to achieve competitive advantage. Having a sustained competitive advantage will affect if a company can renew and reconfigure resources and capabilities in order to cultivate innovation (Camisón & Villar-López, 2014). Schilling (2013) argues that dynamic innovative capabilities are needed in order to be flexible in organizational structure and respond to new opportunities. According to Teece (2009) these types of capabilities helps companies to improve productivity, the development of new ideas and products, reducing costs and recognising opportunities that matches the want of customers.

To create an end result of exceptional products that can aid in generating substantial profit for the company the processes of innovation are central to understand (Griffin et al 2014). For companies such as Toyota, Apple and Procter and Gamble who are companies that are fruitful innovators, the common denominator is that they have a company structure where processes, culture and functions add together to enable continuous and transformative innovation to thrive. (Trotter & Vaughan, 2012). Desouza et al (2009) mean that in today's highly competitive business world, it is the companies that have strong built innovation processes that will take the lead in their respective industries (ibid).

However, according to Desouza et al (2009) plentiful of organizations perform unsatisfactory with regards to creating sustainable innovation programs. This could be due to a poor conception of what a process of innovation entails. It might seem complicated and hard to manage. Many organizations develop ideas by chance rather than active innovation management – and it is only these that are undergoing the processes of investigation, development and commercialisation. The difficulty of performing well when it comes to innovation processes is according to the authors due to the intrinsic and complicated nature of innovation, which requires companies to be both robust and flexible (ibid).

Freeman and Engel (2007) describes how entrepreneurial ventures that by energy and luck have transformed into growing, sustainable, lucrative companies can be analysed through

parameters such as age and size. Managing a growing number of employees and selling of products necessitate organisational structure and business processes in order to generate internal government and external accountability. When these entrepreneurial ventures develops, grows and matures the process of innovation decelerates (Freeman & Engel, 2007). The structure and systems put into place is also closely tied to things such as risk avoidance and bureaucracy that may easily cause a hinder for flexibility and change (Kollman et al, 2009). This could give a situation – if a company not safeguards its advantages in terms of innovation – where it ends up in a situation where it's more innovative prone competitors in the start-up sphere overtake it. Business accomplishment leads to innovation resistance, this leading to the notion that no winner is ever safe (Freeman & Engel, 2007).

1.2 Perspective of Problem

At the basis, and the inspiration, of this research question lays a start-up company based out of Gothenburg called Luxbright. The company is an innovative new player within the X-ray tube market, with one product line that could be a radical addition to the industry - potentially helping to spur on advancement also in X-ray tube devices. For a growing company it could be claimed that it is of importance to look at how the innovation processes should be ideally managed, and furthermore how to try to maintain the positive innovative aspects of being a small company while growing, this by looking at innovation processes. As previously mentioned, strategic considerations regarding innovation are essential for any company striving to be competitive in the long run (Berends et al, 2014).

1.3 Research Gap & Research Questions

There are plentiful of articles regarding innovation processes handling different aspects; e.g. knowledge creation (Bergendahl & Magnusson, 2015), tacit knowledge in small technology firms (Koskinen & Vanharanta, 2002), market innovation processes (Kjellberg et al, 2014), how leadership can support knowledge flows, front end innovation processes (Trotter & Vaughan, 2012), and the differences of innovation processes between the Corporate model and the Entrepreneurial model (Freeman and Engel, 2007). Further, Mattes (2013) look at formalisation and flexibility in innovation processes by analysing them in terms of communication, power and trust by connecting them to learning. In terms of managing innovation processes Salerno et al (2014) look at which innovation process should be used for which project, Desouza et al (2009) look at how to craft organisational innovation processes and Şimşit et al (2014) give an outline of the innovation management process. Berends et al (2014) who look at small firms product innovation processes mean that product innovation literature builds primarily on research on large, traditional companies and the corresponding illustration on product innovation processes is one that rests on causal logic. Hence, mean that little is known about the innovation processes or dynamics for small companies, due to few or no research on the topic of how small companies evolves over time. Often there is also a lack of general distinction of size in much of the research (Berends et al 2014). Similarly to

what can be seen in large parts of the paragraph, Scozzi et al. (2005) mean that the research of characteristics within innovation processes is extensive. However, the focus is often upon only some of the aspects within the whole process.

Hence there is to the authors' knowledge no research that focuses primarily on what a small innovative knowledge intensive company growing should have in mind with regards to product innovation processes – if taking a more general stance on innovation processes. For the sake of clarification it should be noted that not all small companies could be claimed to be innovative. Scozzi et al (2005) mean that there is a difference between a large group of companies that are not innovative and a limited number of companies that are very innovative. The aim is however to focus on the latter, which is done by collecting data from innovative knowledge intensive companies of different sizes.

Fig.1 below aims to illustrate the thought behind the chosen topic. Obviously both small and large firms both respectively have drawbacks and positive aspects related to their innovative climate and innovation processes. As a small company grows it could potentially transform itself to a large company, including all of a large firm's classical characteristics coupled with its innovation processes – or is it worth as a small company to consider to hold on to the positive aspects of being small when managing their innovation processes? The first research question has the ambition of addressing the horizontal arrow running from the large company to the small company by reviewing what could be of benefit to keep with regards to innovation processes when growing. This while the second research question address the journey from the small circle to the larger circle – i.e. if there is a possibility to hold onto advantages a small company has when growing into a larger company, by integrating the appropriate innovation processes.

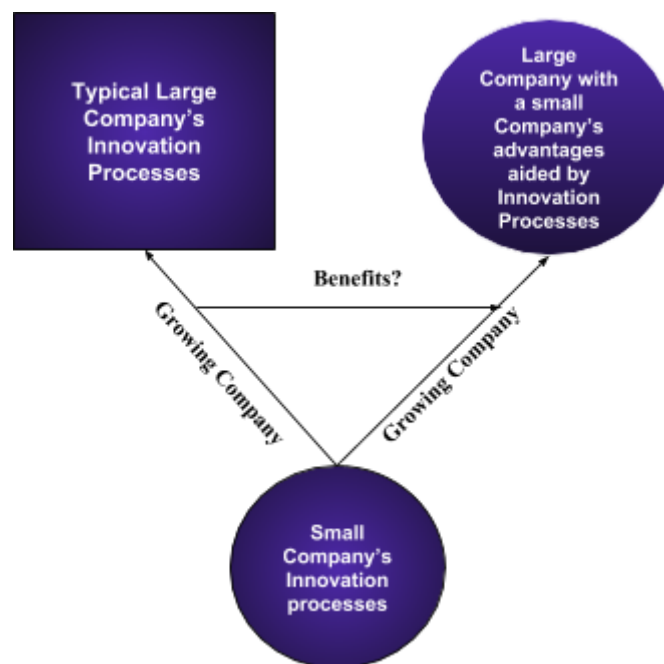


Figure 1. Figure for illustrating the research topic. (Illustration by the authors)

Hence the report will answer the following research questions:

RQ1: What can be beneficial to hold on to with regards to product innovation processes when a small knowledge-intensive¹ company grows?

RQ2: How could an innovative small company within a knowledge intensive sector, wanting to create competitive advantage in the long run, manage their product innovation processes when growing?

1.4 Delimitations

Since the scope for this research is limited, mainly concerning time, not all potential interesting avenues can be pursued. The subject of innovation processes could be ventured into from many perspectives, as seen in the section ‘research gap’. The aim of this report is however not to give account for specific elements that could constitute or being part of an innovation process, whereby a choice was made to have a general take on innovation processes. Certain stages and sub processes are hence only briefly described in order to rather give a comprehensive overview since this will best help with answering the research question. The focus of the report has been on product innovation processes, thereby excluding service, process and organisational innovation processes. Furthermore, the research does not go into detail of radical and incremental innovation and how innovation processes could/should be altered depending on the type. Lastly, the data gathered is only from knowledge intensive companies, which implies that the results should only be analysed in this context.

¹ Where knowledge intensity is defined as a company whose production output is largely dependent upon complex knowledge (Oehmichen et al, 2017).

2. Theoretical Framework

The following section aims at providing a comprehensive overview of the current literature available within the subject of innovation and innovation processes, with a specific focus on the characteristics of small companies and the variable of company growth.

2.1 Small Companies Growing

Morris & Trotter (1990) describe how company's through different stages generally grow and mature. It can be described as a metamorphosis where a start-up transforms into a diversified corporation, and where the large firm is not to be seen as a scaled up version of a small firm (ibid). A start-up company often starts off with an organic business structure, where the personnel's tasks are flexible and directed towards what has to be done at the moment. Authority is divided among several individuals and decision rights are often shared among several members of the start-up team. When the organization begins to earn revenues from sales and the workforce grows the organizational routines changes and becomes more formalized. This is often a necessity when the organization has more inventories, assets, orders and people to manage. For the innovation process these changes often lead to a change from creativity to discipline. (Freeman & Engel, 2007).

An entrepreneurial firm looking to progress and survive has according to Kollman et al (2009) to incorporate structures and systems into the organization. The structures often contribute to expansion of the control capabilities for senior managers of the company as well as making it easier to establish stable relations with customers and suppliers (Freeman & Engel, 2007). However, it is often found that structures and systems also are closely tied to things such as risk avoidance and bureaucracy, which easily can cause a hinder for flexibility and change (Kollman et al., 2009).

Some research points towards how small companies can benefit from working with a formalized process together with thought out undertakings and decisions points for new product development – this summing up to the conclusion that a formal process for product innovation is a part of its best practise. Conversely, other research presents observations of small companies rarely using such structured innovation processes. A formal innovation process is however seen as essential for an efficient product innovation in larger companies (Berends et al, 2014). Silva et al (2016) presented the results that small and medium companies (technology based) innovated intuitively and very fixated on the founder's idea rather than innovating in a systematic way. Also meeting customer requirements and needs were of focus when innovating.

2.2 Innovation & Innovation Processes

Numerous definitions of innovation have been presented in the literature, mostly because it is very difficult to describe the entire depth within one concept. Baregheh et al. (2009) have conducted a content analysis of existing definitions and suggested a multi-disciplinary definition:

“Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace.” - Baregheh et al. (2009). s. 1334.

Product innovation, which will be in the focus point of this thesis, considers bringing new offerings to the market. Generally, the following types of product innovation are recognized: cost reductions, product improvements, line extensions, new markets, new uses, new category entries and new to the world products (Kahn, 2018). Matsuno et al. (2014) mean that the product innovation processes determine the success of new products in the external environment.

The development of innovation is characterized by highly intricate actions in need of integrated and unusual thinking, with the end result of reaching social acceptance (Silvia et al, 2016). When considering innovation from an economic standpoint, an innovation can be seen as accomplished when the first commercial transaction has been made. Thus, from this point of view, innovation is about gaining benefits either economically, personally or organizationally through new changes. (Koskinen & Vanharanta, 2002). Worth to mention, is that innovative ideas do not always make it to the market, research has shown that to produce one new successful product, around 3000 raw ideas are needed (Schilling, 2013).

Innovation can happen in different places within an organisation; some have inventions beginning at the bottom or middle level while others have ideas developed from the executive or board level that is then disseminated downwards (Freeman & Engel, 2007). Innovation can range from incremental to radical, and many forms of product innovation are therefore possible (Matsuno, 2014). Incremental innovations are small innovations that often are improvements of existing products and happens continuously in every organization (Fischer et al, 2014). This type of innovation is according to Sheng & Chien (2015) also a response to the needs of the current customers and markets. Incremental innovation revolves around increasing the knowledge a company already have in place. Radical innovations are often major breakthroughs that are highly related to a high scientific influence and a high degree of novelty (Fischer et al, 2014). This type of innovation involves new knowledge to be acquired as well as the evolution of new products for new customers, or even newly dawning markets. Often this type of innovation needs the advancement of particular qualities and benefits that are above those found in the current markets (Sheng & Chien, 2015).

Lendel et al (2015) describe an innovation process as a sequence of actions which are systematized and controlled in order for inputs of innovative ideas being transformed into innovations. It should be acknowledged that innovation is not a single activity but rather a process or a number of processes (Žižlavský, 2013). The processes facilitate for example identifying innovation opportunities and customer needs, producing innovative ideas, knowledge and information about innovation etc (Lendel et al, 2015). Innovation can be supported by processes and these can also facilitate repeatability (Kahn, 2018).

Historically there have been different takes on innovation process through different models. Şimşit et al (2014) describe how there since the 1950's been a number of different generations of innovation models. Each model professes to illustrate and direct the process of innovation for industrial companies. During the Technology Push (1950-1960) the focus was on Science & R&D, which then the market receives. Innovation was seen as a sequential process in a linear model. The Market Pull models (1960-1970) had its focus on the marketing side; the market was seen as the origin of ideas delivered to R&D. Also, this model was linear in its nature, with identifying and responding to customer needs. The Coupling Models (1970-1980) has emphasis on feedback loops between science, technology and market, but is still to be viewed as a sequential model. A popular example of such a process is the Stage-Gate model (Şimşit et al, 2014). After that came the Interactive Models (1980-1990) which were combinations of push and pull. There was also focus on external linkages and internal integration in the models. The Network Models (1990-2000) had focus on gathering of knowledge, networking, external linkages and systems integration. These models are closed networks of innovation where the company self-reliantly come up with, develop and commercialize their own idea. The next is Open innovations models (2000-) where new technologies are developed through external and internal ideas, but also by external and internal market paths. This is similarly to above a network model, but the difference being that it is both internally and externally focused (Şimşit et al, 2014).

Hyypiä et al (2016) state that often management science literature has the idea that innovations are created only in linear and formal processes. According to Mattes (2013) endeavors to innovate in a formalized way is tied to a linear outlook on innovation – this where hierarchies and guiding methods are established. This perspective posits that innovation is an occurrence which can be planned and materialized without having to test the setting of current framework and values. This notion also has the view of single loops when it comes to learning. In this type of organisation communication is done via established channels and specific knowledge and the organisation is hierarchically coordinated (ibid).

Hannola et al. (2013) mean that the inflexibility of the traditional stage-gate models often causes problems. Several authors have tried to describe how innovation happens through a number of events happening in the innovation process, typically through a number of stages. However, King (1992) argue that stage-based models do not provide a sufficient description

of the innovation processes, but instead the processes are more fluid. Hyypiä et al (2016) state that advance leading and planning is difficult to manage beforehand. Further, the authors mean that creation of innovation in organisations can be looked at as being reliant on the two processes analysis and interpretation. The analytical process is often seen to be more instinctive and natural for business management, this since the linear approach decision making approaches are promoted in business and engineering education. Innovation creation is however based on more than solely problem-solving; the processes tied to innovation are influenced by matters which cannot be tackled linear and logic ways according to Hyypiä et al, 2016. Hannola et al. (2013) argue that the majority of innovations are actually very fuzzy, which implies that there is a continuous process moving back and forth through the development stages. More flexible stances of innovation have approaches that the innovation model is recursive and allowing for several feedback loops in an informal setting with tacit knowledge. The structure here has a more informal coordination and is more set from personal contact and its succeeding trust. Here network structured companies move tasks from the line organisation into specific projects. This outlook on innovation believes that learning is intricate activity comprising double loop learning (Mattes, 2013). Lendel et al (2015) describe a similar view where innovation processes have a built in system of learning. This system is backed by feedback in each process phase. As an example, the notion of customer needs is an area which is driven by a repeating feedback process that can drive innovation.

Mattes (2013) state that the challenge that lies at the heart of an organisation performing innovation is based on the difficulty to combine flexibility and formality. In this framework formality mean the outline of rules that are institutionalised and moreover often include documentation. This formality guides procedures and actions in companies. On the other hand, flexibility means steering away from set procedures and instead rely on self-control and independence of capable organisational departments or individuals (ibid). Traditional NPD (New Product Development) oftentimes rests on the foundation of high level of structure, as well as on a stable climate. A different perspective mean that more focus should be put on uncertainty absorption which is a large part of the environment of development of products. This could generate a process with less structure and higher flexibility. The two alternative outlooks on NPD both create different types of challenges. Faster decision-making is in high speed environments linked to superior performance, while disregarding guidelines could lead to disastrous results (Kamoche & Pona e Cunha, 2012). Studies however suggest that companies do not rely fully on either flexibility or formality, but they rather use the two combined in their innovation projects. Mattes (2013) however mean that formality and flexibility is not necessarily to be seen as strictly opposites. The managerial and sociological perspectives have the stance that neither exploitation and exploration and formality and flexity can be seen to be fully conflicting with each other. They are rather two poles that can complement and facilitate each other, and even reinforce one another. Structures can facilitate flexibility and learning and change and stability can be depicted as being integrated and

mutually enabling (ibid). In a similar line of thought Kamoche & Pona e Cunha (2012) point to successful product innovation balancing limited structure with improvisational freedom.

2.3 Phases of the Innovation Process

There are a number of different ways to describe innovation processes – Kahn (2018) describe how the innovation process entails three different phases; discover, develop and deliver. Salerno et al. (2014) describe how the innovation process traditionally is seen as a sequence of phases involving idea generation, screening/idea selection, development and diffusion. According to Utterback (1971) the phases are overlapping. Some approaches to product development incorporate gates for the different stages, where the Stage-Gate model is often exemplified. From idea generation to product launch there are stages with decision points, each in place with the ambition of mitigating risk of the product development project (Cooper & Sommer, 2016).

In order to present the innovation process in a clear and overviewing way the traditional phases described by Salerno et al. (2014) will constitute the framework for our thesis as seen in Figure 2. This with the aim of presenting a general picture of what innovation processes in different stages can entail, but not with the notion of excluding other possible variants. It is important to note that even though the stages are presented as a sequence, they are not necessarily to be seen as a linear format.

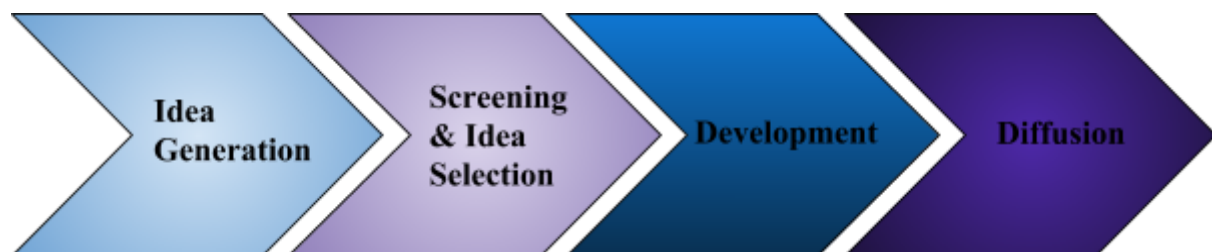


Figure 2. Phases of innovation as presented by Salerno et al (2014). (Illustration by the authors)

2.3.1. Processes of Idea Generation

The generation of ideas is a major part of the early innovation process – the result of these early activities has a large influence on the costs found in the later stages, but also in how the new product performs commercially (Bergendahl & Magnusson, 2015). Ideas could evolve both internally at a company or externally, for instance in relation to customers, academia etc. The generation of ideas can stem from different environments - they can for example be thought out in a relaxed surrounding or in an environment where a change is necessary in order to survive (Desouza, 2009). Desouza et

According to Desouza et al (2009) it can be challenging to move ideas within a company due to potential idea hoarding and context specificity. The former term refers to individuals

perceiving knowledge as a power element, hence ideas are not shared. There might even be company structures in place which facilitate idea hoarding. The latter term refers to when a hinder arises due to ideas being too specific, this leading to the ideas not being accepted or used in other contexts. One important aspect of idea movement is that the idea might lead to inspire new ideas – this stemming from the idea travelling from a part where it is well known to a part where it is seen as new and inspiring (ibid).

Bergendahl & Magnusson (2015) mean that a network structure can help spur on idea creation. Albeit that ideas surface in the heads of individuals, but it is the social interactions that have shown to be of importance for creating innovation. Co-workers who share capabilities and expertise while trusting each other have a better situation for creating value. This could be originated from openness, a better level of understanding and sharing of tacit knowledge. In the start of the innovation process – as the ideation stage – what is seen to benefit innovation is a larger amount of looser diverse relationships. In the later stage, in the execution part of the innovation process it is rather a limited amount of closer and more unified relationships that work best (Bergendahl & Magnusson, 2015).

Another tightly connected area of ideation is the element of creativity. This, according to Freeman & Engel (2007), oftentimes requires a looser structure for a company in terms of reporting relationships, job definition and an alteration in rewards since it is hard to anticipate requirements tied to the invention process. (Freeman & Engel, 2007). Şimşit et al (2014) mean that the management of innovation is not appointed only to R&D but rather includes employees which helps with creativity to the company's development, production and marketing. According to Bergendahl & Magnusson (2015) about half of all innovation proposals are created internally. Management can promote and set up creativity for the entire personnel by using the right innovation management tools – this can aid in the continuous development of the company. Also, Bergendahl & Magnusson (2015) are in the same line of thought; if wanting to leverage the entire company's creativity profound changes are needed when working with generation and development of ideas. This entails processes which attracts more employees and a sanctioning for cooperative idea work. This facilitates a structure where employees socialize and where they work jointly in a network manner, which mentioned previously has proven to spur on idea creation (ibid). On an individual level creativity emerges most often when people are intrinsically interested (Koskinen & Vanharanta, 2002). This creativity can be subdued in a surrounding where a set reward and control structure is in place, and furthermore if a large company segments their business (ibid).

2.3.2 Processes of Screening & Idea Selection

Generating new ideas is most often not the problem when talking about new products. Instead it is the screening of ideas that becomes an issue (Magnusson & Wästlund, 2014). According to Fredriksen and Knudsen (2017) many ideas are useless and the value distribution is often

highly skewed. This is in line, with what has been described by Schilling (2013) that in order to produce one successful product 3000 raw ideas is needed. Evaluation of the generated ideas is necessary since not all of them will provide enough value in order to be implemented (Desouza, 2009).

From a large amount of ideas generated, firms have to take decisions upon which ideas have the highest potential to lead to payoff to the firm. These ideas should then be prioritized and obtain the largest investments, remaining ideas should only be invested in with a small amount of resources. (Fredriksen and Knudsen, 2017). According to Cui et al. (2015) firms still have much left to learn in terms of understanding customer needs in order to develop product ideas that are viable. Still, a lot of products fails to live up to their potential or the adoption rate is slower than expected even though the frequency of new products introduced to the market is increasing (Cui et al., 2015).

There are several approaches to tackle the selection of ideas. Commonly, they all include some sort of pre-defined criterions that the firm looks upon when taking the decision. Essentially, it builds upon two rounds of evaluation, first rating the idea against each criterion and then comparing the generated scores for each idea. The literature has not presented any generally accepted criterions to be used but instead it is dependent upon the context. However, criterions such as feasibility and originality could be used. The process is often very time-consuming and for firms wanting to ensure an early market launch the time aspect is essential. (Magnusson & Wästlund, 2014).

An alternative approach to the decision process based upon criterions which is less time-consuming is the use of intuition. According to Miller and Ireland (2005) intuition can be described as making choices through a subconscious process. While the formal specific criteria assessment involves established success factors, the process of intuition is able to capture things that otherwise not might be considered. However, it will not be possible to determine why ideas have been evaluated in a certain way. The risk of using intuition as a basis for decision-making is that the decision becomes biased. Even though, it has been argued that expert intuition can contribute to efficient and effective decision-making, but the outcome depends largely on the decision-makers prior experience and knowledge. (Magnusson & Wästlund, 2014).

According to Hansen and Birkinshaw (2007) strong screening processes is essential for new concepts to flourish. A lot of companies have strict selection procedures that declines many novel ideas, which then in turn hinders employees from turning in ideas since it does not get any further any way. However, there are also companies facing the opposite problem, letting too many ideas go ahead and hence experiencing an overflow of projects and too little resources. (Hansen & Birkinshaw, 2007). Fredriksen and Knudsen (2017) mean that managing the front-end activities in the innovation process is essential.

2.3.3 Processes of Development

Salerno et al (2015) describe that the development processes could entail product development and project management, while Kahn (2018) depicts it as the phase where promising ideas move into development in which the design and technical specifications are executed.

With regards to project management, Cantisani (2006) argue that if speed is seen as strategically important when introducing an innovation to the market, then the best way to achieve that is through effective project management. After all, project management theory was developed in order to handle things that could not be handled effectively by traditional management practices. (Cantisani, 2006).

In the development of a new product, one aspect is to test and trial the new design's process or concept by making a prototype. The ambition is to get provided with details from a real system which is working, rather than from a theoretical idea. A prototype aids in communicating ideas as well as confirming requirements and getting feedback. In order to generate a correct decision, it is important to have repeated cycles of repeated sharing, collecting feedback and refining the prototype. Every cycle will clarify and put focus on the combination of customer need and the prototype project. (Şimşit et al, 2014).

Experimentation is an iterative process as well as unstructured, which might complicate to make routines out of the process. The result is that a collection of future ideas can be generated and commercialisation apt ideas can be identified. It also facilitates sharing of knowledge, ideas, prototypes and past knowledge. Experimentation could be done by for example presenting ideas at trade shows, attending conferences, write articles or collaborate with academic partners – but also through collaboration and experimentation with other external partners, e.g. lead users (Desouza et al, 2009).

2.3.4 Processes of Diffusion

Diffusion can be explained as a way of getting acceptance and buy-in for the innovation (Desouza et al, 2009), but it can also be described as the launch of the innovative product (Salerno et al, 2015). Kahn (2018) mean that it is this phase that really distinguishes innovation from ideation and invention; without this stage a company has not generated an innovation per se. It is an important step of actually putting the offer on the market in order for it to achieve market acceptance and purposeful use.

Freeman & Engel (2007) state that commercialization typically needs discipline – this with the reason behind that there are growing amounts of resources tied to the innovation process and that an increasing number of managers become interconnected with the innovators. In order to choose how the commercialization phase is best approached it is of value to analyse

the different potential routes. Therefore it is important to get an idea of costs and benefits of different commercialisation methods (Desouza et al, 2009). Kjellberg et al (2014) are in the same line of thought, meaning that companies have a primary ambition of gathering as much market information as possible in order to secure that satisfactory decisions can be made. Especially regarding decisions as which market to enter and/or how to advance market areas within the current markets.

Desouza et al (2009) mean that companies that work well with the diffusion of innovation will already have customer segmentation policies in place, as well as working with network structures in order for the innovation to be diffused to other organisations. A company also does well to have solid relationships with lead users and key customer segments - which can leverage the company's situation positively at launch (Desouza et al, 2009).

Salerno et al (2015) mean that the customers could shape the structure of the innovation diffusion process – for example customers as sources of innovation or as co-innovators. Idea generation and diffusion might therefore be changed by the customer involvement. The traditional innovation process outlook sees the diffusion process as the final stage of innovation, while Salerno et al (2015) mean that diffusion can occur already in the early stages, this e.g by presenting the product to lead users or releasing an initial version to the market.

2.4 Small Companies Innovation Capabilities

2.4.1 Innovation Disadvantages of being a Small Company

In 1965 Stinchcombe presented the concept of liability of newness, a concept that has been widely used as a tool for explaining the struggles new firms' have to go through to survive. It has been shown that the failure rates of new firms are substantially higher than older firms, which seem to be related to the lack of learning experience among new firms. Newly created organizations without any initial experience often displays low quality of performance as well as small chances of survival caused by the lack of established relationships with for example suppliers. (Abetecola et al., 2012). The liabilities of newness are especially common in high-tech sectors where the idea is to be taken through an unclear path without knowing if the idea holds (Patton and Marlow, 2011). A solution to overcome the liabilities of newness could be an incubator that enables the entrepreneur to widen their network to gain and share knowledge quickly (ibid).

On the other hand, Choi and Sheperd (2005) draws in positive aspects into the concept of newness, arguing that the use of newness often focuses on too few dimensions. According to Choi and Sheperd, newness includes both liabilities and assets, where immaturity is to be seen as a liability and youthfulness as an asset. These aspects are not only dependent on the actual age of the organization even though it often is used as a direct measure of newness.

Youthfulness corresponds to the organization's ability to adopt and be flexible in their structure (Choi and Sheperd, 2005). A highly related concept to the liability of newness is the liability of smallness. A small firm often experiences liabilities caused by the fact that they experience issues in for example attracting the same skilled personnel as large firms (Abetecola et al., 2012) – for example in the form of scientists and engineers (Freeman & Engel, 2007) – have less financial resources and a hard time to handle the administrative costs and high-interest rate payments (Abetecola et al., 2012), less authority, lacking or non-existent business processes, and not as many strategic alliances (Freeman & Engel, 2007). Overall, small firms will experience disadvantages in terms of costs and difficulties in attaining resources, which will increase the failure rate compared to larger firms (Varum and Rocha, 2010).

As previously mentioned, one of the most common disadvantage of being a small company has been described as inadequate resources (Schumpeter, 1934; Berends, 2014; Rogers, 2004), which results in small companies undertaking less innovation projects compared to larger companies. In particular, lack of financial resources has been recognised as an obstacle in order to cover the costs of innovation. Small companies generally have limited practice of product innovation. Berends et al (2014) mean that small companies doesn't have occasion or incentive to have a strict selection procedure or stage-gate model – this since the company doesn't have to cope with a plenitude of innovation projects at once and hence have no stress in having to select between innovation projects (ibid).

Small companies might also have other drawbacks for profiting from innovation – this due to the small company's industry position has limited prospects of having the benefit of brand trustworthiness, name recognition, track record, inadequate network relations with governmental and business organisations, limited ability to impact industry standards and lastly incapacity of protecting proprietary resources (Berends et al, 2014).

In newer companies, which have a collaborative teamwork atmosphere, the screening element and cost-benefit analysis might be sub-optimal, which might generate the company to go under (Desouza et al, 2009). Berends et al (2014) point out that smaller companies in the areas of early market screening and market research often are inadequate or lacking. According to Koskinen and Vanharanta (2002) good communication and dissemination of tacit knowledge is important when marketing a product. Small companies often have less skills within their sales force and a smaller market power compared to large companies (Koskinen & Vanharanta, 2002). However, in older companies that are hieracial it can be challenging to find advocates and screeners can be negatively biased in relation to new and potentially risky ideas. This hinder might be balanced with increased collaboration and mindful adjustments to the company culture (Desouza et al, 2009).

Scozzi et al (2005) present the notion of SME:s having different problems in studies that sees the innovation process as sequence of tasks or a flow of decisions. In the first stance there are

problems such as: poor management, ignoring procedures, not having monitoring checks in the process and responsibility not being taken. The second stance presents problems such as: absence of structured company memory, issues with problem framing and problem solving.

2.4.2 Innovation Advantages of being a Small Company

Firstly, it should be noted that not all small companies are innovative. For example, Scozzi et al (2005) mentions that there is a difference between a large group of companies which are not innovative and a limited number of companies which are very innovative. However, seeing to the type of companies that is a part of this report being innovative, the literature on advantages of innovation for small companies is still very applicable. Small and medium sized companies have according to Silva et al (2016) a more flexible, organic and leaner environment when putting it contrast to larger companies.

According to Berends et al (2014) small companies are not to be considered as miniature forms of large companies. All the different features which make up small companies creates several upsides to their product innovation (ibid). One of the main advantages of being small is that they often are flexible (Berends et al, 2014; Scozzi et al, 2005) – this due to:

- They are often managed by an owner/director who can make important decisions fast
- Absence of bureaucracy in the company
- Informal and efficient communication
- Close customer relationships

The factors that make up the flexibility of small companies lay the foundation for quick reactions to changes in technology and markets – this often generates distinguished products for niche markets (Berends et al, 2014).

When looking at the upsides of being a small company, one could also look upon the matter from what is sometimes a hinder to innovation in large organisations. In large scale company's creativity is often subdued due to specialisation of functions, focus on short term issues and results, communication difficulties, investments in existing technology, career outlooks adjusted to risk avoidance and bound budgets (Pearson, 1989).

Small companies can according to Koskinen & Vanharanta (2002) quickly assure themselves that there is a market for their innovation due to more casual and seemingly better relationships with organisations and possible customers. Small companies have better communication with their customers (Koskinen & Vanharanta, 2002; Scozzi et al, 2005) – this since the more informal nature, but also because it takes place with people who have power over decisions in the company (Koskinen & Vanharanta, 2002). Moreover, the strong customer relationships may enable fast response changes in technology and markets (Scozzi et al, 2005).

Moreover, adding to the upsides of small companies, it is often regarded as a sphere where it is beneficial to work creatively. A contributing part to this is because of shorter interaction distances within the company and between its customers and inventors. Diffusion on tacit knowledge is then more probable to be done with much more ease in small companies than larger ones. For larger companies formalized R&D departments generally ignore inventive ideas from other employees within the company - it can even be perceived as an intrusion on their importance (Koskinen & Vanharanta, 2002).

Sahut & Peris-Ortiz (2013) are of the idea that the concepts of small businesses, innovation, and entrepreneurship are all interconnected and mean that the literature often still separates them. The authors describe small businesses as the most favourable climate for entrepreneurship and innovation. These two are not inevitably maintained by the knowledge and characteristics of resources of large scale production, they rather need commitment and close collaboration between the company's employees. It is these that constitute some of the conditions that spurs on innovation, and not necessarily the factor of company size. The factors of commitment and collaboration might be particular and hence not be able to be imitated by large companies. In a similar notion Nonaka and Takeuchi (1995) mean that even innovative large companies might be overrun by small companies in terms of innovation teams. This due to the small companies' teams might have a greater level of knowledge sharing, as well as higher level of commitment and motivation (ibid). According to Scozzi et al (2005) some research has pointed to that typically the technical individuals in smaller companies have a higher average capability, and that these companies can create innovation more cheaply.

Additionally, small companies often can benefit from the so-called inventor attachment. With product development or market entry situations, complicated challenges can at times be conquered by an extraordinary commitment to the invention. Sometimes it can even be that this perseverance can defeat the lines of logic of a rigorous cost-benefit method (Freeman & Engel, 2007).

2.5 Managing Innovation Processes as the Company Grows

By reviewing the literature of small companies' innovation benefits coupled with innovation processes, some approaches will be presented as a tool for enabling a small company growing being able to keep the positive innovation aspects with the aid of different management of innovation processes.

When deciding upon the methods for managing innovation it can according to Freeman & Engel (2007) be seen as corresponding to making the choice of any improvement methods or change processes. There are plentiful of innovation models – perhaps as many as there are innovation definitions. A comprehensive analysis of the current nature of the company along with its processes and resources is best performed in order to certify the best fit with the

measures and management methodology (ibid). Even though primarily pointing to organisational innovation processes, also general change is applicable, when Hyypiä et al (2016) refer to studies proposing that it is better that a company expands its complexity to equal the complexity of its surrounding. This instead of having the ambition of simplifying the company's initial arrangements. The authors also present the notion that innovation triggers can come down to paradoxes and complexity. Hence leadership should be approached as an intricate conjoint dynamic that learning and innovation can emerge from.

As previously mentioned the concepts of small businesses, innovation, and entrepreneurship can be viewed as oftentimes being interconnected (Sahut & Peris-Ortiz, 2013). It could hence be motivated to also explore the aspect of entrepreneurship as a company grows. Morris and Trotter (1990) mean that the attention of entrepreneurship should not only be seen as an acknowledgement of small companies' contribution the economy. There should also be a growing attention of integrating entrepreneurial orientation in firms of all sizes. It can be viewed as a natural occurrence that for firms to lose their entrepreneurial nature – as they grow the company constructs internal constraints on entrepreneurship (ibid). The term of Corporate Entrepreneurship entails entrepreneurial behaviour inside set mid and large sized companies. The activities can be both formal and informal but are directed towards generating new businesses through product and process innovation and market innovation in established firms (Finkle, 2011). Corporate Entrepreneurship is by some seen as the most productive way of handling an external environment undergoing constant change. Aiding entrepreneurship in larger companies entails a transition from the traditional outlook of the entrepreneur as an individual with specific traits to looking at it as an organisational process. This process means encouraging and recognising innovativeness, reactivity and risk-taking. An entrepreneurial company manages to adopt these dimensions on a constant basis among managers at all levels. The process is separated but still supported by specific individuals. Furthermore, it entails a company which is willing to support flexibility, creativity and risk. (Morris & Trotter, 1990). According to Matsuno et al (2014) a firm's proclivity of entrepreneurship could help spur on growth prospects and competitive advantage for companies of all sizes.

Many firms are today practicing an agile team management approach, which also has ventured into the sphere of innovation process management. The method is originated and has been refined in high-performance software firms but has expanded into other industries (Davidson & Klemme, 2016). In short, the approach involves close customer contact, short iterative cycles and mobilization of talents of the employees doing the work (ibid). With regards to the traditional innovation process, Hannola et al. (2013) mean that several things could be learnt from the agile approach. For example, taking a more customer-driven approach, improving the knowledge-transfer, using light user stories instead of heavy documentation and also implementing short iterations which creates a flexibility (Hannola et al., 2013). In industries where technological change happens fast, and the development cycles are short it is more and more important to have a fast innovation processes, often it is seen as

the basis for competitive advantage. An agile approach could facilitate this through enabling better collaboration and information transfer between management, developers and customers (Dieste et al., 2012).

Continuing with the idea of agile management of innovation processes, there are also notions of implementing the agile framework into the stage gate model (as previously touched upon in Chapter 2.3). The traditional stance on gated processes are that they might be too planned and rigid in order to adequately handle the today's fast changing world (Cooper & Sommer, 2016). There are indications that Agile methods are able to be combined with more traditional gating processes, generating a mixed model. So far the research is limited, but has shown promising results for working well with manufactured products. Mixing stage gate and agile methods has generated some positive indications (Sommer et al, 2015; Cooper & Sommer, 2016), such as:

- Improved team communication, better morale and motivation.
- Improved and continuous customer feedback
- The planning is more efficient via getting earlier customer feedback on important product matters.
- Decreasing inflexible and set plans which could generate delays.
- Progress metrics that could improve and more intuitively depict the project status for management.

There could however also be some downsides to take into account reviewing this mixed model: if having full time teams for the product projects it could result in detachment from other parts of the company; conflicts could occur, particularly with managers who must release some degree of control; long-run planning is inclined to be overlooked by the focusing on the current sprints (Cooper & Sommer, 2016).

Another way of solving the issue of implementing more structures and systems to the organization while still enabling for continuous innovations could be through ambidextrous management, easily described as dual management of opposing activities (Kollmann et al, 2009). Or by Purchase et al (2016) explained as a company's ability to perform different and oftentimes strategically conflicting undertakings performed in parallel. In the case of entrepreneurial firms and growth strategies this implies that exploitation and exploration are managed at the same time, preferably implemented at a stage where the firm has reached organizational stability. This will help the firm to flourish both in the present and the future through preserving existing businesses and exploring new opportunities at the same time. Firms that choose to only focus on one of these aspects will not succeed in the long run according to Kollmann et al (2009). However, the optimal balance between the two will differ depending on the industry and the environment that the firm operates within. Firms operating in an environment where incremental innovations are enough to survive, where the industry is changing slowly, will not have a distinct need for ambidextrous management. However, entrepreneurial growth companies operating in an industry where radical innovations are essential will find that ambidextrous management is an attractive option.

(Kollmann et al., 2009). Purchase et al (2016) mean that since exploration and exploitation are processes which have differing demands on the company's resource use, especially concerning knowledge, companies might need to handle trade-offs in resource allocation and decision making. Ambidextrous management can be divided into two different types; structural and contextual ambidexterity. Structural ambidexterity builds on dividing the organization into different parts that have different tasks. The structure should in most cases just be temporary, to enable the organization to get started with new initiatives (Kollman et al., 2009). Freeman & Engel (2007) however point to the risk that the division will generate a remoteness which will cause innovators to be separated and lose impact with line managers. This may in turn cause a problem with technology transfer from the innovation entity. Contextual ambidexterity on the other hand, involves every member of the organization, expecting everyone to contribute to the balancing of exploitation and exploration. All employees will then have to be open to entrepreneurial opportunities and take initiatives. Different types of organizations will benefit from different types of ambidextrous management. Small entrepreneurial growth companies will many times lack the resources for structural ambidexterity and will therefore find contextual ambidexterity as a better option. (Kollman et al., 2009)

Similarly to Kollman et al (2009) and contextual ambidexterity, Kahn (2018) describes an approach to both individuals and the organisation as a whole being immersed into the innovative perspective. Kahn (2018) mean that a company who wants to obtain the benefits of innovation must recognize innovation as a trinity containing outcome, process and mindset. The author points to innovation being both an outcome and a process, and organisations which do not implement this notion will not be as successful in their pursuits. The companies which focuses only on innovation as an outcome will minimize the focus on processes, hence inefficiencies might occur in the innovation processes. On the other hand those companies that focuses too much on innovation processes might create an environment that is too bureaucratic and as a result could hinder innovation outcome. Kahn (2018) therefore promotes a balanced approach on innovation outcome and process – but the two also being coupled by an innovation mindset. An outcome could be seen to be stemming from an innovation process, which in turn is accentuated by an innovative mindset. An understanding of innovation on and individual and company level will aid in the creation of innovation.

2.6 Literature Summary

Small companies often start off with an organic business structure and then moves towards more formalized organizational routines as the company grows (Freeman & Engel, 2007). In order to progress and survive systems and structures is needed, however this can also cause hinders for flexibility and change (Kollman et al., 2009). According to Silva et al. (2016) small and medium companies are more focused upon the founder's idea and meeting customers need instead of innovating systematically.

An innovation process has been described as a sequence of actions by Lendel et al. (2015). Through history a number of different generations of innovation models have been evident. The more recent is as described by Şimşit et al (2014) Network models (1990-2000) and Open innovation models (2000-). Hannola et al. (2013) have described how traditional stage-gates models often causes problems while King (1992) have stated that they do not provide a sufficient description of innovation processes since the processes actually are more fluid. In this thesis the innovation process has been described through the four phases presented by Salerno et al. (2014); Idea Generation, Screening/Idea Selection, Development and Diffusion.

A small company is seen to present both disadvantages and advantages in terms of innovation, examples of few which can be seen in the below table.

Table 1. Summary of a small company’s disadvantages & advantages

Disadvantages	Advantages
Lack of Learning Experience	Flexibility
Lack of Established Relationships	Fast decision-making
Lack of Resources	Informal and efficient communication
Limited practice of product innovation.	Close customer relationships
Limited market power	Enabling creative work
Potential suboptimal cost-benefit analysis and screening elements	Easier diffusion of tacit knowledge

Lastly, a number of different approaches to handling innovation processes as the company grows have been presented: e.g. Corporate Entrepreneurship, Agile Management, Agile Stage Gate and Ambidextrous Management, .

3. Methodology

The following section provides explanations and a description of the methodological choices made within this research. Additionally, the methods for literature review, collection of data, and analysis are described.

3.1 Research design

3.1.1 Research Method

The performed study has used a qualitative research method, which aims at finding the significance that can be derived from data. This is contrary to quantitative methods where the focus lies upon counting data or quantities. Qualitative research is seen as an appropriate tool for explorative research where little is known in advance or for the aim of investigating underlying behaviours, attitudes and feelings. In general, a qualitative study focuses upon gaining an understanding of the subject. (Rasmussen et al., 2006). This is very much in line, with the aim of this research, trying to understand how innovation processes evolve and how these can be managed when the company grows. Therefore, a qualitative research method is seen as most appropriate.

3.1.2 A Comparative Research Design - Multiple case study

By focusing on literature and data gathered from companies, all in different stages, the ambition has been to provide a useful guide for Luxbright – but also other companies in similar situations – by how to work with innovation processes. The companies which have been interviewed have been selected based on the frame given by Luxbright; i.e. knowledge-intensive industry. Hence the focus point of this study consists of knowledge intensive Swedish companies. Beyond this factor, the variable of company size was also part of the decision of which companies to target; e.g. too large companies were not selected because of the large gap existing between them and start-ups. Thus, smaller and medium companies were evaluated as more relevant for the aim of the research. The context is very specific and therefore a multiple case study is also seen as a sufficient way of generating results that everyone within this context can gain knowledge from (ibid). The case study is suitable for researching an area which can be full of complexity and subtlety (Denscombe, 2010), that arguable also is the case dealing with innovation processes and how they are managed within different contexts. There is no optimal number of companies in a multiple-case study. However, choosing something between four to eight cases usually works well, less than that can result in difficulties when trying to generate theory with much complexity (Eisenhardt, 1989).

The chosen research design, a multiple case study, is commonly used in combination with the qualitative research strategy. Bryman and Bell (2011) describes multiple case studies as an

extension of the single case study design. However, Dyer et al. (2009) points towards how multiple case studies might miss the entire depth that can be recognized when conducting a single case study. Albeit, it seems important and relevant to extend the research beyond one single company, in order to gain knowledge that can be applied more generally in the specific context. The use of multiple case studies has become increasingly more common when conducting business research and is mainly concerned about comparing cases. Hence, it goes under the notion of a comparative research design and enables the researcher to compare the findings from each case towards each other. Overall, comparative research designs should in qualitative research be seen as an extension of a case study and involves features that rely on the capability of comparison. The design enables the researcher to recognize what stands out and encourage a frequent theoretical reflection of the results.

A positive aspect of a multiple case study design is that it improves the construction of theory – this since the researcher is in a good position to form the setting in which a theory would or would not be relevant and correct. Furthermore, by comparing cases, emerging concepts to theories can evolve. However, it has also been claimed that multiple-case studies hinders the researchers from going in-depth of each case and instead focusing too much on the contrasts between the cases (Bryman & Bell, 2011). One additional potential drawback of the chosen research design could be in relation to generalizations from the findings – hence it will be clearly stated in this report for what contexts potential generalizations can be made (Denscombe, 2010).

3.1.3 Scientific paradigm

The undertaken research follows an inductive theory. Hence, theories or conclusions are presented in the end of the process based on the gathered data. Contrary to the deductive approach, the theories are emerging from the patterns and relationships one uncovers during the research. Important to note is that the research topic and questions have taken the basis in existing theory and have been analysed through a literature review, and that this is not contradictory to the inductive approach. The data generated through the interviews, with a plentiful of details, have led to the generalisation of concepts and ideas. The inductive theory is by the authors seen to be suitable when researching the chosen topic since the method is iterative and allows for slight alterations along the way (Bryman & Bell, 2011).

Looking at the research through an epistemological view the path that is followed is the one of interpretivism. This epistemological view enables an understanding of human behaviour, this contrary to the notion of trying to explain outer influences. Since the expectation is to uncover the research questions along the way, hence recognising the need to have an open mind during the process, this is also an approach that is in line with the interpretivism (Bryman & Bell, 2011). We can't beforehand know what information will unfold; hence the qualitative methodology is more flexible in comparison to the quantitative in this aspect, making it the preferred choice for this research topic.

3.1.4 Research quality

When conducting research it is of importance to take the concepts of reliability and validity into consideration, both externally and internally. External reliability can be explained as the degree to which the study can be replicated. According to Bryman & Bell (2011), it is generally hard to meet the criterion of external reliability in a qualitative study because social settings and circumstances will vary from case to case. A low degree of external reliability can therefore be expected. However in order to try to mitigate the concern of external reliability, the research design is thoroughly presented. Internal reliability evaluates how well the researchers are able to agree upon the observations made (Bryman & Bell, 2011). The internal reliability has the aim of being increased through open and mindful discussions between the two researchers. Furthermore, one of the ambitions with giving the respondents the chance of reviewing the transcriptions was that potential unclear answers could be communicated about - hence not leaving potential questions up for interpretation by the researchers.

The concept of internal validity describes the degree to which the researchers observations is in congruence with the theoretical ideas that are formed. By conducting interviews that covered extensive areas and ideas, the ambition and hope is that the data gathered was captured in full – hence facilitating a structure with the ambition of creating internal validity. According to Collins & Hussey (2013) this type of validity is often high in qualitative studies. External validity, best explained as the degree to which the results can be generalized in different social settings, is often limited in qualitative studies because of the often small samples. (Bryman & Bell, 2011) Hence, this is something to keep in mind; the results of this study cannot be generalized beyond the specific setting.

3.2 Gathering of Data

3.2.1 Primary Sources

3.2.1.1 Selection of Companies

The companies relevant for the research have been found through contacts and the Internet, with special focus on finding innovative companies operating in knowledge intensive sectors. Searches have been made among companies in Sahlgrenska Science Park, Lindholmen Science Park, Chalmers companies as well as companies participating at the Advanced Engineering fair in Gothenburg 2017. Additionally, searches have been made on Google, looking for innovative companies, for example through looking at the 33-list where a company only gets listed if they are based upon an innovation, are maximum seven years old and not are noted on the stock exchange.

The aim has been to find companies in different development stages, in order to get a comprehensive picture of the development small companies often undergo. The companies that were evaluated as relevant for the research were initially contacted through email, and asked for the most knowledgeable respondent within the company in terms of innovation processes. Furthermore, the purpose and aim of the research were explained as well as the option of being anonymous. Interviews were then scheduled with all companies giving a positive reply, in total eight out of the forty companies reached out to, corresponding to a 20% response rate. The companies replying with negative answers mainly explained their choice to not participate with time restraints, confidentiality issues or little knowledge around the topic. One company wanted to review the interview guide before committing to an interview. After reviewing it the company decided to take part in the project.

3.2.1.2 Interview Methodology

The interviews were conducted using a semi-structured interview approach. Semi-structured interviews take the basis in an interview guide with a number of topics to be covered. This ensures that the interviewees are presented similar questions, which facilitates the analysis process in comparison to an open interview, which easily can take different directions depending on the interviewee. However, in contrast to a structured interview, a semi-structured interview also allows elaborations and follow-up questions. The interview structure is to be seen as flexible. For the given time frame and number of interviews to be conducted, semi-structured interviews seem to suit the purpose of the research very well. According to Bryman and Bell (2011) the chosen method are highly related to the chosen qualitative research strategy and design.

After reviewing literature within the topic innovation processes the interview guide was created in order to cover certain topics of relevance, this included e.g. aspects as how to craft innovation processes (Desouza, 2014), idea generation where creativity was seen as important (Freeman & Engel, 2007) and the issue of finding a balance between flexibility and formality (Mattes, 2013). Overall, the aim was to investigate the issues and hinders that the literature emphasised as well as gaining a comprehensive understanding of the innovation processes at each company. Therefore general questions such as e.g.; “how do your innovation processes look like today?”, was also asked.

The order and the structure of the interview guide was a matter to be dealt with mindfully. For example the first questions were of easy character, as suggested by Denscombe (2011), which had the ambition of making the responder relaxed and confident. The structuring of the questions aimed at being formulated in such way that it stayed relatively open. This since this type of structure could generate some advantages – e.g. the responders can answer in terms of their own interpretations and unusual responses can be attained (Bryman & Bell, 2011). The questions were designed to be as neutral as possible (and not leading) in order to capture the true views of the respondents. Furthermore, much care was taken so that the questions would be graspable - both in wording and the structure. For the full interview guide see Appendix I.

The method of collecting data via interviews was seen to be particularly suitable since this approach works well for getting in-depth information as well as plentiful of details. The interviewees can also be probed and lines of thought can be followed over a lengthy time. One other benefit of interviewing is that it is a flexible approach (Denscombe, 2010). This was seen as an important factor since companies' innovation processes could be very different. Denscombe (2010) also mean that interview as a method can generate validity since data can be screened for relevance and accuracy directly. Potential downsides to interviewing could however be in terms of reliability; this since objectivity and consistency due to the effect of the context and of the interviewer can be hard to reach. Furthermore, when doing interviews one has to be aware of what is communicated is not always what is done in reality (ibid).

3.2.1.3 The Interviews

The interviews were held with individuals with good insight in the overall innovation process at their company, and took approximately 20-50 minutes each. The place of the interviews differed, the majority were conducted at site in the company offices but there were also two phone interviews and one interview held at a local café. The different types of settings were mainly chosen in order to have a relaxed and comfortable setting for the interviewees but also for convenience reasons. More information about each interview and interviewee can be found in Appendix II where the length of each specific interview also is presented.

When starting the interview, permission was asked to record the answers along with an explanation that the recordings were to be used in transcription purposes only. This is also an important aspect when trying to establish rapport with the respondent according to Denscombe (2010). It should however be noted that audio recorders can make respondents uncomfortable. The upside of being able to revisit the interview by listening to it afterwards, as well as a tool of enabling transcription was seen as heavier weighing in this report. As a complement to the recording, some note taking was also done in order to generate a quick overview. Both authors were present at all interviews, however only one person at a time held in the interview in order to create a better flow – this did not however exclude the possibility of e.g. asking follow-up questions by the one not interviewing. When the interview was seen to be finished by the interviewer the respondent was asked a last question regarding if something was not covered that the person thought to be of relevance or importance (as also suggested as a technique by Denscombe, 2010).

During the interview a neutral expression was adopted as far as it was seen suitable. By not revealing the interviewers own thought and views and by having a cordial and receptive tone to the respondent, the goal is to get the interviewee to open up, as suggested by Denscombe (2010). Overall the interviews went smooth, although some questions needed further explanation for some respondents. One of the interviews that were conducted via phone unfortunately had issues with bad reception on both ends. It did however only create some

minor question marks for some words when transcribing, so overall it didn't impede the major takeaways of the interview.

Seven of the interviews were conducted in Swedish, while one was conducted in English. The choice of language was mainly based upon the interviewee and their preferences. All interviews were transcribed from the recording and the interviews that were conducted in Swedish were also translated to English. To make sure everything was captured and interpreted in the right way, all interviewees were also given the opportunity to read through the transcript after the interview – this in order to be able to make minor adjustments and clarifications if needed. By offering the respondents to read through the transcription, the accuracy of the data was also controlled (Denscombe, 2010).

3.2.2 Secondary Sources

3.2.2.1 Literature review

A literature review was undertaken as a means of generating a thorough theoretical foundation for the aim of the report. Only research articles that had been peer reviewed have been used. Additionally, in order to gain up to date and relevant information the ambition has been to use articles published no earlier than year 2000. However, exceptions have been made for classical literature within the subject. The search was conducted using the 'SuperSearch' function on the website of Gothenburg University Library.

The following search words were used: Innovation processes, Innovation processes young companies, creating innovation processes, building innovation processes, creating innovation, innovation young companies, incremental radical innovation, agile innovation processes, flexible formal innovation process, innovation definition.

Additionally, the literature review was used when analysing the given results. Thus, the literature section was also constantly under revision, adding relevant parts as the study evolved.

3.3 Method of Analysis

A thematic approach has been used as a framework for analysis and this is also one of the most commonly used analysis methods for qualitative data (Bryman & Bell, 2017). All transcriptions have been coded through labelling parts that seem to be of relevance for the research question. This has made it possible to easily see patterns and create a comprehensive view of the given data.

The analysis of the data collected through the interviews has been performed by using the software program NVivo. NVivo, in short, can switch out manual tasks. However, it does not remove the need for transcribing all data, since it only allows text input (Collins & Hussey,

2013). NVivo enables the coding and retrieval process to be more efficient and fast compared to when doing all analysis by hand (Bryman & Bell, 2017), this was also the main reason why the software was used for the analysis. Another upside related to using NVivo is that we as researchers are more encouraged to think in terms of codes being related in ‘trees’ – this spurring on to reflect over how codes are interrelated. It should however be noted that even while NVivo can take over many manual tasks, the data must still be processed and interpreted. Though Computer-assisted qualitative data analysis, such as NVivo, might have some potential downsides as an analysis tool. One view is that this analysis approach may cause data to be fragmented in a way that the narrative structure is interrupted. There is also a concern that fragmenting the text when coding may result in decontextualizing data when the coding is put together and presented (Bryman & Bell, 2017). By keeping potential downsides to NVivo in mind, the ambition has been to reduce the risks through mindful analysis.

After uploading then transcriptions of the interviews in NVivo, the work of coding the answers to nodes commenced. From this coding an overview of the nodes for each identified theme could be attained. This gave a clear overview of the respondents’ answers, which aids in the analysis process by singling out relevant and interesting results from the data gathered.

3.4 Definition of company size: Complexity as Company size proxy

Brooksbank (1991) describe how business researchers use the terms “small”, “medium” and “large” regarding company size. The use is however not anchored in any consensus regarding how the terms are actually defined. The author describes different approaches used, defining size from either quantitative (such as number of employees and sales turnover), qualitative variables, or the two being analysed together.

This report however uses a qualitative size definition. The qualitative definition means looking at the idea of stages of development and growth. It stems from the concept that companies can be organised from a company form which is simple to complex. A company usually moves towards complex when the number of products increases and the coverage of the market grow bigger. The reason behind not implementing a quantitative size definition was mainly due to categorization issues. Three of the companies in this study do not have any product on the market yet, and can therefore not be measured in sales turnover. Additionally, some companies use many consultants in their organization instead of hiring and hence the number of employees might not properly reflect the stage where they are at. Therefore the qualitative size definition was seen as the most appropriate choice.

By analysing the product strategy as an indicator of company size, an arrangement of the companies interviewed in this report can be made. Brooksbank (1991) mean that most researchers view the first stage as a company that has a single product. The second stage means that the company expands the line of related products. Lastly, the later stages mean

that there is an expansion of product lines that can be both related and unrelated to the core business

Three of the companies had products still to be launched; Mimbly, 10MD and QuickCool. QuickCool will however launch its product the summer 2018. Insplorion builds their products on a joint knowledge base – generating three different product areas. Even though the number of employees is not the basis of the size evaluation, in this case it might be an indicator of the level of complexity. Insplorion currently has six employees still being able to manage the product lines, hence the relatively early position in the spectrum of the companies interviewed. The complexity evaluation for Company X and Cellink, and putting them in contrast to each other, is not straightforward with regards to product strategy. Company X, who has applications proven in the field for over ten years, has several products along with control software. Cellink is a young but fast growing company with products of bioprint and bioprinters. Both companies have two products which are interrelated, therefore a distinction is hard to make. Hence Company X and Cellink in the context of this report, and with regards to product strategy, will be viewed as comparable in complexity.

Qualisys application range is very broad, from e.g. sports to engineering. However, it mainly takes the basis in two product lines, cameras and software. Additionally, they offer a number of accessories that works complementary to the existing product lines. NIRA Dynamics also has mainly two product lines, working with both with tire management and intelligent navigation. Therefore both Qualisys and NIRA Dynamics will be placed in the same area of complexity.

Most important to mention is that the companies are only evaluated in relation to each other and not compared to other company's sizes that is not part of the report. The categorization of size could be claimed to be depending on the indicator chosen, whereby it could vary if another approach was used. However, it is the authors' belief that a categorization like this will contribute to a better understanding of the companies' innovation process work, by enriching it with the factor of complexity level. Please see figure 3 in chapter 4.1 for an overview of the companies' complexity level

3.5 Potential Limitations

Firstly, worth to consider is that this study will as all qualitative studies be influenced by the researchers own opinions and reflections, however, this is also one of the reasons why having two researchers with different stand-points is believed to be beneficial. All interpretations and own reflections will be stated clearly to avoid confusion. Data gathered from interviews are expected to be hard to analyse with regards to the extensive amount and unstructured text material (Bryman & Bell, 2017). This potential problem is however expected to be mitigated by the chosen analysis method.

Secondly, potential limitations that can arise during the course of the project could be that the data gathering is connected to human beings, thus one has to keep in mind that the data could be both subjective and perhaps not disclosed in full. The individuals interviewed might for example not be willing to talk freely regarding certain subjects, due to it being e.g. sensitive matters on both individual and company level. How open people are willing to be and what they are willing to share with outsiders is matters that one has to reflect upon. By aiming at establishing trust as well as letting the respondents to read through the transcribed material mitigation of the problem may partly be decreased.

Secondly, the extent of the research will be limited because of the given time restraints. With this in regard, not all issues that arise are expected to be investigated in an in depth manner. The focus point will lie in answering the research questions; other interesting paths for research will be presented in the end of the study as suggestions for further research. The limited amount of time also decreased how many companies that could be targeted for the report during the time frame. All of the eight companies are also in different industry areas, with the common ground that all are knowledge intensive. Hence these issues should promote caution in the level the report's analysis and conclusion can be generalized.

Thirdly, another limitation to this report was that only one person per company was interviewed. It should be noted that it is only that individual's view on the company's innovation processes and not the overall perception of it that was captured. It was however people that were very immersed and knowledgeable about the company's innovation processes (both formal and informal) that were of interest. Though the question should be raised if perhaps it could have added a more thorough view of the companies' innovation processes if data could have been gathered from several individuals per company.

Lastly, one weakness of the research design in relation to the research questions is that data is gathered only from one point in time. Ultimately it would have been beneficial for the research question if data could have been collected twice or more points in time in order to generate a deeper understanding of a company's innovation processes if a company grows. For example it would have contributed with a deeper understanding to e.g. see how the balance of flexibility and formality has changed –or if it has – during the course of time.

4. Empirical Findings

The following section presents the findings obtained from the conducted interviews. The data presented in this section constitutes of the sections “Current Innovation Processes” & “The Companies Thought on Innovation Processes as the Company Grows”, which will lay the foundation for the following analysis.

4.1 Overview of Companies & Interviewees

In total eight companies in different stages of development were interviewed with the aim of collecting information regarding their innovation processes, advantages and disadvantages of these, future view of their innovation processes and so forth. The below table give an overview of the companies.

Table 2. Overview of the companies and interviewees

Company name (founding year)	Name of Interviewee (Title)	Company’s Business Area
10 Medical Design (2012)	Petra Apell (Founder & Business Developer)	Radiation protection textile for protective clothing
Cellink (2016)	Gusten Danielsson (CFO)	Bioprinting Technology: 3D Printers & Bioink
Company X (2005)	K D (Product Manager)	Products, software, & solutions
Insplorion (2010)	Patrik Dahlqvist (CEO)	Sensor platforms: Battery sensors, air quality sensors and NPS based research equipment
Mimbly (2017)	Miguel Estruch (Chief of Innovation)	Products for the household that tackle water scarcity
NIRA Dynamics (2000)	Robert Johansson (Team Manager)	Software Solutions for Tire Management & Intelligent Navigation
Qualisys (2000)	Fredrik Müller (VP R&D)	Motion capture and 3D positioning tracking systems
QuickCool (2003)	Fredrik Radencrantz (CEO)	Intranasal brain and body

		cooling system
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As described previously, a size proxy in terms of level of complexity dependent on product strategy was used in order to categorize the companies within the group (less complex, medium complex and complex). It is important to e.g. recognize that the complex companies should not be viewed as large companies even if they are placed at the furthest right. The categorization presented is a spectrum of the companies in the study, and is done with the ambition of providing a structure for the analysis and its corresponding discussion.

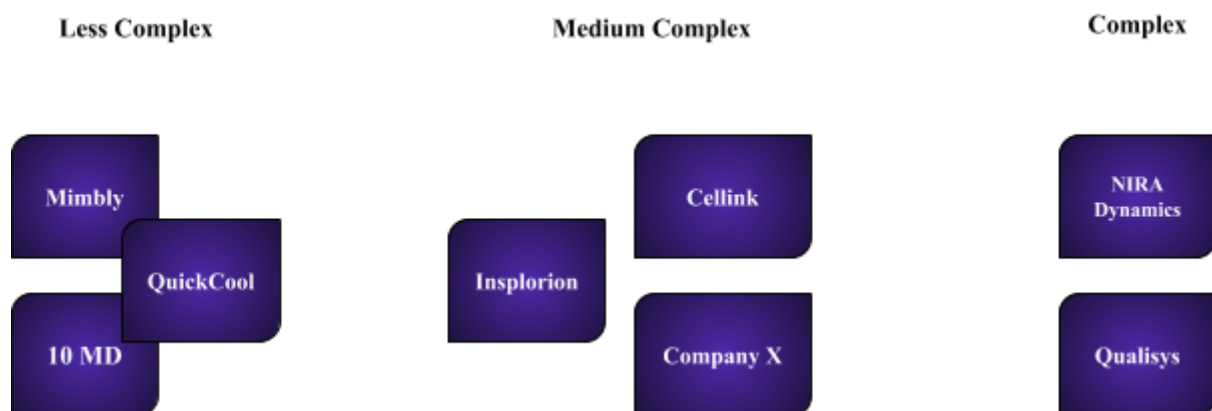


Figure 3. Complexity level as proxy for company size categorisation. (Illustration by authors)

4.2 Current innovation processes

4.2.1 Less Complex Structure - 10MD, Mimbly, QuickCool

4.2.1.1 10 Medical Design

Petra means that everything they do is innovation. People in the group have different responsibilities, e.g. with focus on lab work, sales and manufacturing. So it is a clear divide of the work, but she mean that they still work together very overlapping. Petra Apell at 10 MD highlights that there should not be any set process. However, she mentions that processes have been implemented more in the format of quality systems (for CE-mark).

“I’m probably pretty pragmatic, thinking that there should probably not be any special process like that. Not too structured, rather that it just comes. I’m not much for it to be a certain way, because then I do not think that innovations are being created in the best way.”
- Petra Apell, 10 MD

Their structure of work is rather described in the form of experimentation, testing and trial and error – all of which is done in an iterative manner. There is also a large focus on the

customer needs, which is a driving force in the company – but that this is not done according to any process. The company bring their prototype, test it at potential customers and get feedback. Further, Petra explains their main advantages as being quick and having an open climate. She describe how there is a difference with how ideas are worked with in 10 MD and in her former workplaces which have among others been in larger companies; ideas just pop up, and it gets brainstormed and discussed. When describing how ideas are evaluated, Petra states that they go on the feeling. But they do consider risk, cost and opportunity in the decision. If the risk is considered to be too high early on and it is seen as too costly, they will put it aside – potentially on the to-do-list for the future.

She also refers to there being large flexibility in the company:

“As a small company, one must be extremely flexible. And you cannot add too much formality during the innovation process, but it should be very flexible - it should be open to new thoughts, ideas, input from customers or whatever it is.” - Petra Apell, 10MD

Petra describes how lack of financial resources is one of the largest disadvantages. Their business is often determined by the funding they are able to get, which sometimes hinders them from doing everything they want.

“It takes a little too long sometimes, and it’s a lot because you do not have the money to do certain types of projects. So we would have been better if we had a lot of money in the bank and if we felt we were able to just do what we wanted, now it will be that you adapt the business a little bit depending on if you can get funding for a specific project or not.” - Petra Apell, 10 MD

4.2.1.2 Mimbly

When asked to describe how Miguel Estruch at Mimbly would describe an innovation process he states:

“Create and use, I would say use the things we already have to create new value. Or, develop new things that can create more value. Processes that bring to the value creation. New value creation through technologies or business models.”- Miguel Estruch, Mimbly

Miguel Estruch describes how they do not have any formal processes. But they often try to map what they need or when things have to be improved from the technical point of view. Their search mainly involves finding new technologies or companies of relevance that they can implement with their systems. Also looking for things that are not mainstream in the industry is something he finds important – it might be in the form of applying something from other industries in their industry.

He describes how they have weekly meetings every Friday where they discuss everything. If anyone has any new ideas, these can be presented. However, ideas are not restricted to being brought up at meetings, it is not uncommon that someone just come to you in the office with

a new idea. At the moment, most ideas are allowed to be developed and then it gets evaluated if it is possible or not. Miguel describes how the selection is made.

“First, we start exploring, start a mini-project, and we divide between the people that has the expertise or has that role. For example, when we wanted to make a new laundry bag we divided one guy to the design and then I know a guy that knows a lot about textiles and then it was me. Then we started and we had about one week to find things and see if it was possible or not and set how the project should be. During the Friday meeting with the presentation, we present it to the rest of the team and if most people want to continue, we continue. It use to be either five people that says yes or five people that says no.” - Miguel Estruch, Mimply

According to Miguel one of their main advantages is the large freedom that is given to employees, where all employees can express their ideas freely and everything gets assessed. He means that creativity happens because of the huge amount of freedom given. Furthermore, it also comes down to the people in the company; them liking the idea of innovation and in turn coming up with new ideas. During the Friday meetings everyone always express their opinions, the only rule that is existent is that feedback that is given should be constructive. However, he also describes how their large amount of ideas sometimes can take up a lot of time in terms of evaluation. Overall, Miguel states that there is a large flexibility within the company and currently there is no balance between flexibility and formality since there are no set processes, but it rather evolves more organically. He states that some opportunities might be missed under the current framework.

4.2.1.3 QuickCool

When asked to describe how he sees upon an innovation process, Fredrik Radencrantz at QuickCool state:

“An innovation process is that we learn from each other. That’s the case. And I think it’s extra important that you have many different skills in a room. You are attracting other skills and experiences. And dare to listen, and that helps to draw conclusions.” - Fredrik Radencrantz, QuickCool

Fredrik Radencrantz explains how the innovation process is divided into three different areas: mechanics, software and clinical. Since everybody have different skills, the responsibilities are also divided according to that. Furthermore, he describes how they are working with regular weekly project meetings. During the weekly meetings everyone are involved. Fredrik explains how they now are at a stage where not all ideas can be implemented due to the soon upcoming launch of their product, but all ideas are saved for future versions. According to Fredrik a key to success is that everyone contributes with ideas. No idea gets rejected, which according to him partly has to do with the high expertise among the consultants, that the ideas that are turned in often are of high quality. He describes how they have been very successful in hiring good consultants that are very open for suggestions. Additionally, he describes how

they through actively choosing the consultants they want in their team have been able to gain a natural dynamic.

One of their main advantages is according to Fredrik their work environment (small office in an open area) which results in that everybody can hear everything that is going on. This is according to Fredrik facilitating the information flows. Also the spontaneous interaction at the coffee machine is something that is seen as a beneficial element for them. Fredrik has the experience from working both in larger companies as well as smaller ones and express that innovation often is easier in smaller companies:

“A small company is a little more effective – in some ways, anyway. And what I think is most favoured is probably innovation – the spontaneity is still there.” - Fredrik Radencrantz, QuickCool

However, he also describes how lack of financial resources is one of the largest disadvantages of being small. Further, Fredrik also explain how the lack of documentation can result in ideas disappearing and slipping through.

“And I think sometimes that many good ideas disappear, that one has not taken the time to document them. And then you’ll get back after a week or a month, or maybe you’ll see it from another context - maybe “this could actually fit.” - Fredrik Radencrantz, QuickCool

Fredrik explains that formality is of importance in terms of innovation – this because formality lets you see things from a larger context that enables you to see connections. However he also state that one cannot be too formal when it comes to innovation processes;

“We are part of the innovation process where we learn from each other and get on new tracks and new thoughts, that someone else has said or read or heard about.” - Fredrik Radencrantz QuickCool

4.2.2 Medium Complex Structure - Insplorion, Cellink, Company X

4.2.2.1 Insplorion

When Patrik Dahlqvist at Insplorion is asked how he sees upon an innovation processes he explains:

“It’s an attempt to structure a creative process that will still be linked to business. There is a difference between invention and innovation that way. It’s not just a fun technique, but it’s going to be something commercial.” - Patrik Dahlqvist, Insplorion

Patrik Dahlqvist means that they do not have any process for innovation; everything they do is aimed at innovation. The company is run through different projects and prioritizing is done in an agile model, where every idea that is delivered is prioritized against the current projects.

They are working with short iterative cycles. Patrik describe how they have a list where ideas are ranked and prioritized, where the list is constantly changing. He also describe how idea generation never has been an issue for them, instead they are almost overwhelmed with ideas and have to prioritize among them. The issue for them is not to try to increase the number of ideas, but rather how to work with them; the focus is to make use of the right ideas and to prioritize them against other ideas.

“It is important that we make sure that we do not get too all over the place, that it gets too much. There are many things that are fun to go for – but we must be careful not to run at all balls, in order to actually get the most important balls in the goal. So it’s rather that we have many creative employees, we come from a creative environment.” - Patrik Dahlqvist, Insplorion

Patrik also describes how ideas that get through the first screening goes into an Excel sheet where they are assigned scores according to for example market potential. However, he also describes that in practice the Excel sheet is not always used because it demands a bit of work effort to assign all scores. Instead they sometimes just take it up for discussion and base their decision upon that. If the idea still is of interest they start to look for soft funding that can be verified. According to Patrik, it usually differs from idea to idea what is seen as gaps, but it could for example be market verification or technical feasibility. Additionally, Patrik explain how they early on try to talk to customers whether it is something worth pursuing or not. He does however state that with customers and other cooperative partners, it is hard to effectively make a formal process out of it. This since there are so different processes from relationship to relationship. Overall, Patrik state the main advantages of their way of working as being fast-moving and having a transparent and open process while also having the ability to create new innovations.

“We have an easy time to create. Then how we work ... yes, we have a rather agile open, fast-moving, transparent process, or if you want to call it a process. And that has advantages when you want to create, so absolute. But it’s the only strength of the small company, and we have made sure we’ll keep it. “ - Patrik Dahlqvist, Insplorion

He also mentions how ideas easily can travel within the company; they have according to him a good structure with morning meetings where everyone can discuss what is currently on the table. Patrik mean that it is easy and manageable to handle the dissemination of information, even with regards to innovation. He also points to the collaboration within the group as being beneficial since different individuals come with different input; some are more on the market side and some more on the technical side, which enables a structure where it is easy to explore market potential and what is technically possible.

Additionally, he states that the company tries to safeguard flexibility, but on the other hand do not mind structures as long as it does not hamper flexibility. This is according to Patrik

done through using an agile process approach that aids with supporting processes and decision-making – while still enabling to change direction. For him flexibility and formality in the innovation processes are not opposed; the view is that the right type of Excel sheet, the right type of flowchart also supports mobility.

4.2.2.2 Cellink

Gusten Danielsson at Cellink describes how they work very close with their customers. That is also what is stated when asked to describe how he sees upon innovation processes;

“The innovation process is the process from identifying what the customer need until we have fulfilled it.”- Gusten Danielsson, Cellink

The reason for the innovation process is often to identify the problem and thereafter identify the people in the company that is needed in order to provide a solution. He explains that if they identify a problem they think is possible to solve, they are taking an explorative approach where they are testing themselves to see if they can find a solution. Often the people in sales come back with feedback to some departments, where they then sit down together and review the feedback and see what can be found out. They also have monthly customer surveys and arrange a yearly workshop where customers are invited. However, one has to have in mind that customers might not know what they need, but they know what problems they are having.

Gusten mean that having the right people enables them to manage most things. Also, having the attitude that everything is possible is important when pursuing an innovation process. The contrary would according to Gusten provide limitations. The general view is also "Doing something is better than perfect". Overall, he emphasis the importance of building a culture around innovation, which results in that there is no need to drive an innovation process since everything they do is innovation. He means that their entire business culture is built around innovation:

“I think what I really feel, what is needed to create innovation is essentially, you need culture and you need a way to implement the innovations. Everything else is secondary.” - Gusten Danielsson, Cellink

Everyone at the company is according to Gusten aware that innovation is a part of their company strategy. He means that being the most innovative company in the industry and preceding competitors is the aim. Gusten describes how there are not any official paths for ideas to take, but instead it is the idea generator that ensures that the idea gets to the right place. He means that everyone that works at Cellink knows whom to turn to, in order to be listened to and to get resources.

Additionally, Gusten explains that everyone at the company can contribute with ideas, but it is the sellers that most often are the largest innovation drivers. They are out meeting

customers regularly and can recognize the needs for improvement. When deciding if an idea is worth to pursue or not, Gusten explains that this is done by the management when it is an idea that demands a lot of resources. Basically, the decision is based on the risk-award. The decision for minor innovation is often based upon the impact, if it is something that is worth to pursue for the idea generator. The amount of innovations possible to generate is according to Gusten very large. Therefore it is also according to him easy that things slip through and not get documented. He means that their way of working could be improved through a larger extent of documentation. Additionally, Gusten refers to formality as a framework to give support to innovation:

“Flexibility is needed for innovation – we cannot limit the flexibility in that – but rather formality is just for the opportunity to create innovation as well.” - Gusten Danielsson, Cellink

4.2.2.3 Company X

When explaining how she sees upon innovation processes K D at Company X state:

“I think it is something unique to the company. Because I think processes are also something that needs to be shaped as they are needed, more than adopting a process because it has shown good results. I think that, since being able to lead to some kind of innovation, it needs to be defined against the market, against product and against the people who actually work with it.”- K D, Company X

K D at Company X describes how they have three different channels that drive their innovation processes, technical, plant-based and customer needs. Since they have a very technological product, there is a need to keep up with the technological developments in the market. Then there are also biologists who work with for example how the response looks like. And then the third is when there is a recognized customer need. According to K D their advantages involves very close customer contact which enable them to get instant feedback. Many in the customer base are also very interested in testing early products which generates a good structure for getting a response whether the they are on track or not. She describe how ideas often originate from a problem that the customers have, it is often the sales people that recognize this. K describes how an analysis of the problem is done where you look for possible solutions. Since, the company wants to do things on a larger scale there is also an analysis done to see if the idea can be useful and applicable for many customers. When a problem definition has been created, the idea moves further to a discussion where possible solutions are evaluated. From there, K describes how the idea moves into a prioritization process. Before a project is started they use the prioritization process to understand for example the costs of the project and the benefits of running it. After that, the development starts. K describes how they are currently working on trying to set more of a structure to their processes.

“We are working on setting a structure as much as possible, it is quite a young company and based on research, too, where it drives development in a different way. So much, yes, but I'll say that – we have different gates we want to go through and different follow-ups as we go through these ideas” - K D, Company X

K D also describes how she can see a need for more documentation, and the lack of documentation can be a disadvantage. She explains that in a small company there often is a high turnover of people, which makes it even more important to have an established process that ensures everything is done the same way every time.

She also describes how they do not have any specific policy around generating ideas and spurring on creativity. K however state that she thinks that you have to make time for being creative and it being expressed in some format. To work with collaborative idea generation they today have things such as workshops, where they analyse a functional analysis problem

4.2.3 Complex Company Structure - Qualisys, NIRA Dynamics

4.2.3.1 Qualisys

When asked to describe his view on innovation processes Fredrik Müller at Qualisys explain:

“The actual process itself, it is obviously set from having a chaotic environment to coming up with things in general. Without it becoming nothing or it being unorganized – then the process part of it is that one really has a structure, attempting to deal with it in a way that makes it more clear to everyone involved in a business.” - Fredrik Müller, Qualisys

Fredrik Müller describe how they work with a NBD (New Business Development) process that works as a flow chart; when a new idea arises the thought is that anyone within the company can simply just fill in a form. He explain how the first page of the form describe what the idea consists of and what commercial potentials there are. Then, the rest of the pages incorporate all the details. Based upon the extent, cost level and commercial opportunity it is then decided if it is worth to pursue or not. Fredrik explain that today management takes the decision but they are on their way to develop a product group that have more special technical expertise, which the management sometimes lack. He explains how the idea is that the product group could take a lot of the decisions and thereby also ease the burden for management. The development of this process has been done gradually.

“The idea is that if we continue with this product group, some of the decisions will be possible to make within the group. So it's only larger cases that involves more investment, or greater commercial opportunity, over a certain level, that the management team have to take a decision on – if it affects budget and how things are handled.” - Fredrik Müller, Qualisys

Overall, Fredrik describe one of their main advantages in the innovation process as documentation, that everything gets documented. This facilitates the process of going back and being able to see what cases are on the table for the moment. Additionally, he describes how it works well with having a more formalized process since it is not as chaotic as it could have been otherwise.

“Personally I like this, that it’s quite clear which cases you have, it becomes documented. It’s not just that you run around and chat – you can go to a paper someone has written, then it was some sort of decision point, so you can go back in time, “this was actually what we talked about”, and you can follow-up and compare whatever you thought of these pieces then. Pure process technology, that’s what is a huge advantage then.” - Fredrik Müller, Qualisys

He emphasises that they have tried to convey to everyone that they can fill in the form. However, he also means that some may perceive the process as heavy and complicated, which might hinder some people from turning in ideas. Fredrik explains that often the ideas that gets turned in comes from developers, and more seldom from the sellers that are actually out in the market. However, when filling in the form, you have to fill in a commercial estimate that has been checked with the respective geographic sales manager. He explains that there should be some type of validation and some type of possibility, and in that way the commercial parts are brought in. Fredrik also point to that often many of the ideas arise in more informal settings, such as around the coffee machine.

“I would say that very much, for real – and that is also my personal experience – that much is happening around the coffee machine. So a coffee machine is a central device and it does not matter if people drink coffee or not. In principle, coffee time gives the opportunity to chat and talk about stuff.” - Fredrik Müller, Qualisys

Fredrik also describes how they have been inspired by Google and implemented that all developers can spend 20% of their paid working hours on what they like, something that have been very appreciated. Fredrik explain how the developers generally work with a scrum-agile method.

4.2.3.2 NIRA Dynamics

When Robert Johansson at NIRA Dynamics describes how he sees upon innovation processes he explain:

“One kind of innovation process is a process that promotes innovation and freedom in thinking, and a culture where ideas and thoughts are to be developed. And to stimulate – to take something from one area to another area to merge into something new. Stimulating innovation, rather than pushing for innovation creation, to support it.”- Robert Johansson, NIRA Dynamics

Robert Johansson at NIRA Dynamics explains how they have a separate innovation group that takes care of all innovation ideas. The group assesses the ideas and then take them forward. This group is completely separate from the daily business operations. He describes how first an idea is presented, then it gets evaluated if it should go into the usual development process or if a preliminary study should be done. If there are ideas that the innovation group feel would need a preliminary study but the technology is missing or they do not know who can do it then a general post is posted for everyone at the company. Letting everybody know that this is up for grabs. After the preliminary study, the results will be reported and then a decision can be taken. Robert describes how decisions are taken based upon if it is technically feasible and if it will give enough “bang for the bucks”. Also, there have to be some commercial opportunity. Robert also describes how they work with deadlines and time restrictions, for example it should not take more than two weeks from the point where an idea is submitted until you get called for a first meeting. Robert explains how they often work quite far from their customers and taking in external feedback on the ideas does not happen. However, at a pre-development stage before it is a finished product and before starting a major study customer feedback is incorporated asking thing such as: “Is there a need? Is there a demand? Willingness to pay?”.

Robert explains how they have tried to build a culture around innovation, and this is according to Robert a great advantage. He explains how they have had a two-day workshop with focus on creativity called Creaton. The event was very appreciated and resulted in that the idea generation exploded – both during and after the event, with the usual reporting of ideas almost being double. He believes that their system is good since the culture enhances that employees contribute with quality, this contrary to a more individualistic culture where each individual seeks to be rewarded. However, their processes are mainly internal and they sometimes miss the input from the people in the organization who works with their customers. Overall, Robert express that there is a problem that ideas do not travel from lower levels and not all ideas being communicated:

“Most ideas do not travel at all through the company, and that's the problem, now I do not know about it because I cannot know this – but I'm almost convinced that most ideas do not travel anywhere, they just stay in the head of someone. And then they will not go anywhere.”
- Robert Johansson, NIRA Dynamics

Robert explains that it sometimes can be hard to get things done. He also explains that he thinks that innovation must not be associated with unseriousness, getting away from the playfulness is something that he have worked hard with. When speaking about flexibility and formality in innovation processes, Robert states that flexibility is an important factor to be able to change things. But there is also a need to have a structure so people do not think it's just a game or that they feel like their ideas are lost in the process.

“ If I came with this stuff a few months ago then what happens to it? “Well Yes, – we are very flexible here so it’s gone in this pile of paper”[ironic tone]. So it must be stable- “this process will work”. So it’s like everything – we can not know all the ideas and all the conditions that exist, so we must be flexible too.” - Robert Johansson, NIRA Dynamics.

4.2.4 Summary - Current Innovation Processes

Table 3. Summary of Current Innovation Processes

Company Size Division	Company	Advantages	Disadvantages
Less Complex	10 Medical Design	Being quick and having an open climate	Lack of financial resources
Less Complex	Mimbly	Large freedom, everybody can express their ideas freely and everything gets assessed.	Time consuming, evaluating ideas takes up time that could be spent more effectively.
Less Complex	QuickCool	Natural dynamic and working close to each other in the office. Sharing of knowledge	Lack of financial resources and lack of documentation
Medium Complex	Insplorion	Fast-moving, open, transparent and having the ability to create	Sometimes too many ideas to choose among
Medium Complex	Company X	Close customer contact and fast feedback	Lack of documentation, everything is not handled in the same way every time
Medium Complex	Cellink	Their culture, makes that everyone naturally thinks innovation	Lack of documentation, sometimes ideas can be missed or disappear
Complex	Qualisys	Documentation, it is always easy to go back and find what has been said.	Processes which sometime hinders people from turning in ideas
Complex	NIRA Dynamics	Their culture, enhances that people contribute with quality	Lack of customer input and hard to get things done. Ideas do not always travel

4.3 The Companies Thoughts on Innovation Processes as the Company grows

4.3.1 Less Complex Structure - Mimibly, 10MD, QuickCool

4.3.1.1 10 Medical Design

Petra Apell at 10MD explains that eventually processes and formality will be added. Both flexibility and structure are needed, but it depends on the phase you are in. Early on in a company's lifetime there is neither time nor money to facilitate structure. Petra believes that the company will change when growing; this since it will get more politicised and structured. But this is also the risk of becoming a big company; they lose the innovation capability because it will not be as natural and there is less opportunity to be creative. Since it has to go through a lot of procedures, you get tired of it Petra says.

Petra describes how they are moving into a phase that will require them to follow more structures. Petra however express that the company does not want to get "stuck" in the structures, and suggests as a solution to perhaps implement some creative meetings on the side. She also highlights how different processes demand different types of leadership. In a smaller company a leader that is good at taking fast decisions and taking risks is needed, while a leader in a larger company might have other capabilities.

Petra Apell, who has previously worked in larger companies, explains how they at Johnson & Johnson had Task Force teams that worked really well. Individuals with business development experience were teamed together and worked across the organization with a separate budget. Running the innovation process across the organization in that way is something she believes will be needed as a company gets larger.

4.3.1.2. Mimibly

When talking about what adjustments that potentially could be needed as the company may grow, Miquel Estruch at Mimibly describe how their processes work well today but in the future there will be a need for them to formalize their processes and prioritize what is brought up during meetings. For example there might be a set time for discussing ideas, but also a format for how employees should explain and present new ideas to the rest of the team. Adding to this, there should be a decision regarding if all of the team will take part in the process, or just the part of the team that wishes to be involved. Miguel also express that the areas that they explore for new things should be more prioritized. When talking about the future Mimibly expresses:

"Give freedom and flexibility to everyone but in a more controlled environment I would say. We should set specific times and specific people." - Miguel Estruch, Mimibly

Further, Miguel state that strength now is that the people in the company generate a lot of new ideas because they really enjoy looking for new things. He therefore mean that the most important aspect to consider is to implement this aspect into the human resources process – this in order to find people that are willing to, or like to be a part in a company with this type of environment.

When considering if it is possible to hold on to the flexibility that the company has today, Mimbly state that it should not be an issue:

“I think that is easy, or it is very possible [holding on to flexibility when the company grows], it is more about just encouraging people to be free to look for new ideas (...). But we need to find a way of how to pre-assess ideas, and to really make sure that everyone knows who they should talk with when they want to present an idea. - Miguel Estruch, Mimbly

4.3.1.3 QuickCool

Fredrik Radencrantz at QuickCool describe how they as a company have so many possibilities with their solution, that the biggest problem to tackle going forward will probably be that they need to limit themselves to what they really would like to invest in. Fredrik who has worked both in larger and smaller companies, describes how he sees upon the differences between the two:

“I hope and believe that our company will be a rather small and dainty company. I have worked at a Getingebolag and Ericsson company, two giant colossals, and it takes time to change and adjust, there is so much internal energy to affect the positions of different managers. Here we can decide for ourselves.” - Fredrik Radencrantz, QuickCool

Adding to this line of thought he adds that there are pros and cons with every structure. He however means that a small company is a little more effective – at least in some ways. The most favoured part of them all is probably innovation, this because of the spontaneity still being existent. Larger companies, Fredrik means, are more formal and rigid – and there is a need to follow processes. Fredrik state that QuickCool also need to follow processes, but since they are a small company they have the opportunity to be a bit more easy-going and are able to more easily discuss things, which he means is a format that benefits them innovation wise. Fredrik also present the view of them as a small company have a different type of mood when they themselves more actively participate in their processes, compared to larger companies.

4.3.2 Medium Company Structure - Insplorion, Cellink, Company X

4.3.2.1 Insplorion

Patrik Dahlgvist at Insplorion describes how they do not want to create any rigid and sluggish processes and flows, but instead really safeguard their agile process. To keep the ability of creating new – the only strength of a small company according to Patrik – is to safeguard the agile, open and transparent process they have now. This also aids in being able to be fast moving. Additionally, they explain how it has been easy to spread information while they are still a small company, but as the company grows it will become harder. Therefore, they stress the importance of creating effective information flows since information is tightly connected to innovation.

“As we grow, we will become a little more specialized, now we are all quite general - and it has been easy to spread information. It will not be as easy in the future. And innovation is very much linked to information. If you can develop technical ideas with market knowledge, it is then innovation happens. How to have more efficient information flows when we grow will be important and it is linked to innovation.” - Patrik Dahlgvist, Insplorion

For the future, if growing, Insplorion believe that the hiring of more narrow profiles will generate more structures. He however think that they will be good at making sure that it still works in an agile format, so that both the structures and the processes are able to change. It is also important that it flows easily. Patrik hope that they will build processes that are formal, but that they do it in such a way that they are even more changeable. He however means that it also comes down to whom you hire as a company, since people might come from companies with different types of cultures.

Patrik says that as a company they believe in being changeable. They do not see that they need to limit themselves just to one technology and furthermore, not just incremental innovation. It might become a structure where incremental and radical innovations are combined and that there will be more innovations in the company. Furthermore, Insplorion reflects over the possible contradiction between flexibility and formality in innovation processes:

“And it is good to question whether it really is like that [contradiction between being formal and structured versus being creative], certain types of processes definitely. People who like to start from a white paper and create from it get tired as soon as they see a box. But if you just ignore the first idea – there I do not see that there must be a contradiction. But rather you can have agile processes that allow a lot of information dissemination between many different skills. It depends on the process and how it is designed, and not that there is a contradiction between being more formal and structured versus creative.”-Patrik Dahlgvist, Insplorion

4.3.2.2 Cellink

When talking about the future Gusten Danielsson at Cellink hopes that the balance between flexibility and formality will be the same as it is today, but adds that it is hard to say since many say that formality increases with time. He however describe how they will have a need of formalizing some parts of the innovation processes but hopes that their increase in people will lead to more innovation:

“We will have greater demands on formalization of some parts of the innovation processes to ensure that we do not lose innovation or that it slips through fingers on people. But in itself, our hope is that we, the more we are, the more innovation we can create, not the contrary.” - Gusten Danielsson, Cellink

Further, Gusten describes how follow-ups might be even more important as the company grows, but also that if the culture is setting the tone for innovation then it should be able to grow with the company. The emphasis should be put on conveying the culture when the workforce grows, making sure that everyone is one the same page.

“It is about being careful, partly with who you recruit and also to convey the culture and the way of working we have built up, so that we do not lose ourselves over time or in growth. If we can make people understand and feel responsible for innovation, I do not see any size limitations. “ - Gusten Danielsson, Cellink

Gusten however states that there is a risk that employees become more and more anonymous in a larger company. Therefore it is of importance that people are closer to where they can get feedback about innovation – instead of going to talk to someone in the management team, one could go to someone that is much closer who is able and knowledgeable of how to handle it. This, he states, could be a part in formalizing processes.

4.3.2.3 Company X

KD at Company X state that a change of the innovation processes is necessary if the company grows. However, it needs to be structured from what is going on within the company in order to match each other. In the future, there will probably be more talent getting hired as well as more resource management on more projects. The more they grow they will be able to expand the innovation process much more and also get time to prioritize it. Furthermore, KD explains that she would like everyone to contribute with ideas even more. Ideally KD would like to create more of a forum for ideas, a structured way of collecting them.

Company X recognises that finding a balance between flexibility and formality is hard. Company X talks about the friction that occurs when adding structures to the open process that often is embedded in the start-up culture, but they will probably add more formal processes when the company grows. Company X express that it is important to put structures

and processes only with what works (and not for the sake of having a process) or when it is necessary. It should rather be looked upon from a problem solving perspective.

“I think it’s important to balance them and to do it quite well with how you work today. And then what’s better and why do you want to improve it?” - K D, Company X

4.3.3 Complex Company Structure - Qualisys, NIRA Dynamics

4.3.3.1 Qualisys

Fredrik Müller at Qualisys describe how large companies in general have built a structure which is made for making a lot of advanced development that is scalable – and then the result is a very process oriented company. This is to enable to be able to deal with a lot of things in a certain manner – and that is a contradiction to how an innovative climate looks like. The two do not go together according to Fredrik, they are simply two different animals. Fredrik, who has experience of a small company that grows larger, state there are a lot of conflicts tied to flexibility and formality in the growing process. Fredrik Müller at Qualisys recognises that finding a balance between flexibility and formality is hard. Qualisys however state what works for them is that the company talks about it. Then it becomes a bit like going up different steps where you have a transition to the next stage. Each step might contain some rough patches, but then you find the format and go on to the following step.

Fredrik give the analogy of normal production related to different personality types: the little company building products one by one and there is full flexibility to the process, growing to the bigger company who needs to plan production and versions. The people that get recruited when the company grows are the structural people – and they might be frustrated encountering the more open process. Fredrik suggest the following approach for handling this clash between people liking to work in different environments:

“I think one way of accessing it is that there are people within this who have been involved on both sides, who have small businesses or innovation experience, yet understand the need in a broader context. So you have at least some of that kind of personalities involved - because if you have the pure process people, then it do not turn out well. So I guess if you are in such a business growth phase then, make sure you have at least one person that have that type of experience. Then you can talk about the stuff and you can discover things immediately, that this is starting to move this way, like you are starting to lose it [the innovation capability]. Fredrik Müller, Qualisys

Further, the company will try to refine the NBD process so it does not get too heavy and inertial. Additionally, there is a need to work further to develop and structure a product owner group instead of having a single product owner (due to the company having so many products to cover). This group has the ambition of in the future decreasing the complexity of making decisions, since not everything might need to be transferred to the leadership team as it

currently is (but rather only the major decisions). Instead a group who has relevant technical knowledge might transform the process so it gets easier and faster.

Fredrik suggests a solution for how to handle both formality and flexibility at the same time in a company:

“What you can do at the company level is to partition the problem and put some types of questions, new businesses and things like that in a separate company. As such, it is associated or belongs to a parent company, where the other more daily business is conducted.” - Fredrik Müller, Qualisys

At the same time he highlights that there is a risk that it starts to develop in a way which results in having two businesses who essentially does the same thing and the costs increases to twice as much. But if it turns out well, it will become a company of its own and will work really well.

4.3.3.2 NIRA Dynamics

Robert Johansson at NIRA Dynamics state that when a company grows the probable outcome will be that it goes from flexibility to formality. He further explains that there will probably be a need to adjust innovation processes as the company grow, but how they will look like he do not know. Robert reflects over previous innovation initiatives at NIRA that have tended to bloom and die as interest fades, something new pops up or not having enough people involved – he is however not sure (and he hopes it is not so) if this is a natural occurrence for innovation processes.

Robert sees a future development area in what type of ideas that are mostly collected. As the innovation process looks like now, it is most of all internal ideas, but there has never been a real limitation to this. As a continuation of the innovation processes it would therefore be good to also incorporate ideas from people sitting with customers, in order to tap into this idea flow.

NIRA Dynamics describes how they initially when the innovation process was created only was one company and one unit, but today they have been divided into two different business units. Robert Johansson at NIRA Dynamics explains that the innovation process should be kept on the side of the daily operations, having its own budget and own mandate. This enables the innovation process to be kept flexible.

5. Analysis

This section involves comparisons of presented findings against each other and current literature. By discussing and interpreting, the section aims at further developing the foundation for answering the research questions.

5.1 Current Innovation Processes

5.1.1 Innovation and Innovation Processes

When speaking of innovation many of the companies pointed to the same notion that the literature address (e.g. Koskinen & Vanharanta, 2002); namely that invention is not innovation, there is also a need for the product reaching the market for this to apply. Importantly, it is therefore of relevance to address that the three companies with simple structure have yet to reach product launch – i.e. they can be seen to have innovative capabilities, but strictly speaking they have not commercialised their products in full. Hence, the companies with less complexity arguably will have more focus on the early innovation processes. Reflection wise, the inclusion of the less complex companies, even though not having reached innovation in the full sense, might still add to the research - this by providing a picture of a small company's disadvantages and advantages from the uttermost part of the spectra.

Overall, the majority of the companies with small and medium complexity level describe their overall stance on innovation processes contrary to the linear and formal outlook on innovation – as described by e.g. Mattes (2013); they do not plan for innovation, but rather see it as something more spontaneous and flexible. In terms of flexibility and formality, the less complex companies promoted their flexibility as an upside. Their descriptions very much matched how Mattes (2013) explain flexibility where the company steers away from set procedures and instead relies on independence and self-control of competent individuals or departments. Arguably, since these companies are in the process of reaching commercialisation, they might not be in need of formalisation their innovation processes. According to Kahn (2018) processes in innovation can help ensure for repeatability, which in the current stage should not be the primary focus for these organisations. Also in line with the more flexible outlook on innovation was that most of the small and medium complex companies spoke about how personal contact and working in project format (Mattes, 2013) was something that was prevailing. E.g. 10 MD, Mimbly, QuickCool and Insplorion – but also Qualisys from the complex group – really highlighted the benefits they found with their project teams constituting of people with different skill sets. The complex companies do have structures of how to work through ideas and some elements of planning, although referring to them as linear and formal would most probably not be a correct description since they do have some room for flexibility. E.g. Qualisys describe that even though they have a NPD

process they have still implemented a flexible structure where the developers are encouraged to explore areas of their own choice.

When the companies were asked to reflect about flexibility and formality in the innovation processes both similarities and differences were presented. Both 10 MD and Mimply said that flexibility was something that was prominent in their organisations. Petra Apell at 10 MD even stated that it is this structure which is needed at the phase they are in now, but a later phase might need more structure. The rest of the companies (QuickCool, Insplorion, Cellink, Company X, Qualisys, NIRA) however spoke about flexibility and formality as something that were used in combination – as suggested by Mattes (2013) is most often the case. It is hence the two least complex companies that stand out. This could arguably be influenced by their companies being pre-launch, and therefore might have a need to incorporate elements of uncertainty absorption (Kamoche & Pona e Cunha, 2012) in order for them to best handle the phase they are currently in. Of the companies incorporating both, different views on the balance were presented. Both Insplorion and Cellink, are in a similar line of thought; Insplorion meant that they do not mind structure as long as it does not hamper flexibility and they do not see the two as opposites, Cellink mean that they can not limit the flexibility but recognise formality as a framework to support innovation. These mindsets are echoed by what Mattes (2013) state regarding formality and flexibility not necessarily need to be looked upon as opposites. Many of the other companies however reflected upon the two as sometimes being problematic to work with, and in the line of two conflicting entities. Among the examples, Company X expressed it as a possible friction when putting structures in place in a company that until lately has had a start-up atmosphere, while Qualisys spoke about the challenge of combining different personalities responding differently to flexibility and formality. Many of the companies therefore could be viewed as having a challenge to combine flexibility and formality when dealing with innovation (Mattes, 2013). One aspect of innovation processes that are more of a formal stance is the structure of integrating more documentation (Mattes, 2013). This was a theme that continuously popped up. QuickCool, Company X and Cellink, all could see that the lack of documentation could be a disadvantage. This could e.g. entail that ideas might slip through or being forgotten, or as Company X stated, be a weakness due to high turnover of people – an established process might then ensure that everything is done in the same way every time. One of the complex companies however saw the documentation as one of their strength since for example one is able to get back and review ideas.

5.1.2 Phases of the Innovation Processes

As previously described in the theoretical framework there are numerous descriptions of different phases of innovation processes (e.g. the structures described by Kahn, 2018 and Salerno et al, 2014). The majority of the companies did not however describe having innovation processes set in these different steps done in sequential way. Company X however described how they have different gates they want to go through, and also different

follow-ups. Also the complex companies, Qualisys and NIRA Dynamics, spoke in terms having more formalised steps. Even if most companies do not have these stages formulated or in use, it could however be motivated to analyse the companies innovation processes in a clear framework – this since many still refer to elements within them.

5.1.2.1 Processes of Idea Generation

As mentioned by Desouza (2009), ideas can originate both internally at the company and externally. All companies with a medium company structure, Insplorion, Cellink and Company X, describes how their ideas often develops from customer needs and therefore are developed externally. Both Qualisys and NIRA Dynamics, which are categorized as companies with complex company structure, describe how their ideas are mostly developed internally and sometimes miss the customer input. There is no evidence for which type of ideas that results in the best products. Though, Cui et al. (2015) have argued that companies still have much to learn in order to understand customer needs and developing products that are viable. With that perspective, the medium complex companies seem to be skilled in this area - which also could be to their advantage. Interesting to note is that there is a difference between the companies with medium company structure and complex company structure in terms of the source of the originated ideas. In relation to the topic of ideation in relation to customers, Cellink describe that the customer does not always know what they need and then it is the company that has to figure that out; implying that the actual idea generation will have to happen internally, even though input is taken from customers.

If wanting to spur on the creativity in the company, which is tightly connected to the idea generation according to Freeman & Engel (2007), Bergendahl & Magnuson (2015) describe how network structures can facilitate this through social interactions. Two of the companies, QuickCool and Qualisys, really underlined the structure of social interactions. QuickCool described how their small open office facilitate information flows and enables employees to have spontaneous interactions over the coffee machine. Qualisys mentioned that their ideas often arise in informal settings where people chat with each other, also highlighting the coffee machine as a central device. One of the less complex companies, Mimby mentions that the amount of freedom that is given is one of the reasons to why creativity is so high in their company. Also Mimby explained that everyone in their company always express their opinions. Insplorion point to the collaboration within the group being beneficial for them since different individuals come with different input. According to Bergendahl & Magnuson (2015) employees that share knowledge and trust each other are more inclined to create value. Since both Mimby and Insplorion have the openness for everyone to contribute, this could imply that they have a high level of trust, which might work to the companies benefit in terms of creativity. Hence, companies from all levels of complexity mentioned at least some element of social dynamics.

Bergendahl & Magnusson (2015) mention how leveraging the entire company's creativity demands processes that are attracting employees and a sanctioning for cooperative idea work.

None of the less complex companies or Insplorion stated that they had any structured ways for working with collaborative idea generation. Cellink have a customer workshop, and also more informal sessions between salespeople and the different departments on a continuous basis. Both NIRA dynamics and Company X described how they work with creative workshops. Qualisys on the other hand have chosen to let developers spend 20% of their time on what they like. This could be seen as a great way to spur on the individual creativity in accordance to what Koskinen & Vanharanta (2002) have stated, that creativity of the individual often happens when people are intrinsically interested. Arguably, since it is the developers that are given this opportunity this could also be one of the reasons to why Qualisys experience the largest amount of ideas originating from developers and not sellers. Overall, it seems like the larger companies have established ways to spur on creativity while the smaller ones does not work with it in a structured way.

5.1.2.2 Processes of Screening & Idea Selection

Magnusson & Wästlund (2014) described how generating ideas most often is not the problem, but instead it is the screening of ideas that becomes an issue. Mimby, presented the prioritization of ideas as a cumbersome process, emphasising how the evaluation of ideas often is very time consuming. However, QuickCool experience that all ideas that they receive are of very high quality and therefore almost all of them are pursued – even though they currently are at a stage where ideas are not implemented, but instead saved for future versions because of their soon upcoming launch. This is contrary to what has been presented by Fredriksen & Knudsen (2017), that many ideas are useless with the value distribution being highly skewed. QuickCool explain the expertise among the idea generators as a source of the high quality of ideas.

As stated by Hansen & Birkinshaw (2007) a strong screening process is essential. With regards to company complexity it seems like there is little difference in the screening process, they all use either intuition or criteria or combine them both. 10 MD describe how they mostly take decisions based on feeling – but they do consider opportunity, risk and costs. Insplorion describe how they have a process for ranking ideas based on criteria but since the process is very time-consuming they often use intuition instead. This is in line with what has been stated by Magnusson & Wästlund (2014) that the process of idea selection through criteria is very time-consuming. Company X explains that they use prioritization processes. Qualisys describe how management currently takes the decisions in their company but they are trying to develop a product group with more technical expertise that could take some of the decisions. This could be very beneficial in the process of taking good decision as Magnusson & Wästlund (2014) state that the outcome of the decisions depends largely on the decision-makers prior experience and knowledge.

According to Berends et al. (2014) small companies do not have the incentive to have a strict selection procedure because the company does not have to cope with a plenitude of innovation projects at once and hence have no stress in having to select between innovation

projects. Although, the companies with a simple company structure in this study all expressed that they had lots of ideas. As previously mentioned, Mimby described how choosing among the large amount of ideas can be difficult. This would imply that a more strict selection procedure could be beneficial. However, 10MD describe how it is often the soft funding that determines which ideas that gets pursued, which could imply that a strict selection procedure is not as important since the decisions in a sense will be taken for you. Also Insplorion mentions soft funding – this as a means to verifying ideas. The gaps could be both technical feasibility as well as market verification.

Hansen & Birkinshaw (2007) mean that companies with strict selection procedures faces the risk of hindering employees from turning in ideas. This because they cannot find the motivation if everything is turned down while letting too many ideas get through results in too little resources for each project. Qualisys explained how they experience that their formalized process for innovation sometimes hinders people from turning in ideas, not necessarily because things gets turned down but because employees look upon the process as heavy and complicated. NIRA expressed that many ideas in the organization probably never enters their processes as people keep ideas in their head. Little can be said about the reason to why they perceive these problems, if it is because of strict selection procedures or just the processes that are perceived as complicated for employees.

5.1.2.3 Processes of Development

10 MD describe their structure of work as being evolved around experimentation, testing, trial and error. They develop a prototype that is tested by potential customers and then they are able to obtain feedback for further development. Şimşit et al (2014) mean that prototyping aids in communicating the idea and generating feedback. As 10 MD describe it they work through iterative cycles which also according to Şimşit et al (2014) is necessary to generate a correct decision. Mimby described how they actually start the development before the screening of the idea, through a mini-project and after that a decision could be taken whether to continue or not. This would possibly give a lot of beneficial insights, such as the technical specifications that is involved in the development phase according to Kahn (2018). However, evaluating many ideas in this way is expected to be very time-consuming, which Mimby also state that they experience.

Experimentation could be done through collaboration and experimentations with external partners such as for example lead users as stated by Desouza et al. (2009). Insplorion described how they early on try to include customers to see if something is worth pursuing or not. Company X describe how they have a customer base that is very interested in testing early products which enables the possibility to get fast feedback. NIRA Dynamics that explained that they lacked customer input in the idea generation phase involves customers in the pre-development of the finished product in order to establish if there is a need, demand and willingness to pay. Generating these types of insights can be beneficial – even though it

is not done in the idea generation phase according to Cui et al. (2015), understanding the customer is essential to develop products that are viable.

5.1.2.4 Processes of Diffusion

Since the companies are in different stages of complexity with regards to their products, it is important to note, as also been described previously, that the companies with less complex structure do not have any product on the market yet. Therefore, little has been mentioned about the stage of diffusion from these companies. According to Desouza et al. (2009) companies can benefit from having solid relationships with lead users and key customer segments. As noted previously, it seems like the companies with medium company structure have closer customer relationships compared to the companies with a complex company structure.

Berends et al. (2013) argue that small companies often are inadequate or lacking in early market screening, and market research often are inadequate or lacking. Both Mimby and Insplorion described that it sometimes hard to choose which ideas to go for, not because there is a lack of market potential but instead because they have too many good ideas. Kjellberg et al. (2014) mean that companies should gather as much market information as possible in order to secure that satisfactory decisions are made. Qualisys mentions how they demand that everyone handing in ideas already at an early stage have conducted a brief market research through talking with each geographic sales manager. Company X describes how even if their ideas often originate from customers, they also try to do some market research in order to establish that the idea is desirable among a larger market.

According to Freeman & Engel (2007) commercialization typically needs discipline. This could possibly imply that when companies move towards the stage of diffusion, more discipline will be needed. Little discipline is seen within the companies with less complex structure, instead they emphasise the freedom and flexibility. Hence they might have a need for implementing more discipline ones they reach this stage.

5.1.3 Small Companies Innovation Capabilities

5.1.3.1 Innovation Disadvantages of being a New and Small Company

The concept of liabilities of smallness, as described in the literature, involves disadvantages for small companies such as lack of financial resources and difficulties in attracting skilled personnel (Abetecola et al., 2012). Lack of financial resources seems to really be a reoccurring issue described by the companies with less complex company structure, which hinders them from pursuing all ideas they have, in line with the disadvantages of being small described by Schumpeter (1934), Berends et al., (2014) and Rogers (2004). Abetecola et al (2012) also mean that one liability a small firm might face is an issue of attracting equally skilled personnel as large firms (e.g. scientists and engineers - Freeman & Engel, 2007). This

seem however not to be the case among the companies interviewed, since there seem to be no shortage of capable individuals when listening to the interviewees talk about their respective company's. Though it should be noted, that from the limited data gathered of the topic, it is hard to draw any strong conclusions.

According to Berends et al (2014) small companies do not have that many innovation projects at once which make them not to have incentive to have a strict selection procedure. What we however have found is that many companies even though being small have a plenitude of ideas and projects to choose from – hence according to Berends et al (2014) should have incentive to implement selection processes. Furthermore Berends et al (2014) mean that one limitation of a small company is that the firm has restricted practice of product innovation. Also this is something that seems to be contradicted by many of the companies, since there seem to be large knowledge and experience. Of course there is a large range of small companies in this world, which arguably make this a plausible fact. The focus of knowledge-intensive companies might also have generated a sample of companies which contains individuals with a lot of experience, where many also had extensive previous experience within innovation.

Not mentioned as a disadvantage in the literature, was the issue of documentation – which has previously been touched upon. The amount of documentation within the innovation processes seems to differ a lot depending on the size of the firm. Some of the smaller companies in the study, QuickCool, Company X and Cellink described how their disadvantages involved little documentation while for example Qualisys, who is one of the complex company's, described it as one of their main strengths. Documentation seems to be important for making sure that everything is captured and that no ideas disappear along the way.

5.1.3.2 Innovation Advantages of being a New and Small Company

Berends et al. (2014) have argued that one of the main advantages of being small is flexibility. The factors that make up the flexibility of small companies lay the foundation for quick reactions to changes in technology and markets. Elements of this was also expressed by many of the less and medium complex companies. One of the elements that constitute flexibility is close customer contact (Berends et al, 2014). According to Koskinen & Vanharanta (2002) smaller companies can faster assure that there is a market for their innovation through their good relationships with customers, which also previously has been mentioned as beneficial for enabling diffusion. Company X emphasised the importance of innovating with customer needs as a basis and described how they are able to attain instant feedback through customers. As previously mentioned both Cellink and Insplorion also described how they worked closely to their customers, while Qualisys and NIRA Dynamics explained how they would like to have more customer input. Worth to point towards is that Insplorion found it hard to make a formal innovation process out of relationships, as with customers - this since every relationship is different. Another element of flexibility is

informal and efficient communication (Berends et al, 2014). Desouza et al. (2009) have stated that it can be challenging to move ideas within a company. Among the companies with less and medium company structure, both Mimibly and Insplorion described how they did not experience this as an issue. In fact, Insplorion stated that ideas easily travel within the company, partly due to a structure with morning meetings where everything can be discussed. Cellink described how the idea generator ensured that the idea ended at the right table within their company. However, NIRA Dynamics, categorized as a company with complex company structure, expressed how they perceived that ideas did not travel at all. Berends et al. (2014) stated among other things that informal and efficient communication is one of the main advantages of being small. Arguably, this is also something that facilitates the movement of ideas within a company.

Especially for the companies that have a less complex structure, structured innovation processes are not formally established. 10 MD described how processes might hinder innovations to be created. Arguably there is also a difference in the need of structure depending on where in the innovation process the company is. When talking about idea creation it seems that the companies agree upon that small companies have advantages compared to larger ones which also is in line with what Koskinen & Vanharanta (2002) have stated. As previously mentioned, the companies with a complex company structure seem to work more with encouraging creativity compared to the companies with simple and medium company structure, where creativity seems to come more organically. Maybe, the size of the company could be a matter of interest in this issue since ideas and creativity seem to occur more naturally in the smaller companies. Bergendahl & Magnusson (2015) state that if wanting to leverage the entire company's creativity profound changes are needed when working with generation and development of ideas. This entails processes which attracts more employees and a sanctioning for cooperative idea work. This facilitates a structure where employees socialize and where they work jointly in a network manner, which mentioned previously has proven to spur on idea creation (ibid).

As suggested by Sahut & Peris-Ortiz (2013), small firms might have an advantage in terms of commitment and collaboration. Additionally, Nonaka and Takeuchi (1995) point to the advantages of greater knowledge sharing and motivation. The general notion is that these qualities seem to happen more naturally in the less and medium complex companies. Above all in the less complex group, where the employees are a small group with a common aim of realising their invention. Also Insplorion speak about some of these terms as a positive element for them; it is easy and manageable to share knowledge and ideas and that collaboration enables a structure for easily controlling for market potential and technical possibilities. Cellink promotes an innovation culture coupled with ambitious goals. If speculating, this could potentially help create commitment to the company's targets. Also that there is an openness towards employees wanting to pursue innovation, could create an environment which is encouraging and motivation enhancing.

5.2 Innovation Processes as the Company Grows

5.2.1 New and small Companies Growing

As previously mentioned, many of the companies in the less and medium complex level display many of the advantages connected to being a small company. For example good communication (Freeman & Engel, 2007), close customer relationships (Berends et al, 2014) and high level of creativity (Koskinen & Vanharanta, 2002). Some of the companies meant that they are able, or that they wish to keep some aspect they are in possession of now. Many believe that it is easy and possible to hold on to the flexibility when growing, as long as people are encouraged to be free of looking for new ideas. QuickCool expressed a hope and belief that the company will stay rather small and dainty. Cellink hope that the balance between flexibility and formality will be the same as it is today, and that the more they are the more innovation they can create. Many of them also say that they will probably add more structure as they grow, which Freeman & Engel (2007) state is often a necessity when companies have more inventories, assets, orders and employees. However, contrary to the hope of many of the small companies, some research mean that these changes will lead to a change from creativity to discipline in terms of the innovation process (Freeman & Engel, 2007) as well as creating an obstacle for change and flexibility (Kollman et al, 2009). The companies with larger complexity generally stated that they mindfully reflected of how to implement innovation processes which have a lightness, or making sure that they are not too complicated. These statements imply that those companies have reached a stage in their growth where the ease in creating innovation might not to be seen to be occurring organically to the degree where it is found in the less complex, and some of the medium complex, companies – hence they have to some degree the characteristics of a larger company, having changed from creativity to a more controlled format (Freeman & Engel, 2007). However according to Kollman et al (2009) an entrepreneurial company wanting to survive and progress have a need of implementing structures and systems into the organisations, which might justify the current structure.

As mentioned in the theoretical framework there are different views on how a small company most beneficially work with innovation processes, some with formalized structures seen as best practice (Berends et al, 2014). Since neither less nor medium complexity levelled companies expressed having strictly formal processes, the art of comparison in this aspect is not something which can be done. This structure is however also in line with small companies seldom using such processes (ibid). The data gathered from the smaller companies were more partly in line with what Silva et al (2016) found, where intuition and focus on customer requirements and needs were something that was distinguished in small companies.

5.2.2 Managing Innovation Processes as the Company Grows

By analysing the different companies outlooks on innovation processes as well as their views on growth in terms of innovation processes, different thoughts, approaches and techniques were communicated.

Patrik Dahlgvist from Insplorion has a similar approach to formality and flexibility as expressed by Mattes (2013); there is no need to look upon the two as opposites, but they could rather reinforce each other. Also Cellink is in a similar line of thought, referring to formality as a framework to give support and enable innovation. Even though Patrik from Insplorion state that it does not need to be a contradiction he is aware that for certain processes, as the first ideation stage, formality might hinder. But moving on from that particular phase there is no need to see a contradiction, it more depends on the process and how it is designed. The structure is achieved by having agile processes that facilitate knowledge dissemination between many different skills. The ability as a small company to create new – that Patrik state is the only strength of the small company – is something they have made sure to keep. As described by for example Davidson & Klemme (2016) and Hannola (2013) it could be beneficial to work in an agile innovation process format. Hannola (2013), mentions similarly to Insplorion, that the agile process creates a better knowledge transfer and the short iterations create flexibility. Also Qualisys mentions agile/scrum methodology – but this rather in regards to how the development team work and not how the innovation processes are handled. Company X and Qualisys instead express that it can be challenging to balance flexibility and formality, as also Mattes (2013) recognize as a difficult task. Company X states that the start-up culture generally being open generates a friction when adding processes. With this said they will still probably add more structures as the company grows. The important factor then is to implement processes which are necessary and making sure that they work as planned. Additionally it is seen as important to try to balance flexibility and formality, and also do it well in line with how the company currently works. This view is similar to what Hyypiä et al (2016) express regarding a company is better off evolving innovation processes in order to match the complexity of the surroundings – this rather than simplifying the structure. For Company X a change of the innovation processes is seen as necessary if the company grows. Qualisys touch upon a matter that is connected to the formalised way to innovate – namely that decision making today has a need to go to management, i.e. implying that there is a somewhat hierarchical structure, as also mentioned by Mattes could be the case (2013). Though the company has the ambition of increasing the flexibility by adding a product group, so decision-making can be more smoothly done. Qualisys also state that a balance is hard to find for formality and flexibility. The company's approach to the potential problems that could arise is that they talk about it. Further, Qualisys also reflects over different stages in a company's development attracting different personality types; when the company is small it attracts individuals that like flexibility and open processes but when the company grows it is the structural people that get recruited, which are

less prone to innovative behaviour. One proposed way of handling this issue is to have employees on-board who have been involved on both sides. Then one is able to communicate about the issues and to more easily discover potential issues regarding the two clashing more quickly.

A common denominator when speaking of how to keep the capability of innovativeness as the company grows is different takes on partition innovation and its processes from the 'normal' on-goings of a company. This is also described by Kollmann et al (2009), but here with the terminology of structural ambidextrous management. 10 MD expressed a solution that her previous employer Johnson & Johnson worked with, namely a task force team that worked across the organisation with a separate budget. NIRA Dynamics brought forward a similar approach; what will enable the innovation process to be kept flexible is that the innovation process should be kept on the side of the daily operations, with its own mandate and budget. In a sense NIRA Dynamic to some degree have used this approach by having an innovation group that handles the innovation ideas, while also being completely separate from the daily business operations. However at the same time they promote an innovation culture at the company, which would imply that employees have, or are encouraged to have, an innovative proclivity. Innovative ideas are also sometimes communicated as 'up for grabs' for all employees to apply for, as well as the company tapping into the creativity of the larger organisation through special creative days arranged as workshops. Hence, it would not be correct to refer to NIRA as having a structural ambidexterity in the full sense. Qualisys stated that one way of holding on to the innovation capabilities as a company grows could be to move the innovation to a separate company, though recognising that the partition could bring both good and bad results. It should however be noted that 10MD and Qualisys spoke of structural ambidexterity as a general solution to a company growing who wants to retain the innovative nerve. It is hence unclear if they see it as an attractive option for their own companies. It should however be noted that creativity can be subdued if a large company segments their business according to Koskinen & Varnharanta (2002), which could be something to be mindful of if pursuing this path. Another element to be mindful of, if implementing structural ambidexterity is that this way of managing innovation , should in most cases just be temporary – and hence to more be seen as a means for the company to get started with new initiatives (Kollman et al, 2009).

Another take on ambidextrous management is contextual ambidexterity, where every member is supposed to contribute to balancing exploitation and exploration and take own initiatives. The way Cellink explains their view on innovation and innovation processes, this approach seems to be present in their mind-set. This is e.g. expressed in how the company speaks about not seeing any size limitations as long as the company can make sure that the employees understand and feel responsible for innovation – this by conveying the company culture and the way they work. Also Mimby and Insplorion speak of innovation in terms that signals that they use, at least to some degree, a contextual ambidexterity approach; the employees all seem encouraged to contribute with both exploration and exploitation. According to Kollman

et al (2009) contextual ambidexterity, in contrast to structural ambidexterity, is oftentimes seen as a more attractive option for small companies- this because the company does not have the resources for the latter. This could also be the case for these companies, although if speculating they might not yet have reached the size where structural ambidexterity would be of relevance.

One approach to providing support for innovation if a company grows while wishing to keep its entrepreneurial aspects, is Corporate Entrepreneurship. This implies encouraging and recognising innovativeness, reactivity and risk taking, and is by some seen as a good way of handling a changing external environment (Morris & Trotter, 1990). Cellink, who really promotes the innovative climate, in a way also describes this. In a sense they also tap into the risk taking aspect by integrating the saying "Doing something is better than perfect" in the organisation. Contrary to the contextual ambidexterity, Corporate Entrepreneurship is not adopted by all employees but instead focuses on managers at all levels.

Kahn (2018) describes how a balanced approach of innovation outcome and innovation process at the same time being coupled by an innovation mind-set enables a successful structure for companies. It should however be noted that this structure is something that is proposed by the author, and not something that has been tested for in practice. The basis of the discussion is however interesting to take inspiration from when analysing the companies. Especially the author's stance on focusing too much on only one of the elements. Both Inspiorion and Cellink have a very large focus on innovation, as well as an innovation mind-set – but are less prone to speak of innovation processes (as least formally structured ones). According to Kahn (2018) this can cause inefficiencies to occur in the innovation processes, which could be something to potentially be mindful of.

6. Discussion

By reviewing the Research questions found in Chapter 1.3 together with the analysis found in Chapter 5 the aim is to thoroughly explore the research topic. With the basis of figure 1 presented in the Chapter 1.3 the discussion will be framed by different relevant aspects.

RQ1: What can be beneficial to hold on to with regards to product innovation processes when a small knowledge-intensive company grows?

From the analysis it is evident that some of the advantages of being small mentioned in the literature also can be confirmed among the case companies of this study. The largest advantages found in this study involve close customer contact, informal and efficient communication, and idea generation and creativity occurring organically (i.e. without processes intended to spur on creativity). However, there are also things that a small company might want to move away from, such as – quite obviously – restricted financial resources, but also lack of documentation

One of the advantages related to flexibility is having a close contact with customers (Berends, et al, 2014) – which is also something that small companies is seen to be good at (Koskinen & Vanharanta, 2002). This could mean a faster assurance in terms of controlling for a market for the innovation with customers. Through reviewing the sections of the phases of the innovation process (found in Chapter 2.3) one can see that close contact with customers can aid in a number of different aspects. In terms of idea generation, customers could aid with providing ideas (Desouza, 2009). With screening and selection, Cui et al. (2015) mean that companies still have a lot to learn in terms of understanding customer needs in order to develop product ideas which are viable. In regards to development, every cycle will clarify and put focus on the combination of customer need and the prototype project. (Şimşit et al, 2014). With diffusion, customer involvement can aid leverage the company's situation positively at launch. From the analysis it is evident that there is a difference between companies with medium and complex company structure in terms of where the ideas originate. Ideas originating from customers were a very prominent part of developing ideas for the medium complexity companies, where they were a source of ideation and feedback. The complex companies however, Qualisys and NIRA Dynamics, both expressed the need of integrating this element; Qualisys would like to increase the number of ideas communicated by the sales staff when dealing with their customers while NIRA Dynamics would like to have more customer input. Hence, this implies that a company growing should aim to keep the close customer contact as much as possible - especially seeing since the benefits can be found in many phases and aspects of innovation processes. Though interesting to note, is what one of the company's said regarding processes and relationship making; Insplorion pointed towards them having found it hard to create any efficient processes to handle different relationships. If hypothesizing, disregarding the lack of other input on the matter,

the informal and non-process way of handling relationships – such as customers – might be what smaller companies could gain from. This could be an important matter to reflect over, especially when contemplating how to structure innovation processes when growing.

Another advantage found in relation to the empirical findings as well as the theoretical framework is that the generation of ideas seem to occur quite naturally in small companies. One concept that is tightly connected to the idea generation is creativity (Freeman & Engel, 2007). Mimby mentions how their high degree of creativity can be derived from the amount of freedom that is given. As previously described in both the empirical findings and analysis, all companies with less complex company structure express that they do not need to put efforts into increasing the idea generation, since it is already very high. However, the companies with complex company structure have established ways to work with spurring on creativity and idea generation. NIRA Dynamics works with workshops that have resulted in a large increase of submitted ideas, both during and for some time after these events. Seemingly, this could imply that they do not lack the creative capability; it is just a matter of tapping into the ideas that is of importance. Qualisys on the other hand mention how they have chosen to let developers spend 20% of their time on what they like. When the company grows, it seems like ideas are generated more through fabricated models than occurring naturally. In large companies creativity can often be subdued because of things such as for example communication difficulties that in turn sometimes hinder innovation (Pearson, 1989). As mentioned earlier, one of the companies with a less complex company structure, QuickCool, expressed how their small office facilitated information flows. On the other hand, NIRA Dynamics, categorized as a company with complex company structure described how they experience that not all ideas in the organization gets communicated to higher levels. According to this, it could seem like that the information flows are easier to manage while the workforce is still rather small. Hence in order to not hinder innovation when the company grows, it could be beneficial to keep the informal and efficient communication if possible.

According to Bergendahl & Magnusson (2015) processes which attracts more employees and there being a sanctioning for cooperative idea work as a means to leverage the entire company's creativity. By jointly working in this network manner idea creation can be spurred on (ibid). In a manner this is a structure which NIRA Dynamics seemed to be aided by, seeing to how many new ideas that surfaced during their workshop. However, worth to consider is if it would be even more beneficial to be able to integrate such a structure on more continuous basis, pointing to what Şimşit et al (2014) point towards with managing innovation: doing it in a fast and flexible way might aid a company gaining a sustainable competitive advantage. Some literature point to creativity being helped by working in a network manner, although Koskinen & Vanharanta (2002) touch upon creativity from another perspective. They mean that on an individual level creativity emerges most often when people are intrinsically interested (ibid). This is more correspondent to how Qualisys works with their tool of 20 % time going towards what the developers are interested in. Seemingly, it could be argued that if the setting of a small company, which constitutes the

foundation for idea generation happening organically, is not possible to mimic when growing, then setting up channels for ideation and ensuring information flows should be prioritized. How this is to be done, i.e. in the network format, individualistic format or a mix between them, is another matter. Perhaps each company needs to look upon which structure that works best for them. Bergendahl and Magnusson (2015) mean that even though ideas surface in the heads of individuals, it is still the social interaction that has shown to be of importance for creating innovation.

One obvious disadvantage of a small company is the lack of resources (Schumpeter, 1934; Berends, 2014; Rogers, 2004), which one naturally would like to move away from as a small company. As previously mentioned many of the case companies with less complex structure expressed a lack of financial resources. There is also one disadvantage which was found among many of smaller companies of the sample which was not mentioned in the literature; QuickCool, Company X and Cellink all could see that the lack of documentation could be a disadvantage. According to Mattes (2013) the integration of documentation is seen to be correspondent to a more formal stance of innovation processes. One of the complex companies however stated that the documentation of their innovation processes was seen as a strength. Hence, the structure of small amount of documentation prevailing in many of the smaller companies might be something worth to reflect over as a small company growing. Some elements of a more formal innovation process, as more documentation, could potentially be of relevance to consider being implemented.

If summarizing this first part of the discussion the general theme that presents itself is that smaller companies more easily access ideas, internally and in regards to customers. Some elements within this also facilitate a structure that enables flexibility. The customer closeness in particular seem to be a beneficial factor seeing that these relationships might generate positive aspects in multiple phases and layers – hence having a great potential of spurring on innovation.

RQ2: How could an innovative small company within a knowledge intensive sector wanting to create competitive advantage in the long run manage the innovation processes when growing?

Innovation is essential for any organization wanting to stay competitive in the long run. Having the capability to manage innovation in a fast and flexible way is of importance for any firm wanting to gain a sustainable competitive advantage (Şimşit et al., 2014). Desouza et al (2009) point to how it is the companies with strongly built innovation processes that will take the lead in their respective industries. Therefore, it is arguably important as a growing company to have the topic of innovation coupled with its innovation processes in mind while growing in order to incorporate the most effective and beneficial practices. As previously mentioned NIRA Dynamics expressed how innovation initiatives in the past have tended to bloom and then die as interest fades, and hoped that this is not how innovation processes

normally look like. Seemingly, one would like to create processes that keep the innovation initiatives constantly at a high level as long as possible.

As previously mentioned small companies display certain aspects that may be a source of innovative capability, where close customer contact, informal and efficient communication, and idea generation and creativity occurring organically was the most prominent factors. What will be further discussed here are ways to manage innovation processes in a way that could enable companies to hold on to the positive aspects of being small even when growing larger.

The predominant view among both literature and the case companies is that small companies will need to implement more structure when the company grows. According to Freeman & Engel (2007) structure is often a necessity when companies have more inventories, assets, orders and employees, which may also justify this transition. According to Berends et al, (2014) a formal innovation process is seen as essential for an efficient product innovation in larger companies. Overall, what has been presented is that this type of processes often not exist in smaller companies. Hence, implying that a change into more formalized processes will be needed as the company grows. However, even if this is the overall need, it might be ways to manage innovation processes in a manner where flexibility and formality can complement each other. This is as previously presented also the way that a majority of the companies talked about flexibility and formality, that they were - or that they wanted to use them in combination. According to Mattes (2013) it can be challenging to balance them – but if succeeding they can complement each other. Hence, this foundation of flexibility and formality tied to the structure of innovation processes is of importance to take into account as a company grows.

Among the methods previously presented, structural ambidexterity can according to Koskinen & Vanharanta (2002) subdue creativity. If that is the case, then structural ambidexterity might not be the most suitable alternative if trying to hold on to the innovative strength of a small company where creativity is a prominent feature. However, this approach has been presented as a good option by several of the case companies. Implying that there are certain upsides within this management method that can contribute to an effective handling of innovation processes. According to Kollman et al. (2009) ambidextrous management is an attractive option for entrepreneurial growth companies operating in an industry where radical innovations are essential. However, they also state that this type of management preferably should be implemented at a stage where the firm has reached organizational stability (ibid). Hence, it implies that structural ambidexterity is a management method that might not be suitable for companies at an early stage. As also previously stated in the analysis, if wanting to pursue ambidextrous management, small growth companies will find that contextual ambidexterity is a more attractive option (Kollman et al. 2009). Several companies seem to have this type of approach in place even though they do not refer to it as contextual ambidexterity. Though, it is only companies with less or medium complex structures that

works that way. The strength of this method is that every employee is supposed to contribute to balancing exploitation and exploration, take own initiatives, be open to entrepreneurial opportunities and take initiatives. (Kollman et al (2009). These are in a manner elements which one can find in smaller companies - which could make this an attractive option for a small company growing.

One other approach, that Cellink had similarities with, is corporate entrepreneurship which according to Morris & Trotter (1990) entails a company which is willing to support flexibility, creativity and risk. This could seemingly be very good capabilities if wanting to hold on to the advantages of being small previously presented. Matsuno et al (2014) mean that a firm's proclivity of entrepreneurship could help spur on growth prospects and competitive advantage for companies of all sizes. However, to what degree it is possible to achieve this in practice is hard to tell. Seemingly, setting up and ensuring an entrepreneurial behaviour within a medium or large company could prove to be a challenge, especially seeing to the risk taking promotive aspect. In a way contextual ambidexterity and corporate entrepreneurship share some similar properties (Cellink e.g. had features that reflected both methods) – such as encouraging innovation. The difference between them is that the former encourages innovativeness for all employees, while the latter focuses on managers at all levels as well as also supports risk taking. It is though hard to conclude if one is better than the other, for a small company wishing to keep some of the innovative advantages of being small.

One of the companies in this study, Insplorion, practised an agile way of working – this was also a method that he believed would enable the company to grow without losing its innovative capability. As previously presented in the theoretical framework, agile innovation process management might prove efficient as a tool. Hannola et al (2013) mean that the approach generates some advantageous aspects for companies that integrate the agile structure into their innovation processes. Some aspects that also are seen to be advantages in small companies. The method promotes close customer contact (ibid), which is also something that small companies are good at – hence this implies that the method enables a structure to mimic a small company in this respect. Furthermore, in the same line of thought, also collaboration (Dieste et al, 2012) and knowledge transfer (Hannola et al, 2013) are elements that align with the agile format and the advantages of small companies that were found in the study. The agile format can furthermore also aid in keeping the company flexible even if growing, which is enabled by the implementation of short iterations. The before mentioned theme among QuickCool, Company X and Cellink, was that the lack of documentation in some respects became a disadvantage at times. The agile format promotes light user stories instead of heavy documentation (ibid) – this could give a middle ground to companies wanting to implement more documentation as they grow, while still wanting to keep a lightness to the process. Insplorion who promoted the agile innovation process management, also meant that the method enables a structure were it might not be a contradiction between formality and flexibility.

Also tied to agile management, is the combined method between the agile framework and the stage gate model. Some aspects within this method also map well in terms of strengths of a small company. The agile stage gate method has similarly to the agile innovation process method, benefits in terms of customer relationships, as improved and continuous customer feedback – also in the early planning stages (which enables efficient planning). There are also benefits to gain in terms of better team communication and increasing flexibility in terms of not having a too set planning. These are aspects which also correspond well with what has been found as advantages in being a small company. However there are also some disadvantages connected to the agile stage gate method which could decrease the beneficial value in total. This can be due to long run planning being overlooked, conflicts tied to managers losing control and a sense of detachment from other parts of the company (Cooper & Sommer, 2016). Reflection wise, if a company integrates this in an early stage, the matter of conflicts might however be subdued, if compared to integrating the method into a larger company with set procedures, since arguably it is more likely to be a more inertial response to the change in the latter example. It should be noted that the research of agile stage gate this far is limited (Sommer et al, 2015; Cooper & Sommer, 2016), which implies some caution to the benefits listed and how generalizable they are.

QuickCool described how there are pros and cons with different structures. Overall, one could argue that how an innovation process is best managed when a company grows largely depends upon the company's specific characteristics. However, all smaller companies looking to flourish and prosper in the future should be aware of the challenges that lie ahead. As, Qualisys mentioned, it is hard to find a balance – but discussing the issue and always having it on the table helps a lot. Seemingly, it is of importance to keep an open discussion continuously of how improvements can be done in order for a company not waking up one day having lost its advantages along the way. Worth to notice is that incorporating one approach does not exclude the use of another. For example, while ambidexterity often looks upon structural changes, agile management is more focused upon a working method. As Company X described, innovation processes are something that are unique to each company, and needs to be shaped as they are needed.

7. Conclusion

The following section will aim at answering the research questions previously presented, by summarizing the findings made in the previous sections.

Firstly, what has been found is that the degree of how much companies used formalized innovation processes correspond quite well with the complexity level; the less complex companies did not work with formalized innovation processes, the medium complex companies used some while still having an element of unofficial processes, and the complex companies had more formalized routes integrated. The predominant view among both literature and the case companies is that small companies will need to implement more structure when the company grows. According to Freeman & Engel (2007) structure is often a necessity when companies have more inventories, assets, orders and employees, which may also justify this transition. However, even if this is the overall need, it might be beneficial to manage innovation processes in a manner where flexibility and formality can complement each other (Mattes, 2013). Hence, the foundation of flexibility and formality tied to the structure of innovation processes is of importance to reflect over as a company grows.

If summarizing this first part of the discussion the general theme that presents itself is that smaller companies more easily access ideas, internally and in regards to customers. Specific elements within this also facilitate a structure that enables flexibility. Some particular characteristics that a small company should think of trying to keep when growing have been identified: close customer contact, informal and efficient communication and idea generation and creativity occurring organically. In particular the customer closeness seem to be a beneficial factor since this strength can aid in multiple innovation phases and layers. One interesting note from one of the companies on the subject was however that relationships were hard to make efficient processes of, which could imply that the advantage might be due to informal structures.

With regards to creativity and idea generation, it can be concluded that there is a difference among the case companies. The companies with complex company structure had to put efforts in to spur on creativity and increase the number of ideas submitted while companies with less and medium company structure did not need these types of efforts. It was found that when the company grows, ideas were generated more through fabricated models than occurring naturally. One would arguably like to hold on to the creativity existent in the smaller companies. According to what has been stated by (Pearson, 1989), one reason for less creativity could be communication issues. It was also shown in this study that companies with less complex company structure experienced more effective information flows compared to those with complex company structure. This is also something that a small company should try to keep when growing in order to facilitate a high amount of creativity. Since setting up an environment mimicking the small company can prove to be a challenge

then setting up channels for ideation and ensuring information flows should be prioritized. How this is set up will vary depending on the company, and it is important to look upon the specific setting.

One matter in particular was found – which was not in any literature handling small companies - that was seen as disadvantage for some of the companies; the lack of documentation among other things was presented as a problem area causing ideas to get lost and forgotten. This was on the other hand seen as a large advantage in one of the complex companies. This could imply that this is a feature to try to implement more for the smaller companies, as well as when they are growing.

By analysing different ways of managing innovation processes coupled with the aspects a small company might be well off to aim to keep, some approaches have been identified and analysed. The methods showing particular promise is the two agile stances – i.e. agile management of innovation processes and agile management joint with the stage gate model. The agile management of innovation processes – which one of the companies in the study promoted as an enabler to growing without losing its innovative capability – has the potential of generating some advantages, some aspects which also are seen to be advantages in small companies. Examples of these are close customer contact, enabling flexibility by short iterations, but also collaboration and knowledge transfer. The method also includes an approach to documentation that is lighter (Sommer et al, 2015; Cooper & Sommer, 2016), which tie well into the companies wanting to implement more documentation as they grow, while still wanting to keep a lightness to the process. The company using this approach also saw it as a strength when balancing formality and flexibility in innovation processes. The agile stage gate model also show promise of mapping well against small company's capabilities. Also this focuses on customer relationships, e.g. containing improved and continuous feedback. The method also generates better team communication and increasing flexibility by not having too set plans (Cooper & Sommer, 2016). This far the research of the agile stage gate is limited - but it has shown promising results (Sommer et al, 2015; Cooper & Sommer, 2016).

Also ambidexterity has been reviewed as a possible management method. To conclude structural ambidexterity might not be the best alternative seeing that the structure can subdue creativity (Koskinen & Vanharanta, 2002), and the technique in most cases only should be temporary. What has been found is that contextual ambidexterity might be a more attractive option to small growth companies (Kollman et al, 2009). Several of the less and medium companies seem to apply such a structure, even though they do not refer to it as contextual ambidexterity. The strength of this method is that every employee is supposed to contribute to balancing exploitation and exploration, take own initiatives, be open to entrepreneurial opportunities and take initiatives. (Kollman et al (2009). These are in a manner elements that

one can find in smaller companies – which could make this an attractive option for a small company growing.

Corporate Entrepreneurship is another method worth mentioning. It entails a company that is willing to support flexibility, creativity and risk (Morris & Trotter, 1990). Seeing to that particularly creativity and flexibility are advantages within a small company, this method could seemingly provide a good structure if wanting to hold on to these advantages. This method however promotes encouraging managers at all levels, and not all employees that is found in contextual ambidexterity. Seeing to this aspect coupled with how employees in smaller companies could all very much be involved in the innovative work - it is the contextual ambidexterity that best mimics a smaller company, at least in this respect.

In summary, both of the agile methods are seen to entail certain advantages that a small company growing might would like to consider to hold on to. Additionally, the methods of contextual ambidexterity and corporate entrepreneurship also present some beneficial elements in this context. To conclude, it should be noted that it is of importance to keep an open discussion continuously of how improvements can be done in order for a company not waking up one day having lost its advantages along the way. Worth to notice is that incorporating one approach does not exclude the use of another.

8. Future research

The following section aims at providing suggestion for further research within the subject that could be of interest.

It could have been interesting, as well as added more dimensions, to conduct a longitudinal-study investigating how the companies evolve over time. As previously mentioned in the limitations, this study has only gathered data during one point in time, implying that not the entire depth of the issue can be captured. It is plausible to think that all companies will evolve and grow in different ways. As also mentioned in the Chapter concerning limitations, it would be interesting - as well as adding to the generalizability - to increase the number of companies for a future study. Additionally, it could potentially add interesting insights to also look at companies all concentrated to a specific industry.

When having conducted this research, elements have come up which we have not been able to explore fully, either due to the restricted time and pages or that the topic is not correspondent with the chosen framework of this thesis. One matter that many of the companies have touched upon is the theme of different personality types in relation to innovation and its processes. Three of the companies e.g. referred to the same book and its corresponding model, where different personalities have different colours. Hence it might be an interesting perspective to further explore. Especially the notion that Qualisys mentions – different stages of a company’s development attract different personalities which can create challenges – is a topic to further explore; how is this best managed for a company growing?

Additionally, two matters found in the literature was recognised as not corresponding to the empirical findings: Berends et al (2014) mean that small companies do not have that many innovation projects at once which make them not have incentive to have a strict selection procedure. This was however a notion that did not match up with the smaller companies, who expressed how they had a plenitude of projects to choose from due to their many ideas. Additionally, small companies could be limited because of their lack of practise of product innovation (Berends et al, 2014). Also this is something that seems to be contradicted by many of the companies, since there seem to be large knowledge and experience. Thus, it could be interesting to further pursue these findings in order to explore the topics.

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Appendix I

Interview Guide

General questions

- Could you please tell us a little bit about yourself and your background?
- Could you describe your role within the company?
- How would you describe the type of innovation your company engages in? For example one often talks about incremental and radical type of innovation? Where are you in this spectra?
- According to you, what is an innovation process?

Overall:

- How does your innovation processes look like today?
 - Do you use different approaches for different parts of the innovation processes? Alternatively, also for different development stages?
- How have you divided the responsibilities within the innovation processes?
 - How does this work?
- How would you say that ideas travel within the company?
 - Are there any guidelines or clear paths that an idea should take?
 - Is there a possibility for everyone that wants to contribute with ideas to the innovation process?
 - How is it decided if an idea is allowed to be further pursued? (Is there a selection process?)
- Are there an established language within the organization concerning the innovation processes?
 - (If yes): How has this developed? For example, has it been more organic or more consciously established?
 - *How does this work?*
- (If a structure is prevailing) How do you work with control- and reward systems with regards to innovation?

- How does it work?
- Can you see any specific advantages or disadvantages with the way you work with innovation processes?
 - Is there anything you feel could be improved in the way you work?
 - What is the main reason that these improvements have not yet been implemented?

Different topics

- How do you integrate feedback in your innovation process?
 - (If not mentioned) Do you bring in external feedback as well?
- (If touched upon above) Could you explain further how you work with external partners in your innovation process?
- How do you look upon the balance between flexibility and formality in the innovation process?
- How do you work with encouraging creativity in the innovation process?
 - Is time given for creativity?
- Do you have any structure for working collaboratively with idea generation?

The future

- How do you see your innovation process developing in the future?
- Do you think there is a need for adjusting the innovation process as the company grows?
 - If going back to the balance between flexibility and formality in the innovation process, how do you think that that balance between flexibility and formality will look like if the company grows?

Closing question

- Finally, is there anything you would like to add that could be relevant for our work?

Appendix II

Company name	Name of interviewee	Company Position	Educational Background	Previous work experience	Interview information
10 Medical Design	Petra Apell	Founder & Business Developer	Chemistry, Chalmers University of Technology. IHM Business School.	Sigma Aldrich. Product Manager Johnson & Johnson. Has co founded company & had consultant Company. Etc.	21 minutes, Interview at Chalmers. 03/04/18
Mimibly	Miguel Estruch	Chief of Innovation	Biotechnology Bachelors. Master in Entrepreneurship & Business Design, Chalmers University of Technology.	Has started two companies.	28 minutes. Interview at site in company office. 22/03/18
QuickCool	Fredrik Radencrantz	CEO	Marketing and Economics, Lund University. South East Asian Studies, William College.	Project Manager, Ericsson. Product development manager & Business Developer ArjoHuntleigh. Probi. Etc.	41 minutes. Phone interview. 22/03/18
Insplorion	Patrik Dahlqvist	CEO	Chemical Engineering, Chalmers University of Technology.	Worked in two start-ups with Chalmers technology.	37 minutes. Interview at site in company office.

			Entrepreneurship School.		28/03/18
Cellink	Gusten Danielsson	CFO	Management Bachelors. Master in Innovation and Industrial Management, University of Gothenburg, School of Economics, Business and Law.	CEO and managing director of HCM. Has started several Companies.	26 minutes. Interview at site in company office. 28/03/18
Company X	K D	Product Manager	Automation & Mechatronics, Chalmers University of Technology	Product Development. Artist & Fashion Designer	28 minutes. Interview held in a coffee shop. 16/03/18
Qualisys	Fredrik Müller	VP R&D	Computer Technology, Chalmers University of Technology.	Developer, CEO at Qualisys	51 minutes. Interview at site in company office. 05/04/18
NIRA Dynamics	Robert Johansson	Team Manager	Mechanical engineering, Linköping University.	Developer at NIRA.	36 minutes. Phone interview. 28/03/18