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Best Practices for Innovation Management

A Study on Large Companies in Sweden

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God innovationsledningspraxis

En studie om stora företag i Sverige

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Sammanfattning

Det övergripande syftet med denna uppsats har varit att identifiera och analysera hur ett antal stora och framgångsrika bolag bedriver innovationsledning. Av 500 svenska företag har de 25 mest innovativa rankats baserat på hur företagen framställts i över 7000 tryckta artiklar under 2018. I artiklarna som tagits fram via Retriever Media har företagen poängsatts efter antalet artiklar som de omnämnts i, korrigerat efter företagens storlek, multiplicerat med artiklarnas genomsnittliga sentimentvärde. De 25 högst rankade företagen jämfördes sedan med 25 referensföretag aktiva inom samma bransch enligt standarden för svensk näringsindelning (SNI).

God innovationsledningspraxis identifierades och analyserades genom 14 intervjuer med 12 av de 15 högst rankade företagen, samt en enkätstudie som besvarades av 20 av de 25 högst rankade företagen och 17 av referensbolagen. Intervjuerna var semi strukturerade med öppna frågor för att identifiera den innovationsledningspraxis som företagen använder sig av samt bakomliggande resonemang. Spearmans rangkorrelation användes för att identifiera eventuella korrelationer mellan företagens innovationsrankning och hur företaget presterar med avseende på olika innovationsaspekter samt hur viktiga dessa aspekter anses. Analysen av innovationsledningspraxis resulterade i praktiska exempel på hur och när olika metoder, verktyg och strategier användes inom företagen. Managementteorier som kan uppfattas som strikta i litteraturen visade sig kombineras, modifieras och utvecklas i flera av de intervjuade företagen. Aspekter som företagen lyfte fram som viktiga var att innovation och förändring behöver ske iterativt, decentraliseras och startas småskaligt med full uppbackning av företagsledningen.

Några av de olika sätt att framgångsrikt leda innovation som identifierats är att: Det finns en vision för hur för företaget ska jobba med innovation och denna vision ligger till grund för mycket av den beslutsfattande processen när det kommer till nya idéer. Nyckelord kopplade till

olika innovationsmål används frekvent för att leda forskning och utveckling i rätt riktning. Det finns även ett övergripande mål om att bli det ledande företaget inom olika områden och näringsgrenar. Även om många av de intervjuade företagen hade liknande innovationsledningspraxis så var denna ofta modifierade för att passa det enskilda bolaget eller branschen. De intervjuade företagen bidrog med en stor mängd intressanta metoder och insikter som andra företag kan inspireras och dra nytta av för att förbättra sin innovationsledningsförmåga. Slutligen sammanställdes en handbok för att genomföra en innovationsrankning, inklusive hur man använder de programvaror som krävs samt all nödvändig kod för att möjliggöra en återkommande rankning av innovativa företag.

Nyckelord: Innovation, Innovationsledning, Praxis inom Innovationsledning, ISO 56002, Ten Types of Innovation, Innovationrankning, Sveriges Mest Innovativa Företag, Innovationsledningssystem, Sentimentanalys.

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Abstract

The overall aim of this thesis was to identify and analyze good innovation management practices in Sweden's most innovative large companies, excluding governmentally owned organizations. Out of 500 large organizations in Sweden, the top 25 most innovative companies have been ranked based upon over 7,000 printed press articles from 2018 available through Retriever Media. The companies are ranked by their innovations score which is calculated by the number of articles a company is mentioned in, adjusted to the company size, and multiplied with the mean sentiment score. The top 25 companies from the ranking was compared with 25 reference companies, active within the same industry based on the Swedish Standard Industrial Classification (SNI) number, that received a lower innovation score.

Good innovation management practices were analyzed based on 14 qualitative interviews in 12 of the top 15 ranked companies and a quantitative survey responded by 20 top ranked and 17 reference companies. The interviews were semi structured with open ended questions to identify used practices, and the reasoning behind them. Spearman's correlation method has been used to investigate if there was any correlation between the company's innovation score, the mean performance score, and the mean importance score rated by respondents. The company case studies provide authentic examples on how and when different methods and concepts are used within industry. However, while theoretical frameworks often are strictly defined and described in solitary, the interviews have shown that when used within industry, it is rather the opposite. In many of the interviewed companies, frameworks and methods are modified, combined and constantly evolving.

Aspects that the interviewees have expressed as important for an innovative company are: Innovation and change should be iterative, decentralized and started in small scale while receiving full support from top management. Examples of identified practices are: The innovation vision is used in the decision-making process for new ideas. Keywords connected

to innovation are used for guiding new aspirations. There is an overall aim to become industry or/and digital leaders.

Although the interviewed companies had similar innovation management practices, they were usually modified to fit within the company's own organization and industry. The interviews contributed with interesting collection of practices within their authentic setting from which other companies could draw inspiration from. Lastly, a handbook was created describing how to conduct the innovation ranking annually, including a description of how to use the software as well as the required script of code.

Keywords: Innovation, Innovation Management, Best Practices for Innovation Management, Innovation Practices, ISO 56002, Ten Types of Innovation, Innovation Ranking, Sweden's Most Innovative Companies, Organizational Innovativeness, Innovation Management System, Sentiment analysis, Opinion mining.

FOREWORD

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Our families for supporting us throughout this study

Andrejs Celukanovs & Sebastian Wattle Björk

Stockholm, June 2019

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1 Introduction

Chapter one describes the background, purpose, and outline of this master's thesis.

1.1 Background

Today, the survival of companies highly depends on their ability to innovate (Nagji & Tuff, 2012). Since the world is becoming more global and the development of new technologies is rapidly increasing, the ability to effectively innovative is likely to be even more important in the future. However, managing innovation can be hard, and many managers feel frustrated over not having a clear method of how to do it (Nagji & Tuff, 2012). If managers do not have a clear idea of how to manage innovation, it can be assumed that the rest of the organization lack direction. This means that the innovative output of the company risks being unsustainable leading to a loss in stakeholder value. Furthermore, innovation is not and should not be limited only to product innovation (Keeley, Walters, Pikkel, & Quinn, 2013). This is something companies are becoming more aware of, but in turn leads to uncertainty in where to focus the company's innovation resources. An easy mistake to make is trying to use the company's old structures and methods geared towards product innovation and apply it to a second innovation area. A successful innovation management system should instead focus on all areas within the company as well as be built up systematically with discipline. Doing this will increase the possibility of success exponentially (Keeley, Walters, Pikkel, & Quinn, 2013). According to McKinsey & Company (2019), "Only 6% of executives are satisfied with their company's innovation performance". Although research and theories regarding best practices within innovation management exist, studies such as the one conducted by Reeves, Love & Tillmanns (2012) show that many executives still feel unsure of how to use them. This shows that there is a gap between industry and academia indicating that there is a need for better communication. However, as managers usually benchmark and copy good practices of others (Nutt, 1999), identifying and presenting good innovation management practices could be of high value as it might be easier for mangers to learn from others rather than interpret academic literature. As Nutt (1999) presents it: "Why reinvent the wheel when someone else may have done it for you?".

1.2 Purpose

The overall aim of this thesis is to identify and analyze good innovation management practices of Sweden's most innovative large companies.

1.3 Thesis Outline

Chapter two describes the theoretical framework in terms of what innovation is, what characterizes an innovative company, how innovation is managed, what are good innovation management practices according to theory, and how innovation and innovation management be assessed. The chapter finalizes with the research question and delimitations and its sub-questions.

Chapter three describes the methodology behind the research conducted within this thesis. The chapter starts with the research approach to describe the assumptions, methods and procedures used. The second part of the chapter describes the research process and details how these

assumptions, methods and procedures have been used. To end the chapter, the validity and reliability of the methodology is discussed.

Chapter four describes the results gained from the innovation ranking, the interviews and the survey. The results from the innovation ranking are presented together with an analysis of each step in developing the ranking. This is followed by identified practices from the interviews, presented in the form of cases and as described by the companies. Lastly, the results from the survey are presented together with interesting findings.

Chapter five discusses the methodology of the research, the implications for theory and the implications for practice as well as recommendations for future research.

Chapter six presents in relation to the overall research question and its four sub-questions.

2 Theoretical Framework & Research Question

Chapter two describes the theoretical framework in terms of what innovation is, what characterizes an innovative company, how innovation is managed, what are good innovation management practices according to theory, and how innovation and innovation management be assessed. The chapter finalizes with the research question and delimitations and its sub-questions.

2.1 Innovation Definition and Scope

Innovation is a widely used word and is in many cases a canned response from top-level management when asked "what does the company need to be successful?" (Wired, 2019). The term has been defined in numerous ways over the decades with variations depending on the topic discussed. In a more technological perspective, innovation has been defined as "The technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) process or equipment" (Freeman, 1982). From a process perspective, innovation has been defined as "… the introduction of a new product, process, or service into the marketplace" (Edosomwan, 1989). The Department of Trade and Industry in the UK has defined it simply as "… the successful exploitation of ideas (DTI, 2005)". One of the more recent definitions by Schilling describes innovation as "The practical implementation of an idea into a new device or process" (Schilling, 2013). In contrast some authors emphasize the outcomes of innovation, instead of innovation being a process. For example, Porter stated that "companies achieve competitive advantage through acts of innovation" (Porter, 1990). In a more holistic view, some authors describe innovation as "a production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome" (Crossan & Apaydin, 2010).

The showcased definitions mentioned do not cover all the aspects of what innovation is due to ignoring the important aspect of newness: to whom is it new? One can argue that newness depends on the application and the audience that evaluates the innovation process and/or outcome. Therefore, there is no ideal definition of what innovation is, but it can rather be described in the context of the process and outcome.

An important aspect within innovation is differentiating what is innovation and who or what can be considered innovative. A common definition of the word "innovative" found in dictionaries is "using new methods, ideas, being original and ahead of times" (Cambridge English Dictionary, 2019) (Oxford Dictionaries, 2019) (Vocabulary, 2019). The usage of this term has increased gradually since the 1960's (Google Ngram, 2019). Since then, multiple authors have applied the noun form of the word - "innovativeness", which is the state of the original adjective "innovative" (Cambridge English Dictionary, 2019). It has been used in a large variety of contexts. Through epitomization, the literature can be divided into two main areas: customer innovativeness and organizational innovativeness. Customer innovativeness was defined over 40 years ago and the definition virtually has remained untouched. It is defined as "the degree to which an individual is relatively earlier in adopting an innovation than other members of one's system" (Rogers, Everett M.; Shoemaker, Floyd F., 1971) (Rogers, Everett

M., 2014). In areas such as marketing, researchers are predominantly interested in understanding the reasoning behind innovative consumer behavior (Subramanian & Nilakanta, 1996). In other terms, the primary focus of analysis is on individual users. For organizational innovativeness, it is referred to as an immaterial asset and manifested as a competence (Klimas, 2014). Although a variety of definitions have been mentioned over the course of the last four decades, the common denominator of some of them has been a unidimensional metric: the number of innovations an organization adopts (Normann, 1971) (Damanpour, 1991) (Garcia & Calantone, 2002).

More recent academic literature has shifted the view of organizational innovativeness to being a multidimensional concept, demonstrating the organizational climate that fosters innovative results (Hult, Hurley, & Knight, 2004) (Wang & Ahmed, 2004) (Ruvio, Shoham, Vigoda-Gadot, & Schwabsky, 2013). For example, Hult, Hurley, & Knight (2004) have defined innovativeness as "the firm's capacity to engage in innovation" and regarded the capacity as being "among the most important factors that impact on business performance".

The view of innovation has become broader over time, moving from merely technical aspects to incorporate many dimensions is also shared within the industry, as reflected in the Ten Types of Innovation framework. This framework is showcased due to dataset size used for creating it. Also, it has been then compared to the Innovation Radars' 12 innovation dimensions. Other frameworks have been considered for investigation such as the Eight Essentials of Innovation Performance but have been omitted due to limited applicability compared to the previously mentioned frameworks (De Jong, Marston, Roth, & van Biljon, 2013).

2.1.1 Ten Types of Innovation Framework

The Ten Types of Innovation framework was developed by Keeley, Walters, Pikkel & Quinn (2013) and all of the following description in this section is a summary of it. It is based on set of nearly 2000 case studies. The framework divides innovation into three categories and 10 areas (Keeley, Walters, Pikkel, & Quinn, 2013):

1. Configuration: Profit Model, Network, Structure, Process.
2. Offering: Product Performance, Product System.
3. Experience: Service, Channel, Brand, Customer Engagement.

As noted by the authors, any of the ten innovation types can be applied by an organization without compatibility limitations between different types (see Figure 1). Furthermore, in contrast to the Business Model Canvas, they do not lie within a continuity (Osterwalder, Pigneur, & Clark, 2010). In an essence, the framework focuses on how status quo can be challenged within the scope of each innovation type. Also, in each type described by the authors, an emphasis is made on the potential importance of benchmarking the practices and the potential possibility of exploring new ones.

Figure 1. Representation of the Ten Types of Innovation

The first type referred to as *Profit Model,* covers the establishment of new revenue streams and importance on acknowledging existing. If the organization is non-profit, the profit model can be interpreted as "how to generate value for stakeholders". The focus here is placed on comparing the ease for the customer to use the products and the additional challenges for switching or stopping using them. The only condition that must be met is that the profit model must be aligned with the innovation intent and strategy.

The second type referred to as *Network,* focuses on the potential benefits of "relationships, partnerships, consortia, and affiliations" where multiple parties share with a mutual benefit as the goal.

The third type referred to as *Structure,* is aimed at the internal changes within the organization to foster a higher level of performance than competitors. As examples the authors give incentives, standardization, and competence training. It is highlighted that it is not the same as process innovation due to structure innovation being related to the internal resources and how they are organized.

The fourth type referred to as *Process,* highlights to how organizations can innovate in terms of methods. As noted by the authors, a methodology is essential for a process to be considered an innovation. A widely known example is used by the authors here: Lean production methodology.

The fifth type referred to as *Product Performance,* covers what the name implies - product performance. It encompasses the importance of uniqueness of the product offering in terms of features and functionality, customer perception of the product and simplicity of usage.

The sixth type referred to as *Product System,* focuses on innovating by creating a system to interconnect individual products. As the authors note, it can include offerings that the organization does not produce or own, but rather for others to create them (i.e. applications for a phone) and as a consequence enrich the original offering via a scalable system.

The seventh type referred to as *Service,* is aimed at exploring innovations related to the long-term customer journey and product life cycle. As the authors state, "service can be the most striking and prominent part of the customer experience".

The eight type referred to as *Channel,* states the importance of innovation in terms of how the offering is delivered (the "touchpoints") to the users/customers, and not about with whom to work with. The emphasis here is on creating an experience with interactions that fosters a positive image of the organization and/or product to the customer.

The ninth type referred to as *Brand,* is described as "extensions that offer a new product or service under the umbrella of an existing brand". The authors note that brand innovation is more

than merely a “successful campaign or a marketing strategy”. It is about the brand becoming “distinct from the competition and relevant to customers”.

The tenth and last type referred to as *Customer Engagement*, is focused on how organizations use customer insights to create and foster relationships between the company and the customer. As noted by the authors, this is often embedded in Brand and Service and therefore, not easy to distinguish.

2.1.2 Innovation Radar and Ten Types of Innovation Comparison

As previously mentioned, there are other similar frameworks to the Ten Types of Innovation that incorporate multiple dimensions of innovation. One of such is the Innovation Radar (Sawhney, Wolcott, & Arroniz, 2007). The framework consists of 12 dimensions and has multiple similarities to the Ten Types of Innovation. A comparison of the two has been made to determine the differences and applicability in the context of this study. The result can be seen in Table 1.

Table 1. Comparison of the Ten Types of Innovation and Innovation Radar dimensions

No.	Ten Types of Innovation	Innovation Radar
1.	Profit Model	Value Capture
2.	Network	Networking
3.	Structure	Organization
4.	Process	Processes, Supply Chain*
5.	Product Performance	Offerings, Solutions*
6.	Product System	Platform
7.	Service	-
8.	Channel	Presence
9.	Brand	Brand
10.	Customer Engagement	Customer Experience, Customers*

The dimensions of the Innovation Radar that do not fully match the Ten Types of Innovation areas are marked with a star. The rest of the dimensions are similar to the innovation types based on the descriptions given by the authors of both frameworks. Due to some areas not matching ideally, the differences of the Innovation Radar dimensions are described further.

The Supply Chain dimension focuses on the delivery activities related to goods, services and information. It is similar to the Process Innovation with a distinct feature of focusing on delivery.

The Solutions dimension is aimed at creating customized offerings for solving customer problems. The value is created through high level of integration to fulfill the needs of the customer. This is similar to Product Performance innovation with the exception of high level of integration.

The Customers dimension is related to discovering customer needs or new customer segments, which is vaguely related to Customer Engagement innovation. The Customer Engagement innovation focuses on fostering a unique relationship between the customer and the

organization, while the Customer dimension is referring to the creation of new markets with unmet customer needs.

Lastly, Service innovation has not been mentioned at all within the Innovation Radar framework. This leads the assumption that the Ten Types of Innovation is a more suitable framework for distinguishing innovation types, considering that it incorporates more case studies and has been revised more recently. Furthermore, it features distinctive types that can be incorporated in a vast range of industries, which will help capture the organization's innovativeness

The previously mentioned frameworks have been derived from large sets of interviews, surveys, case studies and other means from organizations that are perceived as successful and innovative. While there is a variety of financial indicators that can be used to determine the success of an organization and its parts, determining how to manage innovation has proven to be a more difficult task.

2.2 Innovation Management

Innovation management is a relatively new discipline in comparison to other management areas such as quality management, which has established and well known methods and tools for organizations to effectively manage the quality of their output (Goffin & Mitchell, 2017). Nevertheless, innovation management is an important area covering aspects such as organization, strategy, processes, and assessment. While knowledge within innovation management has increased in recent years, the field has failed to fully benefit from the research due to much of the work not being sufficiently coherent and cumulative (Tidd & Bessant, 2018). Since a large part of the current research conducted within the area is focused on isolated aspects of innovation management, there is a need for a more systematic approach to tie it all together. While research within innovation management typically highlights the need for organization to effectively manage changing environments, it is common for new findings to be isolated from previous ones, making it difficult to form a holistic view on how to manage innovation. Therefore, the following part of this section gives an overview of some aspects that are normally highlighted as important for innovation management.

Organizing

Collaborations between individuals and groups with specialized expertise is essential for organizations to succeed at innovation. Such collaborations require coordination, which poses a challenge for managers (Scarbrough, Panourgias, & Nandhakumar, 2014). These challenges are exacerbated by the increased speed of business and the need for organizations to become quicker and more agile, which has been mentioned in literature for the last 20 years (Kotter, 2012). Therefore, it is not surprising to think that this would be common knowledge in 2019. However, companies are still trying to use their old structures, although slightly tweaked, to identify and act upon early opportunities with accuracy and speed (Kotter, 2012). According to Kotter: "That's like trying to rebuild an elephant so that it can be both an elephant and a panther. It's never going to happen.". This indicates that organizations which do not perform well need to be drastically revamped. While it may in some cases be required, it is not the best solution for all. For example, by promoting cross-functional collaborations or by decentralizing the organization the innovation performance and output can be increased as well (Love & Roper, 2009) (Rangus & Slavec, 2017).

Processes

Reeves, Love & Tillman (2012) found that less than 20% of the executives asked felt competent in the adaptive capabilities required to address unpredictable environments. Even though, many recognized the importance of building them. They considered this partly a result of the classical management styles that have been thought to many executives during business school. This was also confirmed when over 80% of the executives in the study answered that they usually start a project by determining the goal and then figuring out how to reach it. Furthermore, 70% answered that they valued accuracy over speed of decisions. This is interesting considering that their environments usually are unpredictable and fast moving (Reeves, Love, & Tillmanns, 2012).

Strategy

Classical management styles are usually aimed at achieving economies of scale. These methods and strategies tend to value efficiency over variation which makes it hard to implement adaptive strategies since failure, the natural outcome of experimentation, is seen as something negative (Reeves, Love, & Tillmanns, 2012). The suggested strategy is instead to start by experimentation before selecting and scaling up. This should be done iteratively, fast and often.

Furthermore, the strategy to solely rely on internal entrepreneurs, commonly referred to as intrapreneurs, to capture and commercialize new opportunities is also inefficient in terms of innovation (Corbett, 2019). Even though there are examples of brilliant intrapreneurship, the idea that innovation can be achieved by hiring top talent without changing anything about the organizations is according to Corbett (2019) simply a myth. Instead, companies need to realize that innovation is a company-wide endeavor that needs a permanent function similar to other business functions. Even though innovation should have a division of its own, it is important that it does not become isolated from the rest of the organization. When innovation divisions such as incubators and innovation labs have no connection with the rest of the organization, they achieve less success (Corbett, 2019). This idea is also supported by Govindarajan & Trimble (2010), who argues that companies should be divided into two teams: one small team focusing on innovation and one large team focusing on making the core more effective and efficient. Furthermore, they suggest that the small team should be built much like a startup using a dedicated team and separate goals. Similar to Corbett (2019), Govindarajan & Trimble (2010) highlight the importance of the small team maintaining its link with the rest of the company. The close collaboration between the two teams can be seen as a symbiosis where the large team (the core of the organization) pays for the small team (the innovation division) to assure its own future survival.

There is also a need for alignment between business and innovation improvement efforts to be successful. As noted by Pisano, firms rarely attempt to align the two (Pisano, 2015). An innovation strategy is needed to tailor a system to match the organization's specific competitive needs. As he states further, "Without an innovation strategy, innovation improvement can easily become a grab bag of much-touted best practices" (Pisano, 2015). Though the variety of interpretations of what innovation is from a functional perspective of an organization can inhibit the implementation of an innovation strategy (Goffin & Mitchell, 2017).

Assessment

For the innovation division to be effective, the company needs to evaluate its performance just as it evaluates the performance of its other business units (Govindarajan & Trimble, 2010). By

continually evaluating and adjusting resource allocation based on the relevant market opportunities of each division, the company value will in 15 years be on mean 40% higher than companies who are stuck in the same broad investment patterns (Hall, Lovallo, & Musters, 2012). In their study, they found that the top third of the companies that reallocate their resources most frequently were 13% more likely to avoid being acquired or becoming bankrupt than the other two thirds.

Besides the need for the organizations to become more agile, faster in decision making, use new management styles, evaluating performance, new hierarchical structures, and best practices, there is also a need for effective innovation management systems.

2.2.1 Innovation Management System

As noted by Karlsson and Magnusson (2019), there are various reasons for companies to innovate. These can include revenue increases, organizational growth, reduction of waste, creating additional value for the stakeholders, and so on. In an attempt to seize these opportunities, companies use a variety of tools, (i.e. hackathons, idea management platforms, design thinking labs, etc.) but they do not lead to results (Karlsson & Magnusson, 2019). The reason for this might lie not only in the tools themselves, but in the competences, approaches, directions, organizational structures, measurements, senior management commitment, and processes. In other words, decisions are made while lacking a holistic view of the issue within the organization. Karlsson and Magnusson (2019) argue, that a systematic approach to innovation management can, among other things, guide the organization in a better way to identify innovation capability gaps by assessing and evaluating the innovation performance in various areas.

One of the newest innovation management systems is the "Innovation Management System - Guidance" (ISO 56002 standard). It consists of "interrelated interacting elements" (International Organization for Standardization [ISO], 2019). As stated in the standard, it allows firms to "identify its innovation policy, strategy, objectives and processes needed" for the achievement of the aimed innovation outcomes. The Innovation Management System incorporates aspects (clauses), such as:

- Context of the organization: understanding the organization, understanding the stakeholders, scope determination of the Innovation Management System, and establishment of the system (clause 4);
- Leadership: innovation- vision and mission (clause 5);
- Planning: innovation- objectives & plans, strategy (clause 6);
- Support: resources, tools and methods, strategic intelligence, intellectual property, competencies, awareness, and communication (clause 7);
- Operation: innovation - operational planning & control, initiatives management, and processes (clause 8);
- Performance evaluation: innovation- monitoring, measurement, analysis, evaluation, internal audit, and management review (clause 9);
- Improvement: deviation, nonconformity, and corrective action (clause 10).

Together, they form a framework referred to as "Plan-Do-Check-Act" with the aim to continually improve the system (see Figure 2). It incorporates all the previously mentioned aspects and has a closed cycle detailing steps to focus on, which undermine the continuity.

(International Organization for Standardization [ISO], 2019). It is important to note that some aspects, such as the innovation vision and innovation policy have a contextual role in the cycle.

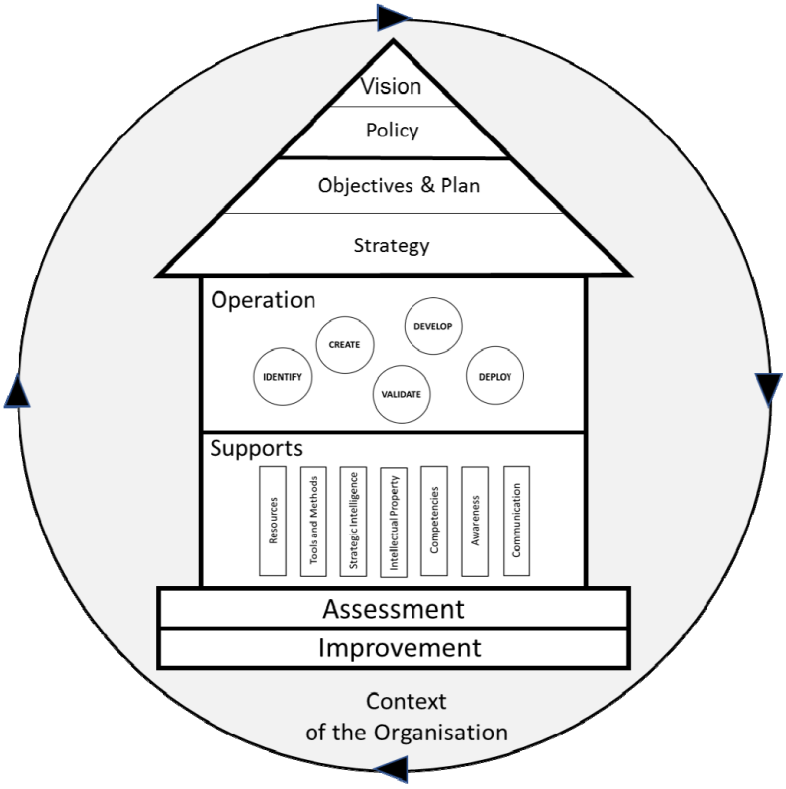

Figure 2. Representation of the framework of the innovation management system, from ISO 56002 (International Organization for Standardization [ISO], 2019)

The Plan-Do-Check-Act framework consists of the following steps:

a) Plan: create objectives in relation to the system, identify the required resources for achieving the desired result and tackle potential risks and opportunities (Clause 6);
b) Do: implement planned operations and support functions (Clause 7 & 8);
c) Check: track and if applicable measure outcomes against objectives (Clause 9);
d) Act: continuously perform actions to improve the performance of the system (Clause 10).

While the elements of the ISO 56002 are based on academic literature, the standard remains untested in industry due to its recent launch. Also, to use the innovation management system, the elements of the standard need to be translated into innovation practices with more specific methods and examples. Furthermore, there is a need for organizations to increase their understanding of innovation management practices to gain substantial financial potential or value in multiple industries (Aas, Breunig, Hylde, & Pedersen, 2015).

2.2.2 Innovation Practices

The term "best practice" is defined as "any method or process that is more effective at delivering a desired outcome than any other method or process within that domain" (Nicholas, Ledwith, & Perks, 2011). A combination of keywords was used when searching for relevant literature on innovation management practices. The keywords included: "innovation", "innovation

management", with "practices", "best practices" and the derivatives of these words in various databases. This resulted in finding only two articles that were distinctively related to innovation management practices.

The first article by Valmohammadi (2012) was focused on Iranian organizations. The aim of the study was to investigate the extent of implementation of innovation practices, to identify the catalysts and inhibitors for implementing them, and to identify the relationship between the performance of the organizations and innovation practices. Results revealed that the most frequent practice of innovation was opening new domestic target groups and customer centricity, as well as the organizational structure being the main catalysts for innovation implementation. As for inhibitors, bureaucracy and excessive regulations had the highest impact (Valmohammadi, 2012).

The second article by Wright, Sturdy, & Wylie (2012) was aimed at investigating the standardization of practices by consultants in a context of multiple industries. As a result, standardized agendas and methods have been identified. The conclusion of the article was that various dimensions need to be considered in the relationship between standardization and innovation management. As stated by the authors: "standardization is often seen as an impediment to innovation", which is not always the case, since systematic implementation and usage of methods can be considered as standardization, even in terms of innovation management practices. This also supports the idea that standards can be used to improve systematically the innovativeness of organizations.

After reviewing the literature surrounding innovation practices, it is concluded that the area requires further research. Furthermore, if companies do not constantly search for new and better innovation management practices, but only rely on existing ones, it will lead to innovation myopia and systematic erosion of competitive advantage (Sawhney, Wolcott, & Arroniz, 2007). To identify companies with potentially unique practices, assessing innovativeness is required to identify such organizations.

2.3 Assessing and Measuring Innovation

In the study by Wang & Ahmed (2004) , organizational innovativeness is defined as "an organization's overall innovative capability". They define five dimensions that impact innovativeness which are: product, market, process, behavior, and strategy. The dimensions are then linked to "key variables": survey questions, which have been sent out to 1500 randomly sampled companies. The results showed high correlation of the key variables to the dimensions. There are a few complications with the developed model: certain questions are not applicable to a large variety of industries. For example, the question (statement) "Our company changes production methods at a great speed in comparison with our competitors" is hardly applicable to software developing companies. Also, the method of sampling does not seem to be reasonable, since the chance of reaching out to an innovative company is just as high as reaching out to a non-innovative company (Wang & Ahmed, 2004).

Moos, Beimborn, Wagner, & Weitzel (2010) proposed to asses innovativeness based on the organization's direction: whether it is input-oriented or output oriented one. As noted by the authors, "input-orientated measurement models focus on the resources the firm is assigning to the innovation activities" and "output-oriented measure the amount or frequency of found or achieved innovations". These two concepts have then been used to categorize the existing

literature on organization innovativeness, hence creating two measurement models. The downside of the study is that it has not been validated empirically, thus it is impossible to determine its validity and applicability.

In the study performed by Ruvio, Shoham, Vigoda-Gadot, & Schwabsky (2013), a framework for evaluating organizational innovativeness was introduced. It conceptualizes organizational innovativeness as an organizational climate with five constructs: creativity, openness, risk-taking, future orientation, and proactiveness. The constructs were used in combination with literature to form questions for the survey. Three countries were selected to participate in the study with an aim to have countries with different societies/individuals/settings to verify the framework. Within each country five to ten leading organizations in the fields of social services and health care were selected to participate. The survey respondents were randomly selected from a predetermined list. The study incorporated multiple verification techniques and can be used within the field of social services and health care. However, the question arises whether the study is applicable within other industries. Also, the way of sampling limits the possibility of using the framework.

As a conclusion from the above-mentioned literature it is visible that alternative ways of identifying innovative organizations are required. The reviewed methods of identifying and assessing the innovativeness of organizations rely on investigating certain industries, random sampling and sometimes financial indicators. After reviewing the academic ways of selecting innovative organizations, the selection methods used by the industry needs to be investigated. These are methods used by different companies within the industry to rank the most innovative companies.

2.3.1 Rankings of Innovative Organizations

Currently, there are multiple organizations creating yearly rankings of "the most innovative companies" based on their own criteria, both globally and regionally. In this following section, five global and three local rankings as well as their methods and criteria will be described.

The first of eight rankings has the title "The World's 50 Most Innovative Companies of 2019" by Fast Company (Fast Company, 2019). This is a global ranking and it is based on a survey sent to a large number of companies within multiple industries. The firms participating in the survey were required to apply via public submission. Based on the result of the survey and possibly other unmentioned criteria, a jury of editors and contributors rank the most innovative companies in multiple categories.

The second ranking has the title "The World's Most Innovative Companies" and is published by Forbes Media (Forbes, 2019). This is a global ranking and is based on an investor survey with a bonus point system based on an innovation premium, i.e. the difference of market capitalization and net present value. To be eligible for ranking, the companies must be publicly traded, have six years of public financial data, be in the top 500 by market capitalization globally, as well as have measurable innovation and R&D investments. Companies tied to commodity prices (i.e. energy producers and mining companies) cannot participate in the ranking.

The third ranking has a title "Most Innovative Companies 2019" and is published by Boston Consulting Group (Ringel, Zablit, Grassl, Manly, & Möller, 2018). This is a global ranking,

where companies are ranked based on the perception of senior executives and their annual reports. The perception of senior executives is determined using a survey where the most innovative companies, both within and outside of their respective industries are rated corresponding to 30% plus 30% of the innovation score. The remaining 40% of the score are based on financial results, for example stakeholder returns.

The fourth ranking has the title "The World's 50 Most Innovative Companies" and is published by USA Today (USA Today, 2019). This is a ranking of global companies that is based solely on the number of patents issued to a company throughout the year in the United States of America. The data is provided by the IFI Claims Patent Services and refined by another organization - 24/7 Wall St, whose data is then used for creating the final ranking.

The fifth ranking has the title "50 Smartest Companies" and is published by MIT Technology Review (MIT Technology Review, 2019). This is a global ranking and it is not clearly stated which criteria the ranking is based on, only that the editors select companies on the basis of "best combination of innovative technology with an effective business model". The list includes global corporations as well as some startups.

The sixth ranking has the title "Most Innovative Companies 2018: the full list" and is published by the Australian Financial Review (Australian Financial Review, 2019). This is a regional ranking with only Australian and New Zealand companies participating. The ranking is based on a process performed by the Australian consulting firm Inventium. The process involves firms applying via an open application, then the consulting firm filters out the companies that do not meet their criteria and require a fee to be payed prior to proceeding forward.

After that, the companies pitch their best innovation of the previous year together with filling out a survey (the purpose of the survey is not stated). Afterwards, the consultancy firm analyzes the data and creates a final ranking with clusters based on industry (Inventium, 2019).

The seventh ranking has the title "Canada's Most Innovative Technology Companies" and is published by the Canadian Innovation Exchange (CIX) (CIX, 2019). It is based on an open application by firms and then a jury's vote with set criteria that considers business model, quality of product and service offering, innovation, market opportunity, and depth of management. Eligibility includes the applicants working within the information and communications technology (ICT) and digital media industries, as well as being a privately held Canadian business. Furthermore, the companies need to have a at least one prototype and the ability to represent the company at the CIX event.

The eight ranking has the title "The Swedish Innovation Index" and is published by Karlstad Business School (Kristensson, Witell, Karlsson, Koskela-Huotar, & Valtakoski, 2019). It is based on 13,000 consumers' opinions (not clear if it is based on surveys or interviews) with a predefined list of 70 companies within 20 industries. When collecting the data, two areas are highlighted. These areas are: the perceived innovativeness (capability of innovating) of an organization and its relative attractiveness (in relation to competitors). Eligibility, or where in terms of location the participants are questioned is not explained in the ranking's description.

The majority of global rankings use financial indicators for determining eligible companies to include as participators. Only one of the previously mentioned rankings does not rely on a person's opinion to rank the companies. Thus, financial indicators and subjectivity plays a big

role in deciding upon the ranking. Next, a literature review on decision making is made to investigate how subjectivity could have affected the highlighted innovation rankings.

2.3.2 Decision Making

The term "objective" is defined as "not influenced by personal feelings or opinions" (Waite, 2012). The source of false feelings and/or opinions towards a matter can be attributed to being impacted by cognitive biases. Cognitive bias is defined as "systematic pattern of deviations from norm or rationality in judgment", which causes false factual or logical inferences, resulting in irrational choices (Haselton, Nettle, & Andrews, 2005) (Banasiewicz, 2019). The amount of cognitive biases today in relation to decision making is counted in dozens and nearly all have various reasons for being triggered, which will likely impact the outcome of a person's choice (Banasiewicz, 2019).

As noted by Pronin, Ross, & Gilovich (2004), "We tend to resolve our perplexity arising out of the experience that other people see the world differently than we see it ourselves by declaring that those others, in consequence of some basic intellectual and moral defect, are unable to see the things "as they really are". It is implied by this statement that the way a person may perceive or interpret things is the true way for him/her, and they react to it normally, in contrast to others (Pronin, Ross, & Gilovich, 2004). It is also referred to as naive realism. One of the main aspects of it is that individuals do not think alike in regard to various matters due to the difference in perception, while they continue to do so due to the inability to acknowledge the existence of a perception on matters different from their own. As multiple studies have shown, in a given attempt for individuals to acknowledge the possibility of biasing their own judgements and decisions, most individuals failed to a large extent. (Pronin, Ross, & Gilovich, 2004).

In many cases, people make decisions based on intuition rather than data. Intuition is referred to as a "decision-making mechanism that relies on rapid, non-conscious recognition of patterns and associations to derive affectively charged judgments" (Calabretta, Gemser, & Wijnberg, 2016). Intuition is also referred to as heuristic, when used unconsciously (Mousavi & Gigerenzer, 2014). As noted by Gál, Mrva, & Meško (2013), they perform the role of mental shortcuts that help to structure and simplify information from the surrounding environment, but can just as well be a source of mistakes in making decisions. In contrast, some argue that heuristics can not only reduce information needed, computation and time, but also improve accuracy. (Gigerenzer & Brighton, 2009). As stated by Mousavi & Gigerenzer (2014) to tackle uncertainty knowledge is required, but comprehensive information is not always needed. Furthermore, as stated by the same author, "the ecological rationality of a heuristic reflects its degree of adaptation to the structure of an environment". Therefore, if the field of expertise of the decision maker matches the environment in which the decision is being made, heuristics will be beneficial, though it is not always known how well matched an individual is to perform a certain task beforehand.

Based on the review, heuristics have benefits depending on the context, while biases pose a larger threat. However, biases can be mitigated by even simply acknowledging that they exist (Kihlander & Ritzen, 2012). While this acknowledgement has shown to be beneficial, the fact that a survey was used for data collection might be disadvantageous. This is due to the need for respondents to acknowledge their own answers and therefore, some form of training prior to

answering would be required. However, this could impact the willingness of executives to participate as it would require more time.

The review of what innovation is, how it is managed, and how to objectively identify innovative organizations demonstrates the perplexity of the matter. Based on the assumption that large organizations have more resources and more processes in place, there is a likelihood of finding more good practices within them. This has led to the formation of the research question(s) in the upcoming chapter.

2.4 Research Question

The research question behind this master's thesis is: What are the best practices for innovation management in large organizations?

This research question has been divided into the following sub-questions:

- Which are the most innovative large companies in Sweden?
- How can the innovativeness of companies be evaluated in a fruitful way?
- What practices do these companies use to manage innovation?
- How do these practices align with established theoretical frameworks?

2.5 Delimitations

The delimitations of this master's thesis are as follows:

- The sample is limited to the 500 largest companies in Sweden based on revenue. Although the same methodology developed in this study can be used for a larger sample, it was limited to 500 companies to increase computational speed.
- For the innovation ranking, annual reports from 2017 and printed press from 2018 was used since all of the 500 companies had not yet released their annual report of 2018 at the time of the study.
- Only non-government owned organizations were used in the ranking, interviews and survey. This is due to organizations such as the Royal Institute of Technology and Trafikverket having different prerequisites and competitive advantages compared to non-government owned companies. Furthermore, many of the organizations owned by the Swedish government, such as Systembolaget, have monopolies and are therefore difficult to compare with other organizations.

3 Methodology

Chapter three describes the methodology behind the research conducted within this thesis. The chapter starts with the research approach to describe the assumptions, methods and procedures used. The second part of the chapter contains the research process describing in detail how the assumptions, methods and procedures have been used. To end the chapter, the validity and reliability of the methodology is discussed.

3.1 Research Approach

The research objective for this thesis is to determine best practices for innovation management in large Swedish organizations. Generally, a best practice can be defined as: "the most efficient and effective way of accomplishing a task based upon a repeatable process that has been proven over time for a large number of people and/or projects." (Kerzner, 2014). Speaking in terms of the New Product Development process, best practices can be defined as "practices that promote greater success in developing and launching new products and services" (Nicholas, Ledwith, & Perks, 2011). Although there are existing definitions of best practices in academic literature related to innovation and development, Kerzner (2014) argues that "every company can have its own definition of a best practice". Therefore, it was decided that this study should not be limited to just one definition of a best practice, but rather embrace and highlight the differences in how companies choose to view their practices.

The chosen approach for finding companies' best practices is through company case studies as it is a powerful tool for both exploration, theory building and theory testing (Voss, Tsikriktsis, & Frohlich, 2002). By combining a quantitative and a qualitative approach in triangulation, it is possible to capture different dimensions of the same phenomenon (Voss, Tsikriktsis, & Frohlich, 2002). This creates high validity as the qualitative case studies can be used to validate the empirical results. Therefore, a combination of both qualitative interviews and a quantitative survey will be used. Since a new ISO-standard for innovation management: ISO 56002, recently has been launched, testing how well linked the highlighted elements of the standard are to companies' actual practices within innovation management will be a contribution to the research community. As the scope of the standard partly is to be used for assessing an organizations innovation capabilities (International Organization for Standardization [ISO], 2019), the content of the standard could be used for conducting a qualitative interview to extract information of a company's practices within innovation management. Similar to ISO 56002, the Ten Types of Innovation framework can be used to diagnose companies' work with innovation (Keeley, Pikkel, Quinn, & Walters, 2013). Although the Ten Types of Innovation framework is based on case studies of multiple companies and not as grounded in academic literature, it still provides a simple and intuitive framework for defining different innovation types. As the ISO 56002 focuses on different factors to consider when establishing an innovation management system, the Ten Types of Innovation framework can be used as a complement to highlight in which innovation types the company's innovation management system is focused on.

Since the research objective is to determine best practices for innovation management, it is relevant to focus on companies that are considered the most innovative. Not only is it interesting to read about practices that make some companies more innovative than others, but "a thorough

understanding of the most innovative companies has important academic and managerial implications" (Lichtenthaler, 2018). Since innovation can enable new products and higher margins, there is a direct link between a firm's innovation activities and financial performance. To continue, Lichtenthaler (2018) argues that innovation activities can strengthen the image of a company and therefore, enable that company to achieve superior financial results based on a higher brand value. This creates an indirect link between how innovative companies are being perceived and their financial performance. It can typically pay off to be considered innovative as communicating new product launches highlights the internal innovation strengths of the organization. Therefore, many companies push hard on communicating innovation (Lichtenthaler, 2018).

To determine which companies are the best ones at innovation, and therefore have the best innovation management practices, focus will be on how innovative companies are perceived. Typically, innovation rankings are based on a combination of expert opinion and quantitative data (Lichtenthaler, 2018). However, these experts are usually not the targeted customers whose perception of the company directly affects the brand image and financial performance. Therefore, a new approach to ranking companies has been utilized in this thesis. Since the perceptional decisions made by journalists form much of the input that citizens build their perceptions on (Donsbach, 2004), the data for the innovation ranking in this thesis will be based on news articles published in printed press. Printed press is preferred over online press as that online journalism does not consistently challenge objectivity to the same extent. Rather there is a risk of aligning with the mainstream view of the matter (Maras, 2013). In comparison, BCG's innovation ranking is based on the opinions of senior executives as well as shareholder return, revenue growth and margin growth (Ringel, Zablit, Grassl, Manly, & Möller, 2018). While this method gives an insight into the perceptions within the industry, it does not necessarily represent the perceptions of the external environment such as customers and citizens.

While conducting case studies, qualitative and quantitative questions are common practice (Voss, Tsikriktsis, & Frohlich, 2002) (Nicholas, Ledwith, & Perks, 2011). However, ranking company innovativeness using news articles requires a more experimental approach. In terms of understanding people's perceptions and opinions, sentiment analysis is an increasingly utilized tool (Gaspar, Pedro, Panagiotopoulos, & Seibt, 2016). Sentiment analysis is common practice in areas such as brand management and political marketing where rapid reputation assessments are valuable. A significant benefit of using software for analyzing peoples' and in this case journalists', perception of company innovativeness is that larger sets of data can be used. When asking a senior executive through an interview or using a survey, time is limiting the size of the data set to a larger extent. Assuming that there already exists a large set of data such as news articles, extracting the authors' perceptions in quantities of millions of articles is done within minutes.

3.2 Research Process

The research process is based on the methods: literature study, sentiment analysis, interviews and surveying. To determine which companies that can be considered best at innovation management, and therefore interesting to interview regarding their innovation management practices, news articles published in printed press have been analyzed and used for ranking. Although there exist innovation rankings as previously mentioned, these rankings are global as the ones published by The Boston Consulting Group and Forbes. Since the aim with this study is to investigate companies within Sweden, the existing lists cannot be used. When ranking Sweden's most innovative companies in this study, the idea is to use a different method as previously explained and base the ranking on public news written by journalists outside of the companies. This has been done by performing an analysis on the total output from printed press during 2018 available through Retriever Media, the largest digital news archive in the Nordics (Retriever Media, 2019). In Retriever Media's search engine, all articles were filtered using keywords certain related to innovation management as well as the names of Sweden's 500 largest companies based on revenue. All relevant articles containing one of the company names in the context of innovation were then downloaded and analyzed using RStudio, an integrated development environment for the statistical computing program language R (RStudio, 2019). To determine if the author is positive or negative when mentioning a company name in context of innovation, a sentiment analysis has been conducted. The more frequently a company name is mentioned in a positive context of innovation, the higher the initial score the company receives, and after adjusting it to the companies' sizes, a final ranking is created.

After creating the ranking, the top 15 companies were selected for interviews based on the availability of their employees. The goal of these interviews was to ask open ended questions to understand what type of practices top performing companies use and present them in the form of company cases. To investigate if there are any differences between top scoring companies and lower scoring companies in terms of innovation management practices, a sample of the top 25 scoring companies together with 25 reference companies were selected to participate in a survey.

The first ten questions in the survey were connected to the Ten Types of Innovation framework where the interviewees rated the importance and performance of each innovation type (Keeley, Walters, Pikkel, & Quinn, 2013). The following 24 questions were related to the European Innovation Management Standard ISO-56002 were the interviewee rated the importance and performance of each element (International Organization for Standardization [ISO], 2019).

Lastly, a step-by-step handbook was created for how to conduct the ranking: Sweden's Most Innovative Companies so that it can be re-conducted in the future and be published annually (see Appendix A for the innovation ranking handbook).

The following is a detailed structure of the methodology:

1. Text analysis to find the most innovative companies.
   1.1. Filter and download all accessible news articles published in printed press from 2018 where Sweden's 500 largest companies based on revenue are mentioned together with predefined innovation keywords.
   1.2. Use sentiment analysis to determine whether the context of each article is positive or negative.

1.3. Adjust for the correlation between company size and the number of articles a company is mentioned in using a regression.
1.4. Create a ranking using number of articles adjusted to company size as the first variable, and the mean sentiment score as the second variable.
1.5. Contact the top 15 companies with the purpose of conducting two interviews with each.
1.6. Pair each of the top 25 companies with a reference company from the same sample group of 500 companies.

2. Interviews.
   2.1. Interviews are semi-structured and are based on 8 areas inspired by the ISO-56002 standard.
   2.2. The time frame for each interview is 60 minutes, conducted over phone, Skype or face to face.
3. Survey.
   3.1. Survey part 1: Ten Types of Innovation.
      3.1.1. Ten innovation types in total.
      3.1.2. Participants will rate the importance and performance of each innovation type.
   3.2. Survey part 2: ISO-56002, Innovation management system — Guidance.
      3.2.1. 24 aspects in total.
      3.2.2. Participants will rate the importance and performance of each aspect.
4. Analyze the data.
   4.1. Interviews.
      4.1.1. Present the best practices for innovation management of Sweden's most innovative companies.
   4.2. Survey.
      4.2.1. Present differences between the performance and importance of the top 25 companies and the 25 reference companies.
      4.2.2. Present what areas of the ISO-56002 standard that is seen as most important.
5. Create a handbook for the innovation ranking to be re-conducted in the future and potentially be published annually.

3.2.1 Establishing Criteria for Filtering

To find news articles relevant to this study, keywords related to innovation are needed as a filter within the Retriever Media's search engine (Retriever Media, 2019). The sampling of these keywords was done using two research databases together with interviewing relevant people within academia and industry. The two research databases used are: IEEE Xplore and Scopus (IEEE Xplore Digital Library, 2019) (Scopus, 2019). These databases were selected based on the recommendations from the thesis supervisors Mats Magnusson and Håkan Ozan, as two relevant databases used by both academia and industry. In each database, the word "innovation" was used as the search word to find all research articles somehow connected to innovation due to the term being generic. From the generated search result, sorted by number of citations, the search keywords within each of the top 150 articles was extracted (see Appendix B for the extracted keywords where articles containing exactly the same keywords are sorted out to save space). This was done within both the IEEE Xplore and the Scope databases to create the sample of keywords to be used in Retriever Media. To verify the relevance of each keyword against the topic innovation management, five people working with innovation management both within academia and industry gave their feedback. Unfortunately, most scientific research and

the keywords related to it is written in English. Therefore, the keywords were translated to Swedish and then sanity checked together with the same five people to ensure that the Swedish translations were accurate in the context of innovation management.

Since Retriever Media has a function to find all words that contain a certain combination of letters, the search word *innovat** searches for all words containing innovation. This means that instead of creating an extensive list of all three versions of the words: *innovation*, *innovativ* and *innovationer*, it is possible to only search for *innovat** and cover all of the three words. Therefore, the final sample of keywords for use in Retriever Media were: *innovat*, forskning och utveckling, teknisk nyhet, uppfinning, nya marknader, affärsmöjlighet, tekniskt genombrott, ny teknologi, nytt kundvärde,* and *ny affärsmodell*.

To avoid paid collaborations and adds, all articles were also filtered using keywords that they should not contain: *Annons*, annonserat inlägg, betalt samarbete, betald annons*, *sponsrat inlägg,* and *PM*.

3.2.2 Creating the Company Sample Group

Since the aim of the study was to investigate best practices for innovation management in large Swedish organizations, the sample group of companies was limited to the 500 largest companies in Sweden based on revenue. The necessary company data was obtained from the global company database Orbis based on the companies' annual reports of 2017, since most companies had not at the time released their annual reports for 2018 (Orbis, 2019).

According to Tillväxtverket (2019), a company is defined as large if it has at least 250 employees. All companies with less than 250 employees were filtered out within Orbis. The resulting 500 largest companies included both private, public and government owned organizations (see Appendix D for company names). However, when creating the final ranking, all organizations where the Swedish government owns a majority share have been excluded.

Since many of the largest companies have subsidiaries with high revenues, the list generated by Orbis had to be manually cleaned so that subsidiaries such as: Volvo Trucks, Volvo Construction Equipment and Volvo Penta to be deleted from the list since they all are subsidiaries to AB Volvo, which is already on the list. However, the names of deleted subsidiaries have been saved and added to the search string in Retriever Media as in many cases, the name of the subsidiary is the commonly used name for parts of – or the whole company group. The names of subsidiaries were also used to clean the data (see Appendix A). In similarity to different names of subsidiaries, some companies are in common language mentioned with a different or short version of the name. As an example, Hennes & Mauritz is in public media usually just referred to as H&M. To get a good search result in Retriever Media, these commonly used names were added manually when going through the list.

3.2.3 Data Processing

To avoid downloading over 3.1 million articles that were published in printed press during 2018, and stored in Retriever Media's archive, all of the articles where filtered online using the above defined keywords and company names. Furthermore, a filter was also added to exclude all articles published by Cisionwire (Cision, 2019). Since Cisionwire is a news portal where companies publish their own news and press releases, it has been excluded under the

assumption that their articles will be less objective compared to articles written by external journalist.

After downloading the filtered articles from Retriever Media, all articles were merged into one file and cleaned up to the extent where they could be analyzed in the statistical computing and graphics language R, using the environment R Studio (see Appendix A for the detailed method of downloading and cleaning articles) (RStudio, 2019). Using RStudio, all articles are searched for the company names within the sample group and paired with the specific company that is mentioned within each article. This was then used to calculate how many articles each company has been mentioned in as well as create a joint index to enable a sentiment analysis on each separate company-article pair (see appendix A for how to process the data in RStudio).

3.2.4 Sentiment Analysis

A Sentiment Analysis is a method of analyzing people's sentiments, evaluations, appraisals, attitudes and emotions towards entities, including organizations among many others (Bing, 2012).

This type of analysis can be performed using the RStudio together with libraries (see Appendix A for the detailed method of conducting the sentiment analysis). In this thesis, RStudio has been used together with multiple libraries, including a sentiment lexicon by the National Research Council Canada (NRC) (Saif & Turney, 2010). In combination with other libraries, it is possible to categorize words in a positive/negative way and associate words with the emotions: anger, fear, anticipation, trust, surprise, sadness, joy and disgust (Saif & Turney, Crowdsourcing a Word-Emotion Association Lexicon, 2013) (Saif & Turney, 2010).

The sentiment analysis conducted in this thesis has been on an article level, meaning that the article has been analyzed as one piece instead of dividing them up into sentences and analyzing each separate sentence individually. Therefore, the output of the sentiment analysis is a positive and negative score regarding the whole article, also known as a document-level sentiment classification (Bing, 2012). This level of analysis was chosen based on the data, the ability to clean the data, and the libraries that were available for use. This was done under the assumption that each article referred mainly to one company at a time.

3.2.5 Ranking the Companies

To rank the most innovative companies in Sweden based on printed press from 2018, all companies are sorted by their innovation score. The innovation score is based on the number of articles a company is mentioned in and multiplied with the mean sentiment score. However, it was found that a company's exposure in media was correlated with the company size in terms of revenue. Therefore, the ranking was adjusted by dividing a company's number of articles with the equation obtained from running a regression in RStudio, see equation 1.

$$Adjusted\ Number\ of\ Articles = \frac{Number\ of\ Articles}{a + b * Revenue} \quad (1)$$

After adjusting the number of articles, the top 25 ranking was created by selecting the companies with the highest innovation score and with more than 15 articles. The lower requirement of at least 15 articles to be ranked top 25 was chosen since the mean value of the sentiment scores was based on a larger sample of articles. The reason for this is that some

articles receive an overly positive sentiment score compared what the main context actually is about, due to the journalist's overuse of certain keywords found in the sentiment lexicon. By setting the lower requirement to 15 articles, the impact of an overly positive articles has on the mean sentiment score is effectively reduced. Increasing the lower requirement gives a mean sentiment score that is less sensitive to overly positive- and negative articles. However, a requirement that is too high will result in the ranking becoming more dependent on company size. Therefore, 15 articles were determined as the optimal minimum requirement to ensure the best of both worlds.

To verify the relevance of the top 25 ranking companies, the articles connected to these companies were randomly selected and verified so that they actually referred to the company in the context of innovation, and not people or objects with the same name. Articles that did not directly refer to the company in an innovative context was removed, lowering the companies score. This was iterated until all top 25 companies had been verified to have relevant articles.

3.2.6 Interviews

After manually verifying the top 25 companies from the ranking, the top 15 companies from that list were approached for interviews. Due to time being limited, the decision was made to limit the interviews to the top 15 companies with two interviews in each. Within each company, a judgmental sampling was conducted to find people with a high position together with relevant knowledge of the company's innovation management processes. These interviewees were searched for using LinkedIn, online search engines, company websites, as well as mutual contacts. For finding the second interviewee, a snowball sampling was conducted by asking the first interviewee who to contact for a second interview. If the second interviewee was unable to participate, or if the first interviewee was unable to recommend a colleague to contact, a judgmental sampling was used instead. Since the objective with the interviews is to highlight the most innovative companies' practices within innovation management and present it as multiple case studies, and therefore not generalize the sample to a whole population, both judgmental and snowball sampling are valid methods to use (Collis & Hussey, 2014).

Each interview was recorded with the permission of the interviewee for the purpose of transcribing. This ensured that the valuable information that given by the interviewees could be re-listened to when analyzing the interviews. Furthermore, each interview was conducted in English and the interviewee had the opportunity to state if they desired to be anonymous in this report. However, since a large group of the interviewees wanted to be anonymous, the decision was made to treat all interviewees the same. Therefore, the interview results are written so that it is not possible to connect one answer to one specific interviewee or one specific company.

The interviews conducted were semi-structured with open-ended questions based on the interview guide found in Appendix F. The interview guide was inspired by the ISO-56002 standard and has the eight areas: Innovation Vision, Innovation Policy, Innovation Objectives, Innovation Strategy, Operation, Support, Assessment and Improvement. For each area, there are 1-5 questions covering key points of interest. Each interview started by first giving a short presentation of the research objective as well as the outline for the interview. In three cases, the interviewee requested the interview guide before determining whether to participate or not. In these cases, the interview guide was sent to the interviewee while in all other cases, the interviewees experienced the question at the time of the interview. The timeframe of each

interview was 60 minutes although the mean length of the interview was 47 minutes. Since many of the interviewees were situated outside of Stockholm, most interviews were conducted over phone or Skype while two interviews were conducted face to face.

After presenting the research objective and interview outline, the interviewees were asked to give a short description of themselves and the company, followed by questions and areas of the interview guide found in Appendix F. In many cases, follow-up questions were asked when the interviewee touched upon interesting practices related to innovation management. This is one of the benefits with the case study methodology as it allows for digging deep into phenomena within their real-life contexts (Collis & Hussey, 2014).

The interview recordings collected from the interviewees were first transcribed and then coded. Since the interviewees in some cases gave a broad answer covering multiple questions or areas, each interview was coded using the 8 areas of the interview guide to enable an easier analysis and comparison of interviewee answers. This was conducted by creating a matrix in Excel where each column represents one interview and each row represents one area or code. By transcribing and coding all interviews, the material becomes more familiar which is essential for conducting a cross-case analysis (Collis & Hussey, 2014). Analyzing the information extracted from the interviews was done for one row at a time with the focus on finding either unique practices of high interest or practices that were shared by multiple companies.

3.2.7 Survey

The survey in this thesis has two goals. The first goal is to give a broader perspective by complementing the cross-case analysis based on the interviews. The second goal is to get data on how important companies actually perceive the different elements of the ISO-56002 and the Ten Types of Innovation framework, as well as how well they currently perform within each of these elements. Since the survey is less time consuming than the interviews, the sample size of companies can be increased as well as including a further dimension. By comparing the most innovative companies with reference companies, potential differences between focus areas and elements in their innovation management systems could be spotted. Therefore, the sample group was extended to 50 companies, the top 25 companies from the innovation ranking as well as 25 reference companies that received lower innovation score. The reference companies have been chosen based on their two-digit Swedish Standard Industrial Classification (SNI) number which classifies enterprises according to the activity carried out (Statistiska centralbyrån (SCB), 2019).

Out of 50 contacted companies, 37 agreed to participate. Although having multiple respondents in each company would increase the certainty in the answers (Collis & Hussey, 2014), the scope of the survey was limited to one respondent per company due to the short timeframe. However, a judgmental sampling was conducted in the same procedure as the interviews to find employees with a high position together with relevant knowledge of the company's innovation management processes. Among the top 15 companies that participated in the interviews, the interviewee was the person answering the survey in the vast majority of cases.

The survey was designed with 34 questions in total where the first ten questions were connected to the Ten Types of Innovation framework with the following 24 question connected to the ISO 56002 (see Appendix G for survey). In the first ten questions, the respondents rank how important they think each of the ten innovation types found in the framework are, and how they

regard the company's performance within the area. The following 24 questions have been developed by Magnus Karlsson at Inngage Consulting as an innovation management capabilities assessment tool (Karlsson M. , 2019). Magnus Karlsson has also been a key individual in the development of the ISO 56002 and is also the chairman of Innovationsledarna, an organization for innovation managers in Sweden. Each of the 24 questions are based on elements from the ISO 56002, where the respondents rank the company's current level and the level of importance for each element based on the five statements: *1. Informal or ad hoc¸ 2. Managed at basic level, 3. Defined and managed, 4. Systematically managed* and *5. Optimized.*

All 34 questions in the survey use discrete variables with a range of 1 to 5 as well as the choice no answer. Before commencing the survey, all respondents are requested to fill in their name, company name, job title, years of experience working with innovation related tasks as well as if they want their answers to be anonymous. The survey was sent to the respondents via link to conduct it online, where the approximate time required for answering all questions thoroughly was circa 15 minutes.

To analyze the survey results, both descriptive and inferential statistics were used. Descriptive statistics were used to give a detailed view of how each survey question was answered using descriptive charts. This is a good method of summarizing data in a compact form to enable patterns to be found that are not apparent in raw data, as well as detecting new hypotheses that can be tested through inferential statistics (Collis & Hussey, 2014). In terms of inferential statistics, both bivariate and multivariate analyses are conducted using Cronbach's Alpha, Correlation Analysis, T-Test, and Mann-Whitney U Test in RStudio.

To check the internal reliability of multiple-item scales, such as the survey questions, Cronbach's Alpha is the most widely used test (Collis & Hussey, 2014). The method creates an index of reliability based on the inter-item correlation of the whole sample and it is a good way of determining whether to exclude any of the items tested before performing further statistical tests. As the 24 questions related to the ISO 56002 can be categorized into the six different areas: *Context and condition, Leadership, Planning, Support, Processes* and *Evaluation and improvement,* the Cronbach's Alpha test is used to verify that the questions within each of the six areas are correlated to each other. If the Cronbach's Alpha coefficient is above 0.7, the inter-item correlation is considered satisfactory (Bland & Martin, 1997).

To investigate the if there is any correlation between the company's innovation score, the mean performance score, and mean importance score rated by respondents, Spearman's correlation method has been used as the survey data is non-parametric (Collis & Hussey, 2014). While Pearson's correlation method evaluates a linear relationship between two continuous variables, Spearman's correlation evaluates a monotonic relationship between continuous variables but also between ordinal values as used in the ranking.

The methods used to test if there is a significant difference between two samples vary depending on if the data is parametric or non-parametric (Collis & Hussey, 2014). For parametric data, the T-Test is the recommended method. However, since the T-Test assumes that the data is normally distributed, it is not recommended to use a T-Test for non-parametric data. Instead, the Mann-Whitney test is recommended to use when comparing differences between two samples of non-parametric data (Collis & Hussey, 2014). Since the two groups of companies are paired and share similar characteristics, the Paired Sample version of the T-Test has to be used while the Mann-Whitney test can be used normally with paired data (Collis & Hussey,

2014). When testing whether there is any significant difference between how the two groups of companies answer the survey question, both these methods are used depending on if the tested data is normally distributed or not. Testing if the data is normally distributed can be done using the Shapiro-Wilk test or by visualizing the data in a histogram (Collis & Hussey, 2014). For the data to be assumed normally distributed, the general rule is that the sample size should be larger than 30 samples (Chakrapani, April 2011).

3.3 Validity and Reliability

Since the methodology has a mix of positivism and interpretivism paradigms to answer a broader research question, both reliability and validity need to be high. In many cases, positivism tends to produce results with high reliability but low validity and vice versa for interpretivism (Collis & Hussey, 2014). However, using multiple research methods such as combining qualitative interviews with a quantitative survey, referred to as a methodological triangulation, has the benefit of giving a broader perspective and reducing biases (Collis & Hussey, 2014).

In order to achieve high reliability, replicability in the study is important and if repeated, there should be no difference in results (Collis & Hussey, 2014). Therefore, the research approach has been to create a methodology that easily could be repeated. For re-conducting the innovation ranking, a step by step handbook was created including information on what type of software required for conducting the ranking as well as the necessary script of code (see Appendix A for handbook). The different types of software that were used was selected based on accessibility, where the licenses could be obtained through university libraries if not free of charge. Furthermore, the interview guide and survey questions are both included in the appendix (see Appendix F & G for interview guide and survey), as well as described within the methodology. The methodology also describes in detail how the case study has been conducted as well as what type of methods have been used to analyze the data.

In terms of validity, there are three main areas to consider: *internal validity*, *construct validity* and *external validity* (Gibbert, Winfried, & Wicki, 2008). For internal validity, the research approach has been derived from literature, although parts of the innovation ranking are experimental. Theoretical triangulation has been achieved through the use of both the ISO 56002 and the Ten Types of Innovation framework as well as other literature to interpret findings. For construct validity, the data analysis is easy to follow as well as explained step by step in the methodology. In addition, all the used research methods have been reviewed and discussed with the thesis supervisors. Achieving external validity is done by using cross-case analysis of different companies based on both data collected within the study and retrieved from other sources.

4 Results & Analysis

Chapter four describes the results from the innovation ranking, the interviews, and the survey. The results from the innovation ranking are presented together with an analysis of each step in developing the ranking. Following, identified practices from the interviews are presented in the form of cases and as described by the companies. Lastly, the results from the survey are presented together with interesting findings.

4.1 The Ranking: "Sweden's Most Innovative Companies"

Using keywords related to innovation management and company names (see appendix F for company names), over 7,000 articles were found and downloaded from Retriever (Retriever Media, 2019). Since some media companies own multiple newspapers, it has been noticed that sometimes duplicate articles are published. After sorting out duplicates, the number of unique articles dropped to 5,177.

4.1.1 Company Frequency in Media

Out of the 500 largest companies in Sweden, the most frequently mentioned companies in terms of innovation were technical universities such as Chalmers University of Technology. Even though the innovative output of Sweden's universities was an interesting topic to discuss, it was outside the scope of this study. Therefore, all universities and companies where the Swedish government owned a majority share was removed. This resulted in 62 companies being removed from the list and out of the remaining 438 non-governmental organizations, 284 were mentioned by at least one article.

Since the top five mentioned companies were: IKEA (225 articles), Ericsson (163 articles), ICA (159 articles), Scania (158 articles), and ABB (150 articles) it was assumed that company size was correlated to how frequently they were mentioned by media in a context of innovation. This was verified using a multilinear regression where the number of articles were used as the independent variable and company revenue and number of employees as the dependent variables. The results showed that there was a significant linear relationship between the number of articles and the company's revenue. However, there was no significant relationship between the number of articles and the number of employees. Therefore, the number of employees as a variable was removed from the regression. As shown in Figure 3, the p-values obtained in from the regression are lower than 0.05, indicating that a significant linear relationship exists between number of articles and company revenue (Collis & Hussey, 2014).

```
Residuals:
    Min      1Q  Median      3Q     Max
-93.679  -8.395  -5.467   1.825 202.983

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 7.939e+00  1.577e+00   5.033 8.61e-07 ***
Revenue     5.096e-07  3.946e-08  12.914  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 23.73 on 283 degrees of freedom
Multiple R-squared:  0.3708,    Adjusted R-squared:  0.3686
F-statistic: 166.8 on 1 and 283 DF,  p-value: < 2.2e-16
```

Figure 3, regression using number of articles as the independent variable and revenue as the dependent variable.

Adjusting for the linear relationship made it possible to create a company ranking that is independent of company size based on an adjusted number of articles.

4.1.2 Sentiment Analysis

While the larger companies were placed higher on the list when counting number of articles, the sentiment score showed no correlation to company size. Looking at the company size in terms of revenue, the top five companies ranged from SEK 3 billion to SEK 34 billion. However, all the top five companies that received the highest sentiment score: Ambea (4 articles), Investor (1 article), Transdev (2 articles), Recipharm (3 articles) and NKT Cables (2 articles), had very few articles. Since the sentiment score is based on the frequency of certain keywords and the length of the text, short texts that contain a high amount of positive words will receive a high score, and in combination with just a few articles, the mean sentiment score will be extremely high. When reading through the articles that received the highest sentiment score, it was concluded that some articles were written with a very repetitive and optimistic language that projected the actual event described in the text as abnormally positive. Therefore, to avoid extreme values of the mean value of the sentiment score, all companies with less than 15 articles were sorted out under the assumption that more articles would create a more accurate score.

4.1.3 Final Ranking: Sweden's Most Innovative Companies

When ranking Sweden's most innovative companies, the adjusted number of articles is multiplied with the mean value of the sentiment score to create an innovation score (see Appendix E for full ranking). However, after verifying the articles connected to the top scoring companies, some companies such as Findus were mentioned only indirectly and therefore filtered out. In the case with Findus, most articles talked about a new company that had moved into Findus old factory in Bjuv. The articles that directly referred to Findus were lower than 15 and therefore, Findus was filtered out. The top 25 companies of the ranking have all been verified that they are the actual company referred to in the articles as well as the article having an innovative context. The top 25 most innovative large companies in Sweden 2019 are presented in Table 2:

Table 2. Sweden's Most Innovative Companies

1. IKEA	6. Klarna	11. Tieto	16. Arla	21. ATG
2. ABB	7. Siemens	12. Stena	17. ICA Gruppen	22. IBM
3. Saab	8. Spotify	13. Valmet	18. Scania	23. Vasakronan
4. Stora Enso	9. Serneke	14. Epiroc	19. Veidekke	24. Swedbank
5. Castellum	10. CEVT	15. NCC	20. Coop	25. Riksbyggen

The top 25 companies seen in Table 2 are perceived by media as more innovative compared to the other companies in the sample group and they vary both in size and industry. To determine best practice for innovation management in large organization, 15 of the companies were approached for interviews and all of the 25 companies were approached with a survey.

4.2 Interview Results - Case Studies of "Sweden's Most Innovative Companies"

Out of the top 15 companies of the ranking, 14 executives and managers from 12 companies chose to participate in the interviews. Although the goal was to conduct two interviews at each company, some of the approached interviewees chose not to participate due to various reasons. In two interviews, the interviewee was accompanied by a second person from the company. Even though both participants have answered questions, these interviews are regarded as one interview. Table 3 shows the interviewees that have been interviewed regarding their company's innovation management practices.

Table 3. Title of interviewees with corresponding companies.

Company	Title
IKEA	Manager
ABB	Research Director
Saab	Vice President Group Strategy
Saab	Certified Innovation Manager
Stora Enso	Senior Innovation & Business Development Manager
Castellum	Head of Strategic Initiatives
Klarna	Vice President Product, accompanied by: Product Manager
Siemens	Head of Digital Innovation
Siemens	CTO of Gas and Power
CEVT	Head of Innovation Strategy & Exploration
Stena	Head of Digital Innovation
Valmet	Research & Development Manager, accompanied by: Marketing Manager
Epiroc	President & Managing Director
NCC	Head of Research & Innovation

Since the first question asked was: "In your opinion, what do you think makes the company innovative?", the interviewees answers were quite broad. However, certain aspects that many of the interviewees have expressed as important for the company to be innovative was:

Innovation and change should be iterative, decentralized, and started in small scale while receiving full support from top management.

These four factors were frequently reoccurring in the interviewees' answers and highlighted as something that set their company apart from the competition or industry in general.

Starting off small scale with a tight budget is how many entrepreneurs have created some of today's largest companies. While many organizations are trying to incorporate the attributes that makes some startups so effective in terms of innovation, some of the interviewed

companies take it one step further. Instead of using the typical strengths of a large organization, they try to work under the same limitations that normally apply to startups. This creates the need to work harder and closer to the customer as well as being more certain of their assumptions. As expressed by one interviewee: “Many believe that spending a lot of money is the solution. I am probably thinking the other way around. What if this would be your own startup? You don’t have any money. How can you go about it and really nail it down to the core and really evaluate the hypothesis to make sure that it is strong enough to apply?”.

On a more organizational level, one of the companies came up with the radical idea of dividing their whole organization into 200 different, what they referred to as, internal startups. Each internal startup consists of a cross-functional team of around 8 employees who, in most cases, have total autonomy in solving their designated problem space. This organizational structure is applied to all functions within the organization, even support functions. This was something that the interviewees believed make the company more innovative, since the innovation responsibility was evenly divided across the whole organization.

While many of the interviewees highlight decentralization of responsibility and decisions as an enhancer of innovation, a strong top management buy-in seemed to be an important co-component. As one interviewee puts it: “it is really essential to have a strong management buy-in to actually be able to drive an innovation agenda forward”. In their case, both the top management and the company owner have not been afraid to push innovation and digitalization forward within the company.

When it came to pushing things forwards, a popular phrase among the interviewees was: “we try to do things, not only talk about doing them”. This was usually expressed with pride in the context of trying new things out and iterating the process together with the customers.

4.2.1 Innovation Vision

The questionnaire used during the conduction of the interviews was based on the ISO 56002 standard, thus the definition from the standard was used for the term "Innovation vision". As described in the standard, an innovation vision is "a description of a future state of the organization is aspiring for", which is "not constrained by the organization's current capabilities", "serves as a guide" for various innovation aspects and "can be communicated internally and externally" (International Organization for Standardization [ISO], 2019).

Used within the decision-making process

Only three of the interviewed companies were able to state their vision which complied with the above stated definition. It is worth noting that the interviewees did not refer to the vision as being the "innovation vision", but an overall vision for the organization. Furthermore, it is not clear from the standard if the innovation vision is supposed to be embedded within the overall vision or coexist in parallel. Some companies use their innovation vision in everyday work while thinking about new ideas and using the vision as a tagline to see if it matches the idea or not, which helps guide the decision-making process on a very early stage. Other companies have also mentioned creating keywords for guiding aspirations in terms of innovation, in similarity with the previous cases. A few companies stated that their vision was to become the industry leaders or leaders within a certain field, i.e. becoming the digital leader.

Communicating the vision

Some companies were not able to state any innovation vision at all but rather focused on the strategy, goals, and objectives, which included some aspirations, but were highly focused on deadlines and delivering solutions. Four companies had a partially established innovation vision, though in most of these cases it was not clearly defined or stated, which leads to assumption that it might be poorly communicated and understood within the organizations, or still being developed.

In a more holistic view, the companies have demonstrated various substitutes to an innovation vision, or they are incorporating some of its aspects. Although they showcase various ways of guiding their innovation activities, in most of the cases, communicating and understanding the potential benefits of an innovation vision could be improved.

Identified practices:

- The innovation vision is used in the decision-making process for new ideas.
- Keywords connected to innovation are used for guiding new aspirations.
- There is an overall aim to become industry or/and digital leaders.

4.2.2 Innovation Policy

A policy is a course or principle of action (Waite, 2012). The term "Innovation policy" used in this study means a set of policies affecting innovation and incorporates the aspects described by the ISO 56002: "it provides a framework for setting innovation objectives, considers ethical and sustainability aspects, is available as documented information, as well as communicated, understood and applied within the organization" (International Organization for Standardization [ISO], 2019).

Environmental and sustainability policies

Multiple companies claim to have a policy that incorporates environmental and sustainability aspects. One of these companies also even had a policy for achieving financial sustainability. It is important to note that the majority of the companies did not have a written down policy. Most policies seemed to be communicated verbally by mid-level managers and within the departments by the employees. In one company, the employees take part in contributing to the environmental sustainability of the organization. Some departments have decided to only purchase vegetarian food for company events based on the employees' collective decision.

Communicating the policy

Some companies acknowledged the importance of having an innovation policy, although they had not been able to spread it throughout the whole organization. One of the interviewees expressed a concern about everyone not fully knowing the policy in the organization. This could be explained by the high focus on developing new products and the pursue of "good payback" on the companies' innovations. According to the interviewee: "the employees simply do not have time for it".

One company stated to be driven by an ethical policy, highly promoted by the CEO and fostered through the intranet. However, the innovation policy was still regarded as not well enough communicated within the company and therefore they recently set new targets for improving the communication surrounding the policy. As an alternative, one interviewee mentioned the use of corporate guidelines in the form of an "ethical and moral compass". This was not stated as a policy, but rather a methodology and a system set up for how to operate. Similarly, another company utilized taglines as a substitute for an innovation policy.

Transparency policy

Five companies directly expressed their policies as being aimed at actively interacting with their clients (customer-centric policies), while another company had a policy of transparency of their products where the customer is active in the decision making.

Overall, the interviewed companies had policies geared mostly towards essential components within their specific business area that enabled them to operate and sustain their business models. Nevertheless, multiple companies expressed having environmental policies either on a corporate, divisional or team level.

Identified practices:

- For innovation activities policies such as environmental policies, ethical policies, business and financial policies as well as customer interaction policies are used.
- Some policies are co-created together with the employees.
- There is a use of policy substitutes such as taglines and corporate guidelines.
- Policies are communicated verbally and through an intranet.

4.2.3 Innovation Objectives

Innovation objectives and the methods of selecting them differ among the interviewed companies. The overall impression is that the interviewees interpret the word innovation objective differently and, in some cases, use it intertwined with innovation vision and innovation strategy. Among the company objectives mentioned, some are directly correlated with financial performance indicators while others are correlated to areas such as the number of customers reached with the current product offering. In some cases, there are no innovation objectives at all, the company has other types of objectives and views innovation just as a mean to reach them.

Financial innovation objective

In one company, all products developed within the last 3 years were viewed as innovations. The company had the objective that these innovations should account for 15% of the company's total revenue streams. To achieve this, the CEO had earmarked certain funds that employees could apply for if they come up with a strong idea. This objective was fairly recently set within the company as the CEO wanted to double the current revenue stream from innovation projects which the year before had been between 7% and 9%.

In contrast, another company wanted to switch focus during 2019 to distribute more time towards incremental improvements and optimizing what has already been developed. In their case, the objectives related to innovation are decided on a yearly basis and the recent ones come after a time of large growth within the company's business areas.

Interlinked objectives

While some innovation objectives are stand alone, others are more interlinked with different business objectives. One company explained that they do have innovation objectives when it comes to their innovation portfolio, in terms of how much that they will spend on co-creation and how much they will be able to spend on research. However, these objectives have to be linked and comply with the current objectives for the business development. Similarly, another company uses their five strategic areas for business development: Sales, Automation, Digitalization, Operational Efficiency and People & Leadership, as the base for setting their innovation objectives. From the limited number of interviews, there is an impression that the methods for setting innovation objectives differs between the industries. For highly regulated industries, it seems harder to set innovation objectives due to the limitations related to how new ideas can be developed and tested.

Identified practices:

- There are innovation objectives correlated to areas such as financial performance or numbers of customers reached with the current product offering.
- The innovation objectives are sometimes interlinked with the innovation vision and the innovation strategy.
- Strategic areas within the company are sometimes used to set the innovation objectives.
- Some decide new innovation objectives on a yearly basis.

4.2.4 Innovation Strategy

When asked about the company's strategy to reach their innovation objectives and overall innovation vision, partnerships were a key component. Even though the type of partnerships differed between the companies, sharing financial and human resources to develop something beneficial to both parties seems to be viewed as an effective accelerator for innovation. While there is a lot of secrecy in some industries, other industries are more open towards partnership with established companies and even sometimes direct competitors. One company described a fairly recent partnership between four of Sweden's largest companies, where they have joined forces to drive innovation forward in areas of mutual interest. While there have been some conflicts of interest, the overall benefit for companies, and also the benefit for Sweden as a nation, has been much larger than any of the negative aspects. Parallels can be drawn between these types of collaborations and the success of companies in Silicon Valley as according to the interviewer: "Sometimes people ask why Silicon Valley is working so well. The typical answer you get is the openness; people are very willing to share. For us, this is typically accelerating things as when you open up, you get influences from others and you can in some cases even share or cross license IP."

Collaborating with startups

In addition to partnering up with established companies, many of the interviewees highlighted the benefits of collaborating with startups. A common practice among the companies is to help startups within their field of interest to accelerate and develop their concepts. If it then turns out that the concept after further development has a large potential, the company acquires the startup. There seems to be two main methods of doing this among the companies. The first method is to scan the market for interesting startups and then invest financial resources through their own venture capital company or by partnering up with other venture capital companies. The second method is to build an accelerator inhouse or together with external partners where startup companies either need to apply or are headhunted for participation. The processes and stages within the accelerators differ between the companies although a common practice is to support with competence and resources. One company has created something that they call "synergy" where startups are allowed to sit at their premises and sign contracts with the company's different business units. According to the interviewee: "the idea is to get hold of technology, integrate it into our products and support the companies to get stuff to the market and accelerate innovation."

Innovation labs

Another popular innovation strategy for the companies is to create their own startup or innovation lab. This can either be done internally or externally and together with partners. One of the companies realized that they did not have the resources or knowledge internally to work with innovation. As a solution, they decided to create an innovation lab together with external experts so that they also gained the experience and knowledge from other industries. The idea with their innovation lab was to focus on disruptive innovation, see the business with fresh eyes, and challenge it. By placing the innovation lab outside the large organization, they noticed that it took shorter time to develop new things with higher results. This idea is supported by Govindarajan & Trimble (2010), who argues that companies should be divided into two teams: one small team focusing on innovation and one large team focusing on making the core more effective and efficient. Furthermore, they suggest that the small team should be built much like a startup using a dedicated team and separate goals.

Dedicated teams

The same strategy is used by some of the companies when focusing on new fast-moving technologies. By creating a small designated team with focus on looking ahead of the current offering and developing completely new concepts, they manage to get a jump start on i incorporating the technology within the organization. However, two key success factors when creating a dedicated team is that it should be cross-functional and be allowed to fail.

As mentioned earlier, one of the more radical innovation strategies among the interviewed companies was to take the whole company and divide it into problem domains, which were then divided into 200 different problem spaces. For each problem space a team of 8 people is assigned to solve that problem space by executing solutions on their own, independently from each other. Since the teams are fully cross functional, new concepts can be created and tried out within a very short timeframe. However, very large changes or changes that affect other teams have to be approved by the domain leads and in some cases top management.

Decentralized organization

The idea to have a decentralized organization to close the gap between the market requirements and the actual decision making is a common thread throughout the interviews. Involving the customer in the development process has for some of the companies been vital, especially when it comes to digitalizing their product offering. While there are different ways of achieving customer involvement, the design thinking process has been mentioned by multiple companies as a good tool for fulfilling customer needs and creating new offerings that the customer really values.

Although a set long-term innovation strategy is the designated choice for some companies, others highlight the potential dangers it can bring when the market rapidly changes. Instead, some companies advocate a more agile approach and argue that it is impossible to know if the expectations and requirements from the customer will be the same in three years. Similar to Reeves, Love and Tillmans (2012) one of the interviewees argued that: “We live in an unstable environment, and when instability is the norm, we need to have more of an agile approach on strategy. We are talking about moving away from planned strategies to emerging strategies. We're living in the mindset of an emerging strategy. We don't do plans more than one year ahead, because we don't know what happens in this year and therefore, we need to have agility.”.

Identified practices:

- Partnerships are used to effectively accelerate innovation.
- Research & development is opened up by some companies to get influence from external sources.
- Collaborations with startups are used to get hold of new technologies at an early stage. Innovation labs and accelerators are used to focus on disruptive innovation.
- Designated, and in many cases cross-functional, teams are used to focus on fast moving technologies.
- One company is divided into small and to a large extent autonomous startup each assigned to a separate problem space, to divide the innovation responsibility over the whole organization.
- A decentralized organization is used to close the gap between market requirements and the actual decision making.
- An agile approach is used instead of a long-term innovation strategy to cope with rapidly changing markets.

4.2.5 Operation

In terms of innovation process, stage-gate, agile, lean, design thinking, and dragons' den are popular terms used by the companies to describe how they generate, develop and test their ideas. The most common one, the stage-gate process, was directly referred to by six of the companies and indirectly referred to by two While some companies use the classic version referred to by Cooper (1990), most companies use their own modified version based on other types of project management techniques as well. One of the interviewed companies, as an example, explained how they have tried to integrate lean methodology into their stage-gate model, to avoid developing things that in the end does not generate any customer value.

Similar, one interviewee describes their process as: "on a higher level we have a linear process, but as in all parts of innovation the underlining steps of the process need to be iterative. In my experience, it is almost impossible to perform linear innovation. If it is linear, I would rather call it development and not innovation.".

Lean and agile

Using a lean and agile mindset when working with innovation has helped some of the companies to generate better solutions at a higher pace. One of the companies that advocates agile thinking has also shifted their process when it comes to generating ideas and testing the feasibility. Instead of focusing on larger ideas and therefore generating fewer, they have started to limit the budget for feasibility testing to promote teams to conduct smaller tests while focusing on a larger quantity of ideas. They argue that a larger volume of new ideas, increases the likelihood of generating good ideas.

Having what some referred to as a dragon's den or a shark tank is one way of promoting employees to contribute with new ideas. This can be used in parallel with the ordinary innovation process as done by two of the interviewed companies. One of these two companies use it within what they call their innovation program that they run from time to time. Within

this program, employees get support from the company in developing their ideas and finalize by presenting for an investment board.

Faster processes

For some of the companies that have created dedicated structures for innovation task such as innovation labs or internal startups, the stage-gate process is either reduced or disregarded. This is done with the aim to increase speed by taking away administrative steps that usually require time. As one of the interviewees explain: "the idea is not the for the management to micromanage the teams, instead we should enable their possible success by giving them the resources that they need and focus on fighting off possible blockers. This is so that the teams can execute as fast as possible in their area of expertise, while all the boring stuff is sorted out so that they do not need to care about it.".

The need for speed is also highlighted by another company that has increased their innovation speed by reducing the time for decision making. In their innovation lab, they use an agile approach with high speed in focus. When new ideas emerge, the decision to invest time and other resources can quickly be made by having an investment board that meets frequently and that can deliver decisions within a short timeframe. However, focusing on high speed is not something that all companies do. In contrary, it is something that sets the top 25 companies apart from the vast majority. According to Reeves, Love and Tillmmans (2012), 70% of companies value accuracy over speed of decision. This is something that the three authors find interesting considering that the companies' environments usually are unpredictable and fast moving.

Forecasting market trends

Besides having the processes to deliver fast change, many companies regard it important to be able to spot and forecast market trends. One company frequently uses cross-impact matrixes based on known trends to create what they refer to as "different tomorrows". Currently, they have defined five different tomorrows which they need to prepare for when it comes to new products and services. This is something that they use for what they call "Horizon 2" and "Horizon 3" type of innovations, and it is based on an idea generation process that they call "Gear Up". The goal with "Gear Up" is to generate ideas using different types of methods and approaches depending on what type of innovations they want to achieve: "Horizon 1", "Horizon 2", or "Horizon 3". Within each Horizon they have different arenas and involve different people and different parts of the organization. For "Horizon 1" innovations, they use internal innovation activities that they refer to as "idea jams", within the different departments of the company. If they want to establish "Horizon 2" innovations, they also include customers and suppliers in the innovation activities and refer to it as Innovation labs. For "Horizon 3" innovation, they either run open innovation activities or acquire startups through innovation scouting labs.

Storing ideas

Although most of the companies had a method of storing both successful and unsuccessful ideas, few interviewees could give an accurate number on how many of the ideas that in the end generated a successful outcome. In many cases, the interviewee stated that the company did not have any good measuring of successful innovation initiatives. One interviewee even stated that "one of the things that keeps us going so fast is that we don't do a lot of documenting". Furthermore, another interviewee problematized the term successful innovation initiatives,

since the company did not have a clear definition of what to consider a successful innovation initiative. Even though most interviewees could not give an exact number of successful innovation initiatives, they could still deliver a guesstimate. These guesstimates had a widespread from 10% to 70%, however, hearing the reasoning behind the guesstimate highlighted the previous mentioned problem of how the companies and interviewees define a successful innovation initiative. Since most of the companies try to obtain an innovation culture where failure is allowed, and in some cases even promoted as a way of learning, it gives the impression that the border between what is defined as a successful initiative and non-successful initiative is a gray zone. Furthermore, some companies also seem to have different definition of the word initiative, some take pre studies into consideration while others do not.

On the contrary there seemed to be no lack of tools and methods used for generating, developing, and evaluating ideas. The most commonly used tools and methods in addition to previously mentioned ones were: Business Model Canvas, Value Propositions, Co-Creation, Pitching, Concept Case Solutions, Feedback Loops, Cross-Impact Analysis, and Design Thinking. One interesting observation was how the companies seemed to modify these different types of tools and methods and combine them to fit in their company and their purpose.

Identified practices:

- Stage gate systems are modified and mixed with other methodologies to fit the scope of use.
- Methods such as Agile and Lean are used to increase the speed of innovation. Limitations added to the feasibility tests are used to promote teams to conduct smaller tests but focus on a larger quantity of ideas.
- A shark tank/dragon's den is used to promote and support employees to contribute with new ideas.
- Administrative tasks are removed to increase speed within designated teams and innovation labs.
- Cross-impact matrixes are used to forecast market trends. Multiple tools and methods are used individually or combined including: Business Model Canvas, Value Propositions, Co-Creation, Pitching, Concept Case Solutions, Feedback Loops, Cross-Impact Analysis, and Design Thinking.

4.2.6 Support

Organizations should ultimately have an approach for competence management and development (International Organization for Standardization [ISO], 2019). Nine interviewed companies mentioned courses, programs and seminars to develop competences related to innovation management. Two companies have specific career development paths and training within the area. Both interviewees motivated the existence of different career paths by stating that: "not everyone wants to work as an engineer continuously, or as a manager and those people require additional knowledge/competence building". Multiple companies had innovation leadership training programs, with one company focusing on idea openness training. Similarly, one company has mentioned annual meetings in which there is dedicated time to discuss further competence development of various members, as well as with whom to collaborate to achieve the desired result. An alternative to that approach is the annual event one company has created where they host a full-day conference for employees to disseminate gained knowledge through an internal spokesperson. Another solution for building competences is having an internal academy as described by one company. The aim with the academy was to certify innovation managers and educate employees within the organization based on the previous ISO-standard for innovation management.

Spreading knowledge

Some companies acquire sought after competences through collaboration. Many of the interviewed companies collaborate with partners to complete projects both faster and also to increase learnings from others to strengthen the internal competences. An example of this, by using cross-functional teams internally or together with partners, "broad" knowledge is built to deepen the professional skills among the employees. One company had a significant interest in how startups operate and what they could learn from it, especially in the areas regarding innovation and speed. Two companies use a method referred to by one of the interviewees as "infecting the organization with innovation". These companies create project teams that during a limited period of time have extra focus on innovation and generating new ideas. When the project team is disassembled, the idea is that these project members are "infected" by innovation and when returning to their separate departments, they will spread the innovative mindset further. As an alternative to "infecting", the innovation lab within one company hires employees with entrepreneurial backgrounds to fill identified competence gaps. It was also surprising to find that one company, in addition to some of the previously mentioned methods, used monetary incentives for management to progress on certain proposed innovation projects.

In terms of free time for employees to develop new ideas, three companies have expressed that individual employees have some degree of freedom to development their own ideas. Some companies stated that it was expected from workers that they have some time "here and there" to work on their own ideas although the distribution of time and resources varied from project to project. In one case, free time was only given during their design thinking sessions, while in another company a central governance was used to approve ideas and distributed time to avoid big projects from halting. The same company also fostered the belief that results could be gained using small monetary resources at the initial stages of a project. In contrast, two companies stated having "R&D free money" or "a pot of money" for developing ideas, though initially the idea needed to be presented to the responsible manager(s) to be eligible to access the funding and time provision.

Innovative culture

Five companies expressed a strong culture of promoting innovation within the company, even though some of their industries were quite conservative. As one company has mentioned, a solution for overcoming a conservative industry or a conservative company is to put the innovation lab outside of the company to give them more freedom in creating their own culture and innovation process. Some companies tried to foster a culture of intrapreneurship with the aim to generate and kill ideas more effectively. Further support functions such as innovation leaders and innovation coaches were also mentioned as contributors to create a culture that fosters innovation and intrapreneurship. As one interviewee stated: "culture is key for innovation". This is also confirmed by a second interviewee claiming that: "it can sometimes be hard to understand what employees' value. However, their values will be expressed in their attitudes and behavior, and therefore, it is important to have incentives that foster an innovative culture"

Strategic intelligence

All of the interviewed companies frequently gathered and analyzed strategic intelligence internally and/or externally. Five companies highlighted internal intelligence teams using a multitude of approaches to gather and process information. Three of these five companies had multiple intelligence units within one single department to gather data using tools such as "data mining, analytics, prediction markets, environmental scanning, technology watching", among others. One company had an internal phone application used by the whole organization to share new findings and observations by taking pictures/videos/etc. The information was then passed forward with attached comments to the intelligence department for further investigation. Another company used a similar approach by having a data science team to evaluate findings posted to the intranet for further investigation. A third company used a separate technology unit to investigate different areas of interest and send out weekly reports of their findings as well as organize quarterly online briefings, where all employees were welcomed to attend.

External consultancy firms are also frequently used to collect and process strategic intelligence. One company expressed the need for consultants to identify potential technologies of interest outside of the company's core focus for future adaptations to extend the offering. For example, using sensors from another industry to create a new offering within theirs.

Some companies mix internal and external resources to gain strategic intelligence. One company used their global presence to create a technology watch network to generate quarterly reports on objectives of interest across the globe. Other companies highlighted combining both internal and external resources when gathering data as they aim to work with the "best in the field".

Identified practices:

- Internal education programs, conferences and certifications are used to develop competence within innovation management.
- Collaborations and partnerships are used to acquire sought after competences.
- Project teams are used to "infect" departments with an innovative mindset.
- People with an entrepreneurial background are hired to fill competence gaps. An innovative culture is fostered to promote and support new ideas.
- The innovation lab is moved outside of the company in conservative companies and industries.

- An internal phone application is used for sharing new ideas within the company.
- Strategic intelligence is gathered and analyzed internally and/or externally.
- External consultancy firms are used to gain knowledge in specific areas.

4.2.7 Assessment

None of the interviewed companies had a systematic method of assessing the efficiency and effectiveness of their innovation management systems although some companies try to make improvements on a yearly basis. However, three companies performed non-systematic assessments. One of these companies assessed the innovation management system on two levels, first an internal assessment on a divisional level and secondly an external assessment on a company group level using external consultancy firms. Some companies had a narrower focus in terms of assessments, for example evaluating the technology readiness level, or performing assessments with a customer centric approach. Some companies use customer follow-ups as a type of assessment: if the implemented technology works and the customer feedback is positive, the innovation has been successful and therefore no improvements in terms of innovation management are required. In contrast, one company's departments performed independent internal assessments biannually to decide in what areas to improve. Having good innovation capabilities was a strategic target within that company and incentivized for the top management. Lastly, one company had a more centralized approach where the internal assessment initiation was controlled by an investment board.

Identified practices:

- Non-systematic assessments are conducted to increase the efficiency and effectiveness of the innovation management system.
- Assessments are conducted internally as well as externally using consultancy firms and customers. Good innovation capabilities are used as a strategic target.

4.2.8 Improvement

In this study the term "improvement" refers to improving the innovation management system. This includes "any actions and changes to the innovation management system, considering the performance evaluation results" (International Organization for Standardization [ISO], 2019).

The interviewed companies have described a variety of ways in which they perform improvements to their innovation management system. Four companies perform these activities annually. As an example, one company has a two-day session with the involvement of mid-level management from one of their "core" divisions for reviewing and improving their processes. During this two-day session, the company also tries to align their processes to their strategic direction. This approach is also utilized another company, although they use it for each department independently and not on a yearly basis.

External feedback

Some companies focused on collecting feedback from employees and customers in combination with annual reviews to decide upon focus areas in which to improve. One of these companies has an innovation lab where the processes are continuously improved using consensus-driven decisions to foster an entrepreneurial spirit. One company hired external consultants and found 16 areas in which they determined it possible to do innovation management improvements. Depending on the primary focus of the department, each department was assigned different key points of interests as well as metrics to determine the performance.

Two companies have employees that are explicitly assigned for innovation management improvements. One of these companies has gradually implemented a new process for projects throughout the organization based on Lean Methodology. One of the companies also has a separate function within the organization called "innovation lead team" with focus on both improving the processes and developing internal educational materials.

Identified practices:

- Innovation management improvements are conducted yearly.
- Improvements are continuous and consensus-driven within the innovation lab.
- External consultancy firms are used to find and suggest areas of improvement.
- Employees explicitly assigned for innovation management are used for improving the processes and educating employees.

4.3 Survey Results – Importance and Performance of Different Innovation Management Areas

Out of the sample group of 50 companies, 37 companies chose to participate in the survey with 20 companies from the top 25 sample group and 17 companies from the reference sample group. The companies that have been offered to participate in the survey are presented in Table 4 where the companies highlighted in green participated and the companies that are highlighted in red either did not want to participate or simply did not answer. The 2-digit SNI-code displayed in Table 4 is the companies' Swedish Standard Industrial Classification number.

Table 4. Companies participating in the survey

Top 25		**2-digit SNI-code**	**Reference**	
Rank	**Name**		**Rank**	**Name**
1	IKEA	47	229	Jysk
2	ABB	27	151	Electrolux
3	Saab	30	143	GKN Aerospace
4	Stora Enso	17	62	SCA
5	Castellum	68	87	Skanska
6	Klarna	64	206	DNB
7	Siemens	29	233	Systemair
8	Spotify	63	66	Atea
9	Serneke	41	183	Bonava
10	CEVT	72	140	Autoliv
11	Tieto	62	184	Bisnode
12	Stena	50	214	Gotlandsbolaget
13	Valmet	28	216	Alfa Laval
14	Epiroc	46	282	Swecon
15	NCC	41	54	PEAB
16	Arla	10	121	Norrmejerier
17	ICA Gruppen	46	250	Svensk Cater
18	Scania	29	126	AB Volvo
19	Veidekke	42	102	Erlandsson
20	Coop	46	56	Unilever
21	ATG	92	197	Betsson
22	IBM	62	83	CGI
23	Vasakronan	68	227	Einar Mattsson
24	Swedbank	64	77	Svenska Handelsbanken
25	Riksbyggen	68	170	JM

The respondent's titles and years of experience working with innovation related tasks are seen in Table 5, where the internal order is unrelated to the companies' innovation scores as well as the order in which they are showcased in Table 4.

Table 5. The survey respondents' titles and years of experience within innovation related tasks

Job title	Years	Job title	Years
Research Director	20	CTO	14
Senior Innovation & Business Development Manager	1	Strategy & Business Development	10
Head of Strategic Initiatives	3	Vice President Research	17
Head of Innovation, R&D	24	Consultant Innovation	2
Acting CPO	20	Chief Digital Development	12
Innovation Manager	12	Development Manager	10
Chief Strategy Officer	20	Vice President Product	19
Head of Development	25	Head of Sales & Marketing	15
President & Managing Director	25	Certified Innovation Manager/Coach	7
Emerging Technology Program Manager	5	Business Development Manager	5
Chief Innovation & Product Development	25	Chief of Project Office & *Company Name* Labs	5
Head of Digital innovation	2	Project manager	20
CEO	15	R&D Manager	15
Head of Digital Strategy	12	Project Management	2
Creative Director/Studio Lead	20	Director of Innovation & Digital Transformation	2
Head of Research & Innovation	20	Senior Commercial Innovation Manager	13
Business Developer	15	Managing Partner	25
R&D Manager	22	Head of Business Development	16
Senior Innovation Coach	8		

Among all the respondents, the mean value of years of experience working with innovation related tasks was 13.6 years. Furthermore, the group of respondents from the top companies had a mean of 15.7 years of experience while the reference group of companies had a mean of 11.2 years of experience.

4.3.1 Correlation Analysis

A Spearman's correlation test was used to determine if there was any correlation between the companies' innovation scores and the mean performance and importance of the top ten survey questions related to the Ten Types of Innovation framework.

Testing the correlation between the companies' innovation score and the mean performance score of the ten innovation types ranked by the respondents gives a p-value of 0.9622. Since the p-value is higher than the 0.05, there is no strong evidence suggestion a correlation between the innovation score and the mean performance score of the ten innovation types (Collis & Hussey, 2014). This is also indicated using a scatterplot in Figure 4.

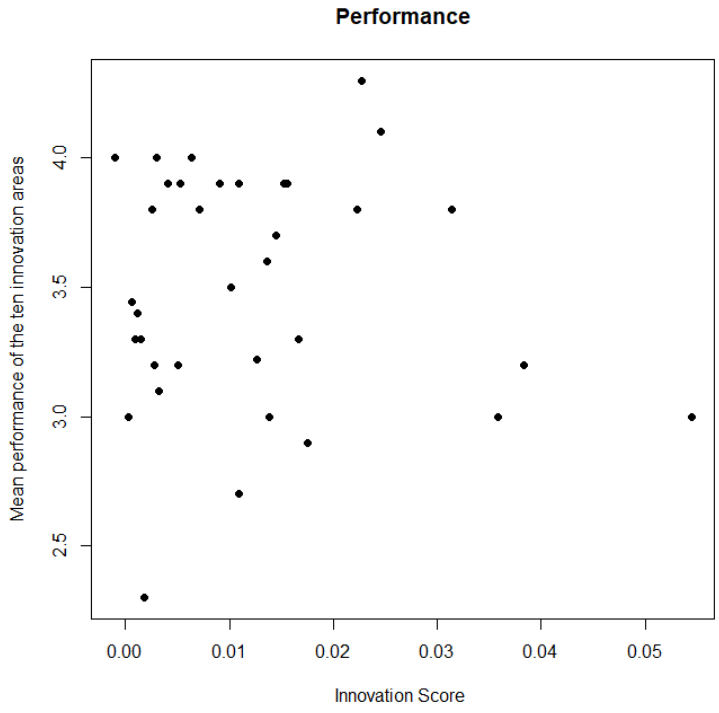

Figure 4. Scatterplot of Innovation score and average performance of Ten Types of Innovation.

Testing the correlation between the companies' innovation score and the mean importance score of the ten innovation types ranked by the respondents gives a p-value of 0.000166. Since the p-value is lower than the 0.001, there is very strong evidence suggesting a correlation between the innovation score and the mean importance score of the ten innovation types (Collis & Hussey, 2014). This is also visualized using a scatterplot in Figure 5.

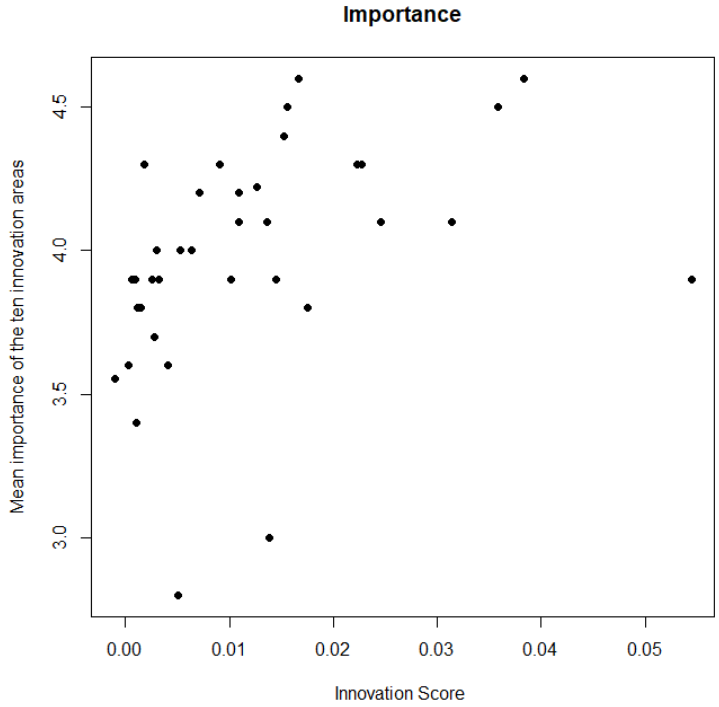

Figure 5. Scatterplot of Innovation score and average importance of Ten Types of Innovation.

4.3.2 Internal Reliability

A Cronbach's alpha test was used to verify that the 24 questions related to the ISO 56002 correlated with each other when categorized into the six areas: *Context and condition, Leadership, Planning, Support, Processes* and *Evaluation and improvement* (see Appendix G for survey questionnaire). The internal reliability for each of the six areas is presented in Table 6.

Table 6. Internal reliability using Cronbach's alpha

Performance	Alpha	Importance	Alpha
Context and condition	0.76	Context and condition	0.67
Leadership	0.81	Leadership	0.82
Planning	0.80	Planning	0.75
Support	0.82	Support	0.77
Processes	0.88	Processes	0.81
Evaluation and improvement	0.87	Evaluation and improvement	0.76

For this type of study, an alpha over 0.8 is regarded as good while an alpha between 0.7 and 0.8 is regarded as satisfactory (Bland & Martin, 1997). Since the area *Context and condition* received an alpha of 0.67 when rated for importance, the lowest correlated question: *Culture supporting creativity and deployment* was removed increasing the alpha to 0.73. However, this was only needed for the importance part of the question. Therefore, the performance part of the question was included when testing the difference in how the top 25 companies and the reference companies rated the importance and current level of the six areas related to the ISO 56002.

4.3.3 Significant Differences Between Survey Answers

To test significant differences between the survey answers, three different tests have been conducted where the measurements and questions are underlined. Firstly, it was tested whether any of the six areas related to the ISO 56002 were rated significantly higher by the top 25 companies compared to the reference companies in terms of their current level and importance. Secondly, it was tested if the top 25 companies had rated the 24 questions within the six areas overall higher than the reference companies in terms of their current level and importance. Thirdly, it was tested whether the top companies had rated any of the ten innovation types related to the Ten Types of Innovation framework higher than the reference companies, in terms of performance and importance.

When testing if the 25 companies rate the company's current level or importance higher than the reference companies in each of the six areas related to the ISO 56002, a paired sample T-Test was used for testing the four areas; *Leadership, Planning, Support* and *Processes.* This was due to a Shapiro-Wilk Normality Test indicating that the data was normally distributed. However, for the areas: *Context and condition* and *Evaluation and improvement*, the Shapiro-Wilk normality test showed strong evidence suggesting that the null hypothesis could be rejected as the p-values where below 0.05 (Collis & Hussey, 2014). Therefore, as the data is non-parametric for *Context and condition* and *Evaluation and improvement¸* a Mann-Whitney test was used instead of a paired sample T-Test.

Although the top 25 companies rated most of the six areas higher than the reference companies both in terms of importance and current level, the resulting p-values for both the paired sample T-Tests and the Mann-Whitney tests were above 0.05. Therefore, there was no strong evidence suggesting that the top 25 companies actually rate any of the six areas higher than the reference companies in terms of importance and current level.

However, testing if the top 25 companies rate the company's current level higher than the reference companies regarding all the 24 questions related to the ISO 56002, gives a p-value of 0.017. This is done using a Mann-Whitney test as the data is non-parametric. Since the p-value is lower than 0.05, there is strong evidence suggesting that the top 25 companies rate the companies' current level higher than the reference companies in the 24 questions (Collis & Hussey, 2014). This is also indicated when visualizing the mean of companies' ratings of each question using a bar plot, see Figure 6.

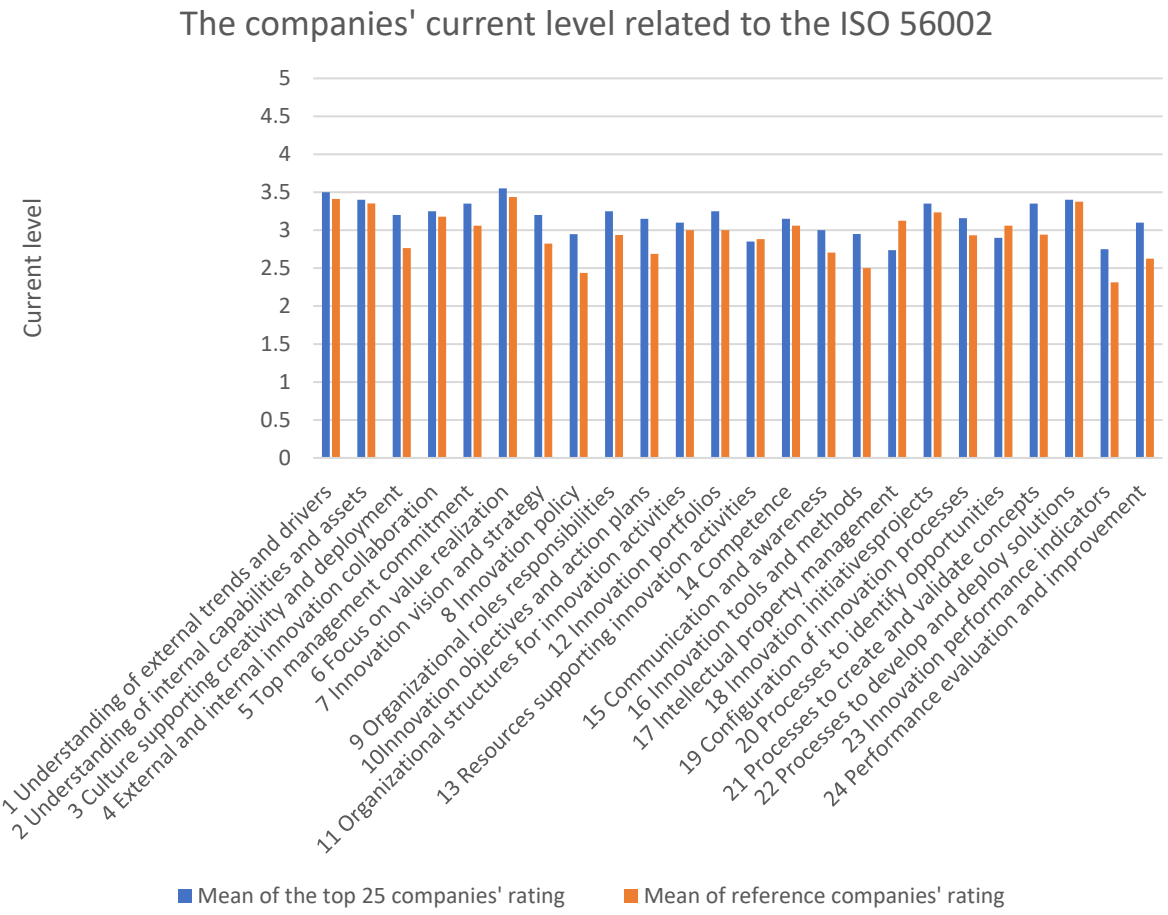

Figure 6. The companies' mean ratings of current level for each question related to the ISO 56002

The four questions where the companies rate their current level highest are: *1. Understanding of external trends and drivers, 2. Understanding of internal capabilities and assets, 6. Focus on value realization* and *22. Processes to develop and deploy solutions*. These are also four questions where there is a small difference in how the two sample groups of companies have rated their current level. One the contrary, the questions: *8. Innovation policy, 10. Innovation objectives and action plans, 16. Innovation tools and* methods and *24. Performance evaluation and improvement,* are rated much higher by the top 25 companies than the reference companies. There are also three questions where the top 25 companies have rated their current level lower than the reference companies. These three questions are: *13. Resources supporting the innovation activities, 17. Intellectual property management* and *20. Processes to identify opportunities.*

Testing if the top 25 companies rate the importance higher than the reference companies regarding all 24 questions related to the ISO 56002, gives a p-value of 0.01816. This is also done using a Mann-Whitney test as the data is non-parametric. Since the p-value is lower than 0.05, there is strong evidence suggesting that the top 25 companies rate the importance higher than the reference companies in the 24 questions related to the ISO 56002. Similar to the companies' current level of each question, the companies' mean rating of importance is visualized in Figure 7.

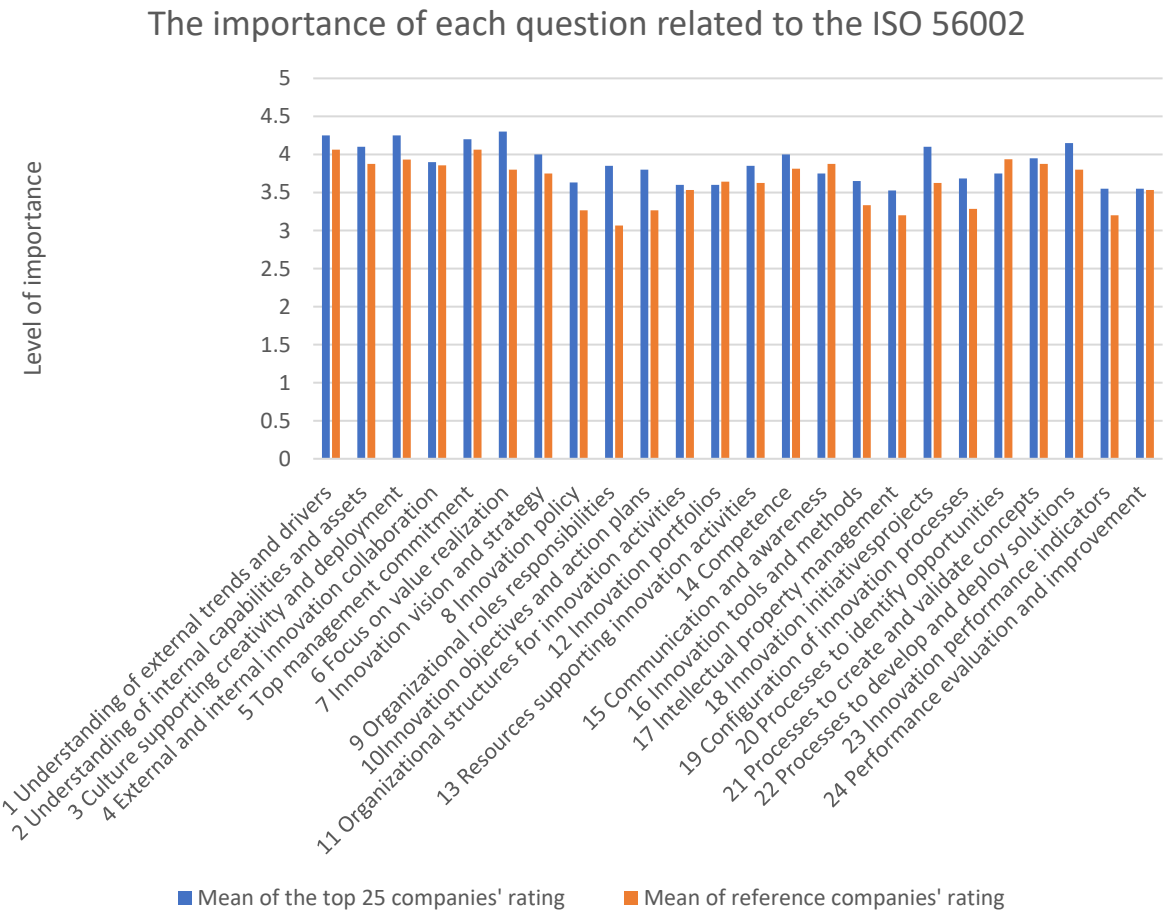

Figure 7. The companies' mean ratings of the importance of each question related to the ISO 56002

When rating how important each question is, the top 25 companies rank: *1. Understanding of external trends and drivers, 3. Culture supporting creativity and deployment* and *6. Focus on value realization* is rated as the most important. In comparison, the reference companies' rate: *1. Understanding of external trends and drivers, 5. Top management commitment* and *20. Processes to identify opportunities* as the most important questions. The questions: and *6. Focus on value realization, 9. Organizational roles responsibilities* and *10. Innovation objectives and action plans* are rated much higher by the top 25 companies. Similar to when the companies rated their current level, three questions are rated higher by the reference companies. These questions are: *12. Innovation portfolios, 15. Communication and awareness* and *20. Processes to identify opportunities.*

Similar to the 24 questions related to the ISO 56002, the differences between how the two sample groups of companies have rated their performance within- and how important they think each of the ten innovation types are is tested. Since, the data is nonparametric in both cases, difference are tested using Mann-Whitney tests. Testing if the top 25 companies rate their performance within the ten innovation types higher than the reference companies, gives a p-value of 0.62. Therefore, there is not enough evidence suggesting that top 25 companies rate performance within the ten innovation types higher than the reference companies. This is due to multiple innovation types being rated higher by the reference companies as visualized in Figure 8.

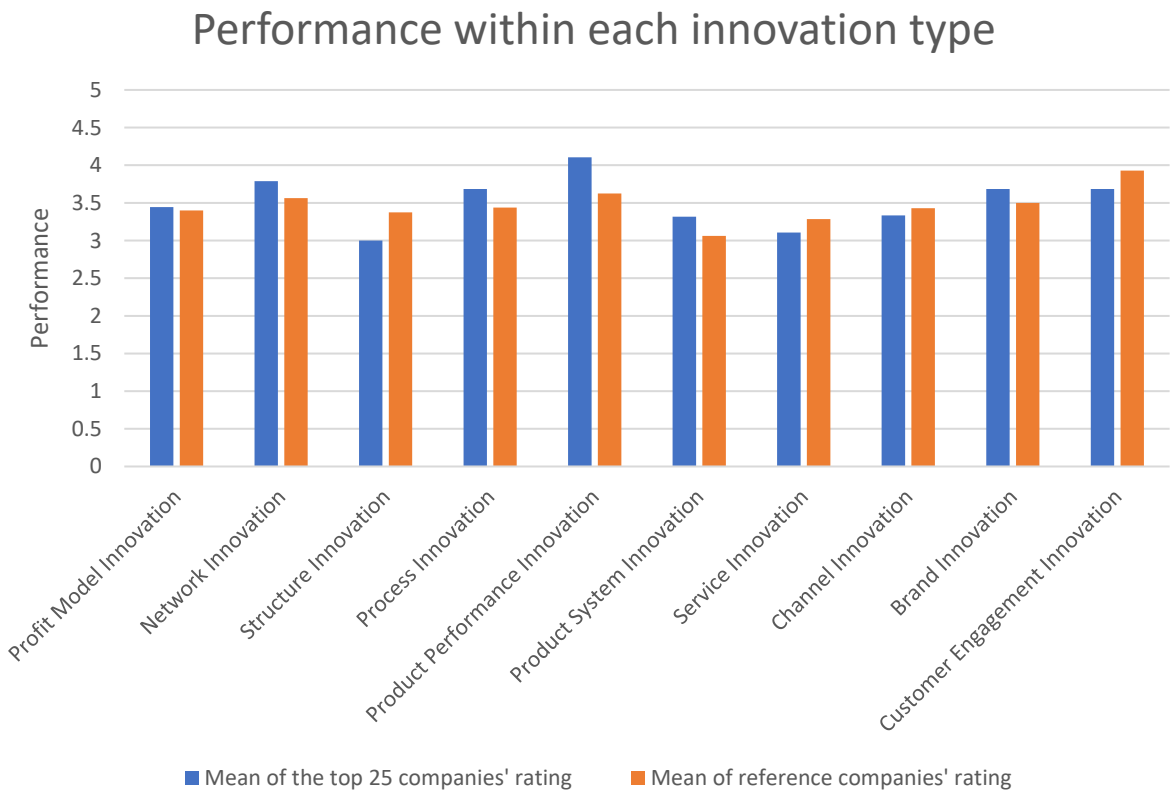

Figure 8. The companies' mean ratings of their performance within each of the ten innovation types.

Figure 8 shows that the top 25 companies rate their highest performance within *Product Performance Innovation*, *Network Innovation* and *Process Innovation*. Although the reference companies rate high performance within *Network Innovation* and *Product Performance Innovation*, they rate *Customer Engagement Innovation* much higher than *Process Innovation*.

Testing if the top 25 companies rate the importance of the ten innovation types higher than the reference companies gives a p-value of 0.0036. Since the p-value is lower than 0.05, there is strong evidence suggesting that the top 25 companies rate the importance of the ten innovation types higher than the reference companies, as seen in Figure 9.

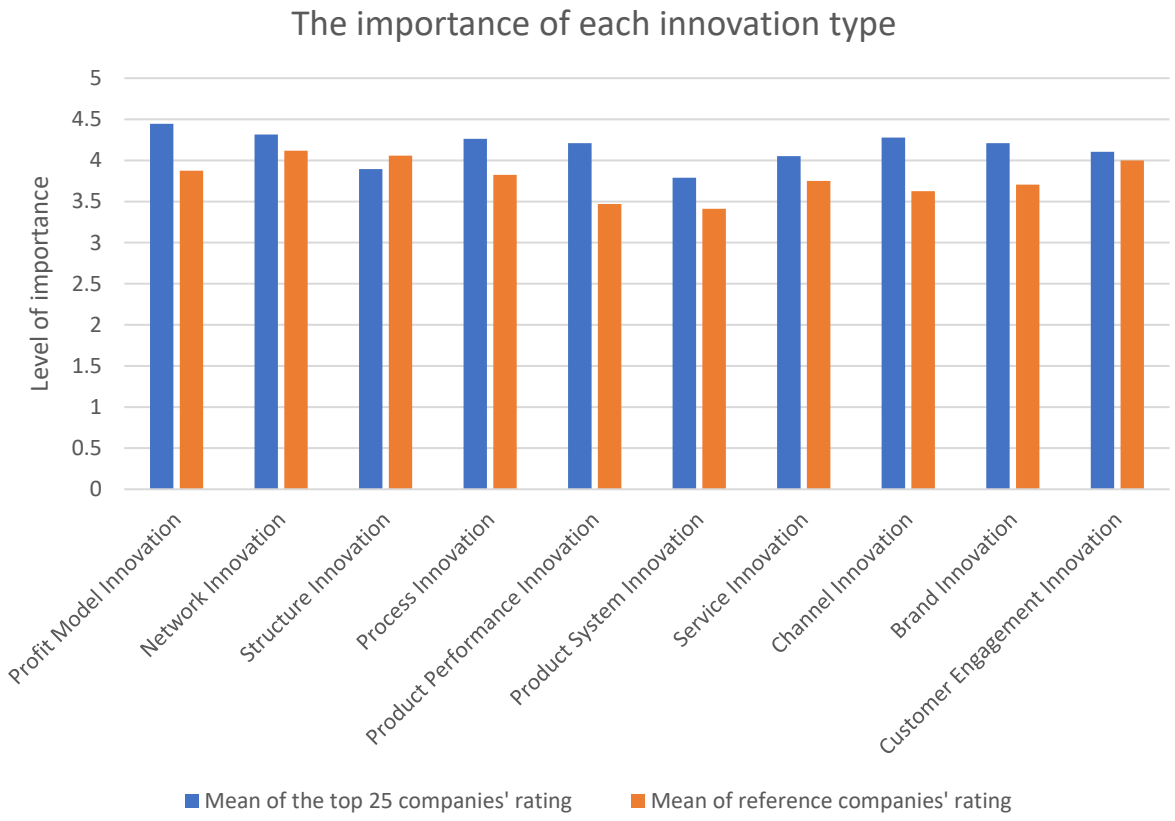

Figure 9. The companies' mean ratings of the importance of the ten innovation types

According to the top 25 companies, the most important innovation types are *Profit Model Innovation*, *Network Innovation* and *Channel Innovation*. While the reference companies share a similar view regarding *Network Innovation*, they regard *Structure Innovation* and *Customer Engagement* as more important than *Profit Model Innovation* and *Channel Innovation*.

5 Discussion

Chapter five discusses the methodology of the research, the implications for theory and the implications for practice as well as recommendations for future research.

5.1 Implications for Theory

Both the qualitative interviews and the quantitative survey contribute with insights to already established innovation management theory. The company case studies provide authentic examples on how and when different methods and concepts are used within industry. However, while theoretical frameworks often are strictly defined and described in solitary, the interviews show that when used within industry, it is rather the opposite. In many of the interviewed companies, frameworks and methods are modified, combined and constantly evolving.

Although the Ten Types of Innovation was not commonly mentioned as a framework, it was acknowledged by most interviewees that there are more dimensions to innovation than just product innovation. Partnerships were referred to by many interviewees as important for obtaining knowledge and increasing the speed of innovation. Within the Ten Types of Innovation framework, creating new partnerships is described as *Network Innovation* and it shows that academia and industry sometimes have a different way of referring to similar phenomena. This is also the case for the following other nine areas of the Ten Types of Innovation framework, highlighted by the interviewees, but referred to in different ways. When looking at the survey results, all ten innovation types receive an average rating above 3. This shows that the responding companies view all areas as important, and that the framework is regarded as relevant by industry.

It was evident that many of the interviewees expressed similar practices using different formulations and terminology, the need for developing a common language among innovation professionals seems high. This could be one of the large benefits with the new ISO 56002, under the circumstance that it becomes widely incorporated among companies. The interviews indicated that many of the elements found within ISO 56002 are also found within the practices of the top 15 companies from the ranking. However, some elements are seen as more important than others such as *Focus on value realization* which has been highlighted both within in the interviews and within the survey results. This combination of qualitative and quantitative data gives valuable insights to the developers of the ISO 56002 as it shows what the intended users actually think. The study also shows that all of the 24 survey questions related to the ISO 56002 cover elements regarded as important by the responding companies. Since these 24 questions were developed as an innovation management capability assessment tool by Magnus Karlsson at Inngage Consulting, the results of the study demonstrated its applicability.

Interesting insights were gained when comparing how the two sample groups, the top 25 and the reference companies, had answered the survey. A surprising finding was that the reference companies on average rated their performance higher within the ten innovation types compared to the top 25 companies, which brings into question whether people objectively can self-evaluate performance. However, in the 24 questions related to ISO 56002 the reference companies on average rated their current level lower than the top 25 companies. This could be explained by the more detailed questions and the thorough examples provided that the respondents could use as references to compare their company's current level. Therefore, it is

assumed that a more precise question gives a more precise answer. In terms of importance, the top 25 companies on average gave a higher rating within both the ten innovation types and the questions related to the ISO 56002. This generated the assumption that people are able to self-evaluate importance more accurately than performance due to importance being less dependent on how self-critical an individual is. The assumption was also supported by the fact that some of the questions that were rated as most important were not the same questions where the respondents had rated their own company's performance the highest.

This result confirms the importance of having accurate measurements when assessing innovation, since cognitive biases and heuristics can cause respondents to answer irrationally. As highlighted in the theoretical framework, individuals tend to have difficulty changing their perceptions of certain matters due to the inability to acknowledge the existence of other perceptions. This could explain why the reference companies on average rated their performance higher within the ten innovation areas compared to the top 25 companies, but at the same time their current level lower in the questions related to the ISO 56002. If the respondents do not receive any reference value to compare with when rating their company's performance within each innovation area, the respondents have no choice but to base their rating solely on their own perception, which most likely will differ from others. However, if the respondents receive a reference value with definition, as given within the question related to the ISO 56002, it is much easier for them to accurately rate their company's current level. This also reduces the potential difference in perception between the respondent and the researcher, which is convenient since the researcher will somehow interpret and analyze the results. As showed by Pronin, Ross, and Gilovich (2004), most individuals fail to acknowledge their own bias. Although researchers usually have the goal to conduct objective studies, it can be assumed that the risk of being biased can be applied to them as well. However, biases can be mitigated simply by acknowledging that they exist. Therefore, this study shows that in order for survey-based research to be objective and accurate it is important that the survey questions are clear, have comparable references, and leave little room for self-interpretation.

While it turned out to be difficult to receive an accurate score when asking respondents to rate their company's performance and current level, the assumption that importance is a better measurement in this context was strengthened. Since the importance was on average rated higher by the top companies within the ten innovation areas, it could be a symptom of the Dunning Kruger Effect (Dunning, 2011). As applied to the context within this study, the more knowledge an individual has within innovation management, the more his or her knowledge about the complexity of the matter increases, and therefore the individual might rate an element lower as he or she knows that the company could improve within the area. As a result, importance is determined to be the better measurement when measuring elements connected to innovation since rating the importance of something requires less self-criticism and reflects the knowledge of the individual to a higher extent. If an individual knows that one innovation area or a certain part of the ISO 56002 is important for success, they will most likely rate it high.

5.2 Implications for Practice

Not only does this study contribute with insights to the academic field of innovation management, but it also provides insights to companies within and outside of the study. Since the innovation management practices of Sweden's most innovative companies are described within the study, companies can benchmark and find inspiration from the cases described. These showcased practices are also supplemented with the opinions and advice from the interviewees, having years of experience from various activities within innovation.

Although some practices described are adapted to fit certain companies and industries, the interviews have shown that there is no limit to how companies can draw inspiration from methods and frameworks to create practices that suite their specific environment. Therefore, companies reading the outcome of the case studies should have the mindset that interesting parts can be cherry handpicked without the need for adopting a whole practice. However, since the sample group of companies cover a wide range of industries, there is a large chance that companies outside of the top 15 sample group can find interesting practices to copy outright.

Since this thesis and other similar studies increase the common knowledge of good innovation management practices, the vast majority of companies get the opportunity to learn from the top 15 sample group that are perceived by media as best at innovation. Since the best practices of today will become the standard practices of tomorrow (Kerzner, 2014), sharing todays best practices will have a positive impact on the overall effectiveness of innovation management. In turn, this will motivate researchers and companies to develop better new practices and push the scientific field of innovation management forward.

5.3 Reflections on the Performed Study

Although there are some uncertainties in terms of how journalists select what topics and events they write about, news articles such as those extracted from Retriever Media, is what a large amount of people base their perception on, such as politics, society, and organizations (Donsbach, 2004). Compared to the typical innovation ranking that is based on executive views and financial data (Lichtenthaler, 2018), ranking companies based on how innovative they are perceived by media gives a new and interesting angle.

At the beginning of 2019, there existed no national Swedish innovation ranking, although a Swedish Innovation Index was released by Karlstad University during the writing of this thesis (Kristensson, Witell, Karlsson, Koskela-Huotar, & Valtakoski, 2019). However, after investigating the methodology and the sample of the Swedish Innovation Index, the decision to base the interviews and survey on the ranking Sweden's Most Innovative Companies was still regarded as the better choice. Since the Swedish Innovation Index was created and launched during the timeframe of this study it is interesting to compare the results from the two rankings. While IKEA is ranked as Sweden's most innovative company by both rankings, many of the top companies from Sweden' Most Innovative Companies are not included within the sample of 70 companies used by the Swedish Innovation Index. As it is more time consuming to base the ranking on customer interviews, as done by the Swedish Innovation Index, compared to using software to analyze an already existing large set of data, the size of the sample group is more limited. In comparison the sample group of 500 companies that Sweden's Most Innovative Companies is based on contains most of the companies from the Swedish Innovation Index. However, some companies within the Swedish Innovation Index are not included in the sample group for Sweden's Most Innovative Companies as they have less than 250 employees in Sweden such as Swebus, or no Swedish Entity such as Netflix. Whether the sample of 70 companies has been created using a methodology or just handpicked based on personal preferences, it is worth noting that witin the group *Media Streaming Services,* Spotify is not included while Bahnhof and Netflix are. Similarly, in the group *Bank & Insurance,* Klarna one of Sweden's fintech unicorns, is not included.

Even though the ranking Sweden's Most Innovative Companies is mostly conducted using software, there are some manual steps. These manual steps are regarded as the main weak spots in the method as small human errors can create large differences in the results. Potential errors include defining keywords, misspelling of company names and keywords, irrelevant articles not sorted out and manual downloading of articles. There is also the risk of journalists being subjective as well as being actively being reached out to and influenced by some companies. Although paid collaborations and advertisements are filtered out using keywords, there is a risk that some paid collaborations slip through due to the way they are written. However, the manual sanity test for the articles connected to the top 25 companies on the list reduces these types of risks.

Regarding the sentiment analysis, one could consider conducting the analysis on a lower level by extracting and analyzing each sentence containing one of the innovation management keywords. However, there are downsides to analyzing the sentiment on a sentence level as the sentiment score takes into consideration the total length of the text. In those cases where one of the keywords are mentioned three times within a large article, it might receive a higher sentiment score compared to a small article mentioning one of the keywords just once. This

will be the case even if the keyword frequency is higher in the small article due to a lower total amount of words. The reason is that a sentiment analysis on a sentence level would only consider the length of the sentence and not the whole article. Therefore, conducting the sentiment analysis on an article level was considered to be a more appropriate choice.

The top companies in Sweden's Most Innovative Companies cover multiple industries and vary in size. Using the relationship between number of articles and revenue, it was possible to adjust the ranking to make it independent of company size. This gives the smaller companies of the sample group, if fulfilling the requirement of a minimum amount 15 articles, the same opportunity as the larger companies to reach the top of the list. As a comparison, the rankings by Forbes and USA today benefit larger companies as they are based on market respectively total patent output (Forbes, 2019) (USA Today, 2019). In these rankings, smaller companies will not be able to beat the larger companies even though they might have a larger innovative output relative to their size. Since this study showed a correlation between company size and how often they are mentioned in media, it could be questioned whether or not BCG's ranking might show a similar correlation between company size and score as it is based on the perception of senior executives. This assumes that the larger a company is, the more people know and talk about it. However, since there is no mentioning of any correlation or company size in BCG's methodology, it remains unknown if it has been accounted for or not. However, this shows that the method of adjusting for company size gives Sweden's Most Innovative Companies another unique advantage.

Although the originally goal was to conduct two interviews with each of the top 15 companies, the conducted interviews with 14 employees at 12 of the top 15 companies gave good insights regarding their innovation management practices. As the interviews were semi-structured, valuable insights were gained both within and outside of the pre-determined questions through the use of follow-up questions asking for detailed examples.

The method of selecting interviewees based on their title and position within their company was helpful as the interviewees had a good insight into the companies' innovation management systems. Therefore, it was easy for most interviewees to understand the context of the questions and to give thorough answers. Although one could argue that a title does not necessarily incorporate a certain type of competence, many of the employees were recommended by other people contacted within the organization. Furthermore, employees that were contacted with an interview request were very straight forward if they felt that they did not have enough knowledge and instead gave a suggestion on one of their colleagues to contact instead.

Using the ISO 56002 as an inspiration when designing the interview guide helped in creating questions that gave a broad perspective on a company's innovation management practices as well as creating a good interview structure. Although other established frameworks could have been used when designing the interview guide, the choice of using the ISO 56002 came down to its broad definition of innovation management as well as its precise description of each area. As the ISO 56002 was launched in 2019, it can be argued that the coverage and definitions are up to date with the latest scientific research within the field of innovation management.

Since the sample of survey respondents was created using the same method as the sample of interviewees, it was assumed that most of the respondents had sufficient knowledge within their company's innovation management system. However, four of the respondents found some questions hard to answer due to certain academic formulations and concepts that were

uncommon within their company or industry. This occurred mainly when ranking the ten innovation types as some companies refer to the innovation types differently.

5.4 Future Research

For future research, it is suggested to investigate the value of creating a common lexicon for relevant keywords related to innovation management to be used for data mining and other related applications. This would generate more accurate and consistent results if this study, or similar studies are conducted in the future. It is worth noting that there are potential risks of creating such a lexicon. As academia and industry seem to lack a consensus on what is defined as “innovation”, and which organizations can be classified as innovative, different perceptions might affect the effectiveness the lexicon.

Furthermore, it is suggested to conduct the ranking: Sweden’s Most Innovative Companies on a yearly basis to investigate any long-term changes. It is also suggested to increase the current sample size of 500 companies.

6 Conclusions

Chapter six presents the conclusion to the overall research question and its four sub-questions.

Which are the most innovative large companies in Sweden?

Using the methodology described in this thesis, Sweden's most innovative companies are presented in Table 7.

Table 7. Sweden's Most Innovative Companies 2019

1. IKEA	6. Klarna	11. Tieto	16. Arla	21. ATG
2. ABB	7. Siemens	12. Stena	17. ICA Gruppen	22. IBM
3. Saab	8. Spotify	13. Valmet	18. Scania	23. Vasakronan
4. Stora Enso	9. Serneke	14. Epiroc	19. Veidekke	24. Swedbank
5. Castellum	10. CEVT	15. NCC	20. Coop	25. Riksbyggen

How can the innovativeness of companies be evaluated in a fruitful way?

Sweden's most innovative companies are ranked based on how innovative Sweden's 500 largest companies by revenue are perceived in printed press published during 2018. The companies are ranked by their innovation score which is calculated by multiplying the number of articles in which they are mentioned, together with the mean value sentiment score of all articles.

What practices do these companies use to manage innovation?

Although the interviewed companies had similar innovation management practices, they were usually modified to fit within the company's own organization and industry. This can be linked back to contingency theory that: "The beginning of administrative wisdom is the awareness that there is no one optimum type of management system" (Burns & Stalker, 1961). Nevertheless, the interviews contribute with an interesting collection of practices within their authentic setting that other companies can in turn draw inspiration from. Table 8 shows the identified practices within the eight different areas.

Table 8. Identified Innovation Management Practices

Element	**Identified practices**
Innovation Vision	• The innovation vision is used in the decision-making process for new ideas. • Keywords connected to innovation are used for guiding new aspirations. • There is an overall aim to become industry or/and digital leaders.

Innovation Policy	• For innovation activities policies such as environmental policies, ethical policies, business and financial policies as well as customer interaction policies are used. • Some policies are co-created together with the employees. • There is a use of policy substitutes such as taglines and corporate guidelines. • Policies are communicated verbally and through an intranet.
Innovation Objectives	• There are innovation objectives correlated to areas such as financial performance or numbers of customers reached with the current product offering. • The innovation objectives are sometimes interlinked with the innovation vision and the innovation strategy. • Strategic areas within the company are sometimes used to set the innovation objectives. • Some decide new innovation objectives on a yearly basis.
Innovation Strategy	• Partnerships are used to effectively accelerate innovation. • Research & development is opened up by some companies to get influence from external sources. • Collaborations with startups are used to get hold of new technologies at an early stage. • Innovation labs and accelerators are used to focus on disruptive innovation. • Designated, and in many cases cross-functional, teams are used to focus on fast moving technologies. • One company is divided into small and to a large extent autonomous startup each assigned to a separate problem space, to divide the innovation responsibility over the whole organization. • A decentralized organization is used to close the gap between market requirements and the actual decision making. • An agile approach is used instead of a long-term innovation strategy to cope with rapidly changing markets.
Operation	• Stage gate systems are modified and mixed with other methodologies to fit the scope of use. • Methods such as Agile and Lean are used to increase the speed of innovation. • Limitations added to the feasibility tests are used to promote teams to conduct smaller tests but focus on a larger quantity of ideas. • A shark tank/dragon's den is used to promote and support employees to contribute with new ideas. • Administrative tasks are removed to increase speed within designated teams and innovation labs. • Cross-impact matrixes are used to forecast market trends. • Multiple tools and methods are used individually or combined including: Business Model Canvas, Value Propositions, Co-Creation, Pitching, Concept Case Solutions, Feedback Loops, Cross-Impact Analysis, and Design Thinking.

Support	• Internal education programs, conferences and certifications are used to develop competence within innovation management. Collaborations and partnerships are used to acquire sought after competences. • Project teams are used to "infect" departments with an innovative mindset. • People with an entrepreneurial background are hired to fill competence gaps. • An innovative culture is fostered to promote and support new ideas. • The innovation lab is moved outside of the company in conservative companies and industries. • An internal phone application is used for sharing new ideas within the company. • Strategic intelligence is gathered and analyzed internally and/or externally. • External consultancy firms are used to gain knowledge in specific areas.
Assessment	• Non-systematic assessments are conducted to increase the efficiency and effectiveness of the innovation management system. • Assessments are conducted internally as well as externally using consultancy firms and customers. • Good innovation capabilities are used as a strategic target.
Improvement	• Innovation management improvements are conducted yearly. • Improvements are continuous and consensus-driven within the innovation lab. • External consultancy firms are used to find and suggest areas of improvement. • Employees explicitly assigned for innovation management are used for improving the processes and educating employees.

Do these practices align with established theoretical frameworks?

Yes, comparing the identified practices with the Ten Types of Innovation framework and the ISO 56002 shows that elements of the two frameworks are highlighted as important by the interviewed companies. Furthermore, companies participating in the survey rate all elements within the two frameworks highly, although some elements are rated higher than others. However, it is concluded that when using a survey-based research approach, importance may actually be a better measurement to assess innovation, compared to performance and current level.

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Appendix

Appendix A – Innovation Ranking Handbook

This is a handbook for ranking company innovativeness based on how innovative they are perceived by public media. The companies are ranked by the *Innovation Score* which is based on the multiplication of the two variables: *Number of Articles* and *Mean Sentiment Score*. The first variable: *Number of Articles* is the number of articles a company has been mentioned in, together with certain innovation keywords, within a given timeframe. The second variable: *Mean Sentiment Score* is the mean sentiment value of all articles combined. Since the articles used are written by journalists and published in printed press, the vision is that this ranking should be more objective and cover other aspects that previous methods of ranking innovative companies lack.

The methods described in this handbook requires access to different types of software. While there is most likely equivalent software, this handbook relies on the following:

- Retriever Media: The largest online news archive in the Nordics. It is used for filtering and retrieving news articles which are the base of the ranking.
    - https://www.retriever.se/product/mediearkivet/

- IEEE Xplore Digital Library: Research databased that is used to find relevant keywords connected to the field of Innovation Management.
    - https://ieeexplore.ieee.org/Xplore/home.jsp

- Orbis: Online database for company data. It is used for creating the sample group of companies as well as extracting data such as revenue and employees.
    - https://orbis4.bvdinfo.com/version-201959/orbis

- Notepad++: Source code editor. Effectively used to arrange and clean up text documents.
    - https://notepad-plus-plus.org/

- RStudio Development environment for R, a language for statistical computing and graphics. R is used for processing and analyzing the data.
    - https://www.rstudio.com/

Setting up criteria for filtering

The first step in this handbook is to define what keywords to use when filtering and selecting relevant news articles. Since the news articles are written in Swedish, it would be optimal to search for Swedish keywords. Unfortunately, most scientific research and the keywords related to it is written in English. Therefore, the keywords need to be translated to Swedish and then sanity checked so that the Swedish translation actually is related to the topic of investigation. The English keywords are found using the research database IEEE Xplore Digital Library by

searching for the topic: Innovation Management and selecting the keywords from the first 100 scientific articles shown. However, after translating the English keywords to Swedish, it is possible to shorten the list by clustering some words together. Since Retriever Media has the search function to find all words that contains a certain combination of letters, the search word *innovat** searches for all words containing innovation. This means that instead of creating an extensive list of words such as: *innovation, innovativ* and *innovationer*, it is possible to only search for *innovat** and cover all of the three words.

For the 2019 ranking, each of the articles had to at least include one of the following keywords: Innovat*, forskning, utveckling, teknisk nyhet, uppfinning, nya marknader, affärsmöjlighet*, tekniskt genombrott, ny teknologi, nytt kundvärde or ny affärsmodell.

While the above keywords are necessary to find relevant articles related to the topic, there are also some keywords needed to avoid certain types of articles such as those paid by the companies themselves or press releases related to the stock market. Therefore, the following keywords shall not exist in the articles: *Annons**, *betalt samarbete, betald annons, sponsrat inlägg, PM* and *Börsen.*

Creating the sample group of companies

The companies that create the sample group are found using the global company database Orbis. In the 2019 ranking, Sweden's 500 largest companies based on revenue was selected as the sample. Therefore, the search filter within Orbis was set to only include companies registered in Sweden and Swedish entities of global companies with over 250 employees sorted by their revenue from 2017. Since most companies publish their annual reports during the spring, the latest available data will be two calendar years back. This means that the data for the 2019 ranking is based on annual reports from 2017 since the reports from 2018 was not yet released until later 2019. However, if the study is conducted later during the year, company data will be available from the previous year.

Many companies have subsidiaries with high revenues and therefore, the list generated by Orbis has to be manually cleaned so that as an example: *Volvo Trucks, Volvo Construction Equipment* and *Volvo Penta* are deleted from the list since they all are subsidiaries to *AB Volvo,* which already is on the list. However, the names of deleted subsidiaries should be saved and added to the search string in Retriever Media as in many cases, the name of the subsidiary is the commonly used name for parts of – or the whole company group. These names will also be used when cleaning the data. In similarity to different names of subsidiaries, some companies are in common language mentioned with a different or short version of the name. As an example, Hennes & Mauritz is in public media usually just referred to as H&M. To get a good search result in Retriever Media, these commonly used names needs to be added manually when going through the list. Some common knowledge of Swedish companies makes it easier to perform this step.

Since the 2019 ranking only incorporates non-governmentally owned companies, these are sorted out manually. As opposed to the 2019 ranking where governmentally owned companies where sorted out after analyzing the articles, this should be done before the filtering and downloading from Retriever Media so that all 500 companies are all non-governmentally owned. This will enable a larger sample group of companies since in the 2019 ranking, 62 out

of the 500 companies where removed after analyzing the downloaded articles which resulted in a sample group of only 438.

Filtering and downloading data

When searching for articles in Retriever Media, there are multiple search functions. The search string used in the 2018 ranking is the following:

(Innovat* OR ”forskning och utveckling” OR ”teknisk nyhet” OR uppfinning OR ”nya marknader” OR affärsmöjlighet* OR ”tekniskt genombrott” OR ”ny teknologi” OR ”nytt kundvärde” OR ”ny affärsmodell”) AND ("AB VOLVO" OR "VOLVO GROUP" OR “VOLVO TRUCKS" OR "VOLVO PENTA" OR "VOLVO CONSTRUCTION" OR "ERICSSON" OR "H&M" OR ““….””) ANDNOT (Annons* OR ”annonserat inlägg” OR ”betalt samarbete” OR sponsrat inlägg OR PM OR börsen*)

Since each article must contain at least one of the keywords and at least one company name, the parentheses containing the keywords and the parenthesis containing the company names is separated with an *AND*. Similar, the parenthesis with keyword that the articles must not contain are separated with an *ANDNOT*. An asterisk (*) is used to after a combination of letters to cover all words containing the same combination of letters. Each keyword or company name is separated by an *OR* and if a keyword or name contain multiple words, these can be written inside two expression marks (“”). There is no problem to run a search string containing all the 500 company names as well as the common names of their subsidiaries at once in the Retriever Media search bar. However, it is a good idea to create the search string in a text document since it will likely be used multiple times.

When receiving the search result from Retriever Media, it should be filtered to only show articles from the relevant year and from relevant sources. For the 2019 ranking, all articles published in printed press except Cisionwire was chosen as the data sample. Since Cisionwire is a news portal where companies publish their own news and press releases, it was excluded under the assumption that their articles would be less objective compared to articles written by external journalists.

The articles can be downloaded in groups of 500 to *.txt* files. The easiest way to keep track of what has been downloaded is to sort the articles in Retriever Media by the month that they were published and then merge all the *.txt* files afterwards using the built-in function in Windows 10.

How to clean the data

1. Merge all articles to one document for smoother cleaning. In Windows 10, open the command prompt and change directory (CD) to the folder containing the downloaded *.txt* files and write: Copy /b *.txt Combined.txt.
2. Arrange the document so that each article becomes one line. This will enable R to create a data frame where one row equals one article. The easiest way to do this choose: *Edit > Blank Operations > Remove Unnecessary Blank and EOL*. This will create one single long line of the whole document.

To create one row for each article, choose *Search > Replace* and in the *search for* field enter the row of equal symbols that separates each article: ==========.... *(make sure*

that it is the right number of equal symbols, 78). In the *Replace with* field, write *\n* and make sure that the *Extended* option is selected in the lower left *Search Mode* box.

3. Remove all symbols that can't be used with RStudio. Choose *Search* > *Replace* and enter "Å,Ä,Ö,å,ä,ö" in the *search for* field and "XXX,YYY,ZZZ,xxx,yyy,zzz" in the *Replace with* field. Then choose *Search* > *Search* and in the *search for* field type "[^\x00-\x7F]+" to find non-ASCII characters (abnormal symbols) and delete them. Afterwards, change back the Swedish special characters ÅÄÖ by choosing: *Search* > *Replace* and enter "XXX,YYY,ZZZ,xxx,yyy,zzz"" in the *search for* field and "Å,Ä,Ö,å,ä,ö" in the *Replace with* field. Make sure that the *Regular expression* option is selected in the lower left *Search Mode* box.
4. Delete duplicate and similar articles. Start by sorting the whole document in alphabetical order to make it easier to identify duplicate and similar articles. This is done by choosing: *Edit* > *Row Operations* > *Sort Rows In Alphabetical Order*.

Use search & replace function: *Search* > *Replace* and enter "((?<=\n)|^)([^\n]{30})([^\n]*\n)(.*\n)?\2[^\n]*($|\n)" in the *Search for* field to find duplicate rows. By using adding "\2\3\4" in the *Replace with* field, and pressing *Replace All*, similar lines will get deleted. The "{30}" parameter decides how many characters in a row that should be exactly the same for the function to highlight the article.

5. Delete common person names that are similar to company names. Ex. Ericsson, Bosch but also city names such as Trelleborg. In the case with Ericsson choose *Search* > *Search* and enter "(\u)(\l)*.Ericsson" in the *Search for* field and delete all occurrences where Ericsson is mentioned as a name of a person. For the other names of people, just change out Eriksson in "(\u)(\l)*.Ericsson" to as an example Bosch, "(\u)(\l)*.Bosch".

In the case with Trelleborg, and other city names that might be shared with a company, this has to be sorted out manually. However, there is a step further down in this handbook to check the relevance of articles where company names that are shared by cities or people will be spotted if missed in this step.

6. Merge the names of subsidiaries to one common name. As mentioned under the handbook headline: Creating the sample group of companies, some companies such as AB Volvo have subsidiaries such as Volvo Trucks, Volvo Construction Equipment and Volvo Penta.

Therefore, choose *Search* > *Replace* and replace all names of subsidiaries to the name of the group or the most commonly mentioned name. As an example. Hennes & Mauritz is replaced with H&M so that independent on which name the journalists use, the articles will show up under the same company name when importing the data into RStudio

7. Add an exclamation mark (!) to all company names. Unfortunately, the library sqldf that is used for finding the frequency of names in R is not case sensitive. Therefore, all company names need to have an exclamation mark added to them. This needs to be done to avoid false points from words that contain a company name. As an example, the common word klarnade contains the company name Klarna. Since sqldf is unable to tell capital and lower-case letters apart, Klarna needs to be renamed Klarna! to avoid getting extra points when a journalist mentions the word klarnade.

The easiest way to do this is to create a macro that changes by all company names at ones. In Notepad++, a macro can be created using the *Makro* function. However, when creating repetitive macros, it is much faster to code it instead of recording it. To do this, open: C:\Users\%username%\AppData\Roaming\Notepad++ and open the file shortcuts.xml with Notepad++.

When opening shortcuts.xml, there will be multiple lines of code. The macro is started by:

```
<Macro name="Add ! to names" Ctrl="no" Alt="no" Shift="no" Key="0">
```

Following the first line, each line corresponds to one command in Notepad++. To change the name of the company Öresundskraft to Öresundskraft!, use the following lines of code:

```
<Action type="3" message="1700" wParam="0" lParam="0" sParam="" />
<Action type="3" message="1601" wParam="0" lParam="0" sParam="Öresundskraft" />
<Action type="3" message="1625" wParam="0" lParam="1" sParam="" />
<Action type="3" message="1602" wParam="0" lParam="0" sParam="Öresundskraft!" />
<Action type="3" message="1702" wParam="0" lParam="769" sParam="" />
<Action type="3" message="1701" wParam="0" lParam="1609" sParam="" />
```

These six lines of code should then be copied and pasted after each other for each of the company names as seen in the picture below:

```
</Macro>
<Macro name="Add ! to names" Ctrl="no" Alt="no" Shift="no" Key="0">
    <Action type="3" message="1700" wParam="0" lParam="0" sParam="" />
    <Action type="3" message="1601" wParam="0" lParam="0" sParam="Öresundskraft" />
    <Action type="3" message="1625" wParam="0" lParam="1" sParam="" />
    <Action type="3" message="1602" wParam="0" lParam="0" sParam="Öresundskraft!" />
    <Action type="3" message="1702" wParam="0" lParam="769" sParam="" />
    <Action type="3" message="1701" wParam="0" lParam="1609" sParam="" />
    <Action type="3" message="1700" wParam="0" lParam="0" sParam="" />
    <Action type="3" message="1601" wParam="0" lParam="0" sParam="Örebro Kommun" />
    <Action type="3" message="1625" wParam="0" lParam="1" sParam="" />
    <Action type="3" message="1602" wParam="0" lParam="0" sParam="Örebro Kommun!" />
    <Action type="3" message="1702" wParam="0" lParam="769" sParam="" />
    <Action type="3" message="1701" wParam="0" lParam="1609" sParam="" />
    <Action type="3" message="1700" wParam="0" lParam="0" sParam="" />
    <Action type="3" message="1601" wParam="0" lParam="0" sParam="ÖoB" />
    <Action type="3" message="1625" wParam="0" lParam="1" sParam="" />
    <Action type="3" message="1602" wParam="0" lParam="0" sParam="ÖoB!" />
    <Action type="3" message="1702" wParam="0" lParam="769" sParam="" />
    <Action type="3" message="1701" wParam="0" lParam="1609" sParam="" />
```

To end the macro, write the following line of code:

```
</Macro>
```

Instead of writing all 500 company names, copy the named from the already created list of companies and simply add a column to the left and to right where the lines of code are pasted. When this is organized in Excel, paste everything in shortcuts.xml and use *Search* > *Replace* to create a new row after each > symbol by entering > in the *Search for* field and *\n* in the *Replace with field* and make sure that the *Extended* option is selected in the lower left *Search Mode* box.

How to process the data

To use the different functions needed within RStudio, the packages containing the function needs to be installed and loaded. Using the following lines of code, some useful packages are installed:

```
##### Adding packages
install.packages("textreadr")
install.packages("tm")
install.packages("syuzhet")
install.packages("sqldf")
install.packages("stringr")
install.packages("factoextra")
install.packages("cluster")
install.packages("scales")
install.packages("xlsx")
```

After installing packages, these need to be loaded to the library each time RStudio is restarted. The above packages can be loaded using the following code:

```
##### Adding the packages to the library
library(textreadr)
library(tm)
library(syuzhet)
library(sqldf)
library(stringr)
library(factoextra)
library(cluster)
library(scales)
library(xlsx)
```

The first step of processing the data is to import the articles and company data into RStudio. The document containing the articles should be imported as a *.txt* file while the document containing the company data should be saved and imported as a comma delimited .csv file. Set the directory for loading the files by modify the following code so that it leads to the right folder:

```
setwd("C://Users//Sebastian//Desktop//Examensarbete//Text Mining")
```

Upload the articles and company data using the following code where "All_Articles_Combined_2018.txt" and "Companies_from_Orbis_500.csv" should be changed to the correct file names:

```
##### Uploading the articles
Articles <- read.table("All_Articles_Combined_2018.txt", header = FALSE, sep = "\t", quote
= "",fileEncoding = "utf-16")
Articles <- cbind(c(1:nrow(Articles)), Articles)
colnames(Articles) <- c("Nr","Text")
```

```
##### Uploading the company names
Companies < read.table("Companies_from_Orbis_500.csv", header = TRUE, sep= ";")
```

Count how many articles each company is mentioned in using the sqldf function. The function searches through one article at a time is for all company names and it finds a name mentioned once or multiple times, that company receives one point. Make sure to check the input data so that the names correspond to the following code:

```
##### Creating a list to see how many articles speak about each company from the list
Table_1 <- sqldf("SELECT p2.Name Companies, p2.Revenue, p2.Employees,
COUNT(p1.Nr) Number_of_articles FROM Articles p1, Companies p2 WHERE p1.Text
LIKE '%'||p2.Name||'%' group by p2.Name")
```

Connect each article with the company name it mentions using sqldf function but with the following different settings:

```
##### Create a list to see which article that corresponds to each company
Table_2 <- sqldf("SELECT p2.Name Companies, p1.Nr, p1.Text Content_of_Articles FROM
Articles p1, Companies p2 WHERE p1.Text like '%'||p2.Name||'%'")
```

After this step, Table_1 should have the four columns: Companies, Revenue, Employees and Number of Articles while Table_2 should have the three columns: Companies, Nr (row number for each article) and Content of Articles. The next step is to analyze the sentiment of each article. This is done by the function get_nrc_sentiment where the content is categorized as positive or negative as well as how it is associated to the 8 emotions: Anger, Anticipation, Disgust, Fear, Joy, Sadness, Surprise and Trust:

```
##### Sentiment analysis of all articles
Sentiment <- get_nrc_sentiment(Table_2$Content_of_Articles, language="swedish")
```

The sentient score of each article is calculated by subtracting the negative sentiment points from the positive sentiment points and then dividing the sum with the total amount of words:

```
##### Sentiment score, (P-N)/Total amount of words
Sentiment_score <- (Sentiment$positive - Sentiment$negative) /
lengths(str_split(Table_2$Content_of_Articles, '\\S+'))
Table_2_with_sentiment_score <- cbind(Table_2, Sentiment_score)
```

In order to calculate the mean sentiment score of all articles connected to a company, a for-loop is necessary. The for-loop takes Table_1 and goes through the whole list of company names. For each company name, a second for-loop searched through all of the articles connected to companies in Table_2. If a company name from Table_1 is matched with an article in in Table_2, the sentiment score is stored in a vector. After the second for-loop has gone through all articles, the mean sentiment score of all articles in the vector is calculated. Then, the first for-loop selects the next company in line as runs the second for-loop so that the whole procedure is done again but for that new company instead. Finally, all means are added to Table_1 to form

a new table of five columns consisting of the company names and the four variables: Revenue, Employees, Number of Articles and Mean Sentiment Score:

```
##### Summarize each companies sentiment score
Mean_Sentiment_Score <- vector("numeric",nrow(Table_1))
for (i in 1:nrow(Table_1)){

  Sentiment_Vector<- vector("numeric",nrow(Table_2_with_sentiment_score))
  for (j in 1:nrow(Table_2_with_sentiment_score)){

    if (Table_1$Companies[i] == Table_2_with_sentiment_score$Companies[j]){

      Sentiment_Vector[[j]] <- Table_2_with_sentiment_score$Sentiment_score[j]
    }
  }
  Mean_Sentiment_Score[i] <- sum(Sentiment_Vector)/sum(Sentiment_Vector != 0) # This
expression equals mean(A)
}
Table_with_four_variables <- cbind(Table_1, Mean_Sentiment_Score)
Table_with_four_variables$Mean_Sentiment_Score[is.nan(Table_with_four_variables$Mean
_Sentiment_Score)] <- 0
```

To investigate if there is any linear relationship between company size and number of articles, a regression using the “lm” function is performed. For the data in the 2019 ranking, there was a significant relationship between number of article and company revenue while there was no significant relationship between number of articles and number of employees. Therefore, number of employees is excluded as an independent variable from the following code. However, if it is desired to run a multilinear regression with both revenue and number of employees as independent variables, it can simply be added to the code by writing + Number_of_Employees behind the variable Revenue. The result of the regression is displayed using the function summary:

```
##### Regression
regression <- lm(Number_of_articles ~ Revenue , data = Table_with_four_variables)
summary(regression)
Coefficient_I <- coef(regression)[1]
Coefficient_R <- coef(regression)[2]
```

Since there is a linear relationship between number of articles and company size in terms of revenue, it is possible to use that relationship to adjust number of articles so reduce the correlation between company size and innovation ranking. This is done by dividing each company’s number of articles with the linear equation received from the regression conducted above:

```
##### Adjusting number of articles to company size
Adjusted_Table_with_four_variables <- Table_with_four_variables
Adjusted_Table_with_four_variables$Number_of_articles <-
(Table_with_four_variables$Number_of_articles /
(Coefficient_R*Table_with_four_variables$Revenue + Coefficient_I) )
```

The final innovation score is calculated by multiplying the number of articles with the mean sentiment score:

```
##### Calculating innovation score
Innovation_score<- Adjusted_Table_with_four_variables
$Number_of_Articles_Adjusted_to_Size * Adjusted_Table_with_four_variables
$Mean_Sentiment_Score_org

##### Adding innovation score to the table
Adjusted_Table_with_four_variables <- cbind(Adjusted_Table_with_four_variables,
Innovation_score)
colnames(Adjusted_Table_with_four_variables) <- c("Companies","Revenue","Employees",
"Number_of_articles_org","Mean_Sentiment_Score_org",
"Number_of_Articles_Adjusted_to_Size", "Innovation_Score")
```

To create an excel sheet of the results, the function write.xlsx is used:

```
##### Create Ecxel sheet with results
write.xlsx(Adjusted_Table_with_four_variables, file = "Results.xlsx",
        sheetName = "Results", append = FALSE)
```

Refining and sanity testing the result

After exporting the list from RStudio, it is important to sanity check the results. In the 2019 ranking, the top 25 companies were presented as Sweden's Most Innovative Companies. Therefore, all articles connected to these 25 companies where checked for relevance so that the article actually directly referred to that company and that the context somehow was connected to innovation.

Furthermore, to reduce the impact of weirdly written articles on the mean sentiment score, all companies with less than 15 articles are sorted out. The reason for this is that some articles receive an overly positive sentiment score compared what the main context actually is about due to the journalist's overuse of certain sensitive keywords. By setting the lower requirement to 15 articles, the impact that an overly positive articles has on the mean sentiment score is effectively reduced.

How to interpret the data and conclusions

The outcome of the methods described in this handbook is an innovation ranking based on how innovative companies are perceived by journalists in public media. This can be used alone or as a component together with ranking methods to evaluate how innovative a company is perceived.

While the articles and company data can be seen as objective, there are certain steps in the handbook where manual sorting is needed. Therefore, it is important to be as systematic and thorough as possible keep the objectiveness of the ranking. Therefore, good knowledge of the companies and a large amount of time is beneficial.

Good luck with your next ranking!

Sebastian Wattle Björk & Andrejs Celukanovs

Appendix B – Example of Keywords Extracted from Research Articles

The extracted keywords from IEEE Xplore and Scopus. Articles containing exactly the same keywords has been sorted out to save space, therefore only 48 of the 300 articles are included.

Relevant article keywords extracted from IEEE Xplore Digital Library

Article title	**Keyword type**		
-	IEEE Keywords	INSPEC: Controlled Indexing	INSPEC: Non-Controlled Indexing
Fast R-CNN	Open source software		
No Silver Bullet Essence and Accidents of Software Engineering	Technological innovation; Project management		
Steps toward a science of service systems		Innovation management	
Failure detection and identification	Technological innovation; Decision making		
Moore's law: past, present and future			Innovation
Factors for success in R&D projects and new product innovation: a contextual framework	Product development	Research and development management; Product development	R&D projects; Project success factors; New product innovation; R&D project failure; R&D project success
An innovations approach to least-squares estimation--Part I: Linear filtering in additive white noise	Technological innovation		Innovations methods
Technology novelty, project complexity, and product development project execution success: a deeper look at task uncertainty in product innovation	Product development	Research and development management	Product innovation; Technology novelty; Product development project execution success; R&D management

SOI-KF: Distributed Kalman Filtering with Low-Cost Communications Using the Sign of Innovations			Sign of innovations
Industrie 4.0: Hit or Hype? [Industry Forum]	Technological innovation		Industrie 4.0; Fourth industrial revolution
Open Innovation in Practice: An Analysis of Strategic Approaches to Technology Transactions	Technological innovation		Open innovation process; Open innovation
The causes of project failure	Innovation management		
Mobileflow: Toward software-defined mobile networks	Technological innovation	Innovation management	Ground-breaking network innovation
Smarter Cities and Their Innovation Challenges		Innovation management	
Image-based modeling, rendering, and lighting	Technological innovation		
A visual analytics agenda	Research and development	Research and development	
Evidence-based software engineering	Best practices; Technological innovation		
The convergence of AML	Technological innovation		Radical technological innovation
Assessing a multidimensional measure of radical technological innovation	Technological innovation; Innovation management		Innovation radicalness
Distributed Parameter Estimation in Sensor Networks: Nonlinear Observation Models and Imperfect Communication	Technological innovation		Innovation step
Innovations in microwave filters and multiplexing networks for communications satellite systems	Technological innovation		Innovations; Research and development

Relevant article keywords extracted from Scopus database

Article title	Keyword type		
	SciVal Topic Prominence	Author keywords	Indexed keywords
Dynamic capabilities and strategic management	Open innovation; Innovation	Innovation; Strategy; Innovation characteristics	
User acceptance of information technology: Toward a unified view			Innovation characteristics
The balanced scorecard--measures that drive performance			Organizational Innovation
Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology	Open innovation; Innovation		
Development of an instrument to measure the perceptions of adopting an information technology innovation		Innovation diffusion	Diffusion of innovations; Information technology innovation; Innovation diffusion; Innovation;
Understanding information technology usage: A test of competing models		Innovation characteristics	Innovation characteristics
Maximizing the spread of influence through a social network		Diffusion of innovations	Diffusion of innovations; Technological innovation; Innovation
Developing and evaluating complex interventions: The new Medical Research Council guidance		Innovation; New product development	Diffusion of Innovation; Innovation; New product and process development; New product development; Product development
Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance		Entrepreneurship; Innovation	Innovation; Sustainable development
The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits	Open innovation; Innovation		
Diffusion of innovations in service organizations: Systematic review and recommendations		Diffusion of innovation	Diffusion of Innovation
The dynamics of innovation: From National Systems and "mode 2" to a Triple Helix of university-industry-government relations	Academic entrepreneurship	Innovation	

Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms		Innovation; Innovative performance; Innovative search	Strategic planning; Innovative search; Openness
Lead Users: A Source of Novel Product Concepts			Innovation management; Novel product concepts
Building a learning organization			Diffusion of Innovation; Organizational Innovation
Value creation in e-business	Model innovation	Value creation	
The Correlates of Entrepreneurship in Three Types of Firms			Entrepreneurship
The future of seawater desalination: Energy, technology, and the environment			Innovation; Sustainable development; Technological development
Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs		Innovation diffusion; Innovativeness	Strategic planning; Innovation adoption
Business models, business strategy and innovation	Model innovation		Innovation management; Value creation; Strategic planning; Innovation
International R&D spillovers		R&D	Research and development capital
Innovation, market orientation, and organizational learning: An integration and empirical examination	Strategic orientation		
A pragmatic view of knowledge and boundaries: Boundary objects in new product development		New Product Development	
Why do people use information technology? A critical review of the technology acceptance model		Innovation	Change management
Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings			Innovation adoption implementation; Metaanalysis of innovation characteristics research
Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management		Innovation diffusion	Innovation diffusion; Technology assimilation

A critical look at technological innovation typology and innovativeness terminology: A literature review	New product development; Product development; NPD projects		
Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms			Strategic planning
Cavity optomechanics: Back-action at the mesoscale			Innovation; Technological development
Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations			Organizational Innovation
A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology		Innovation; Personal Innovativeness	Personal innovativeness
Theorizing change: The role of professional associations in the transformation of institutionalized fields	Institutional entrepreneurs		
Understanding the rationale of strategic technology partnering: Nterorganizational modes of cooperation and sectoral differences		innovation	
Resource-based View of Strategic Alliance Formation: Strategic and Social Effects in Entrepreneurial Firms	Open innovation; Innovation	Entrepreneurship; Product Innovation	
Localization of knowledge and the mobility of engineers in regional networks	Innovation		Patents and inventions
Customer power, strategic investment, and the failure of leading firms		Innovation; Technological change	Innovation
From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory	Innovation; Sustainable development	Sectoral systems of innovation	Sustainable development; Sectoral systems of innovation
The learning region: Institutions, innovation and regional renewal	Innovation	Innovation	Development strategy; Innovation system

Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities		Capabilities: Continuous innovation	
Neoantigens in cancer immunotherapy			Innovation
Finance, entrepreneurship and growth	Model innovation	Innovation	
Using online conversations to study word-of-mouth communication			Diffusion of Innovation; New product research
Innovation, organizational capabilities, and the born-global firm		Innovation and capabilities	
Open source software and the "private-collective" innovation model: Issues for organization science		Innovation; User Innovation	
Trust in automation: Designing for appropriate reliance			Organizational Innovation
Disseminating Innovations in Health Care			Diffusion of Innovation; Organizational Innovation
Are individual differences germane to the acceptance of new information technologies?		Information technology innovation; Technology implementation	

Appendix D – Sweden's Top 500 Largest Companies by Revenue

No.	Company name (other names)	Data from year	Operating revenue 1000 SEK	No. of employees
1	AB VOLVO (Volvo Group, Volvo Trucks, Volvo Construction, Volvo Penta)	2017	335,068,000	87,104
2	VOLVO CARS (Geely Sweden)	2017	214,166,000	37,969
3	ERICSSON	2017	202,410,000	100,735
4	H&M (HENNES & MAURITZ)	2017	200,004,000	123,178
5	SKANSKA	2017	157,877,000	40,400
6	VATTENFALL	2017	137,575,000	20,041
7	SCANIA	2017	126,825,000	42,369
8	ELECTROLUX	2017	122,273,000	56,708
9	ATLAS COPCO	2017	119,940,000	47,599
10	ESSITY	2017	109,265,000	18,370
11	ICA GRUPPEN (ICA)	2017	107,334,000	22,137
12	SANDVIK	2017	98,253,000	43,376
13	TELIA	2017	92,622,000	25,472
14	SECURITAS	2017	92,220,600	227,460
15	AXEL JOHNSON	2017	78,120,000	20,372
16	SKF	2017	78,037,000	45,678
17	ASSA ABLOY	2017	76,608,000	47,426
18	PREEM	2017	69,217,000	1,458
19	SSAB	2017	66,779,000	16,158
20	SCA	2017	66,121,000	4,031
21	AUTOLIV	2017	61,349,000	47,886
22	ASTRAZENECA	2017	60,771,000	5,723
23	NCC!	2017	54,629,000	17,762
24	PEAB	2017	50,180,000	14,344
25	CARL BENNET	2017	49,784,000	27,213
26	BOLIDEN	2017	49,662,000	5,684
27	AXFOOD	2017	46,451,000	9,903
28	SKANDINAVISKA ENSKILDA BANKEN (SEB)	2018	45,866,000	14,751
29	SAS	2018	44,718,000	10,146
30	SWEDBANK	2018	44,222,000	14,865
31	IF SKADEFORSAKRING	2017	43,610,000	n/a

32	SVENSKA HANDELSBANKEN (HANDELSBANKEN)	2017	41,674,000	11,832
33	DAGAB INKOP & LOGISTIK	2017	40,753,577	2,002
34	HUSQVARNA	2017	39,455,000	13,807
35	ALECTA	2017	38,514,000	n/a
36	SONY	2017	36,794,675	861
37	ALFA LAVAL	2017	35,902,000	16,367
38	TOYOTA	2017	34,842,000	13,335
39	HEXAGON	2017	34,536,167	18,315
40	INVESTOR AB	2017	34,398,000	20,054
41	STENA	2017	33,723,000	11,531
42	ABB	2017	33,060,000	8,027
43	TELE2	2017	31,936,000	5,670
44	TRELLEBORG	2017	31,877,000	23,152
45	SPOTIFY	2017	31,808,094	1,091
46	SAAB	2017	31,477,000	16,427
47	GETINGE	2017	29,680,000	10,684
48	VOLKSWAGEN	2017	29,540,849	435
49	SYSTEMBOLAGET	2017	29,362,000	3,611
50	IKEA	2017	27,626,807	6,957
51	AHLSELL	2017	27,522,000	5,471
52	BILIA	2017	27,506,000	4,708
53	BONNIER	2017	27,098,000	9,410
54	AAK	2017	26,565,000	3,399
55	SKANDIA	2017	24,802,000	n.a.
56	WILLY:S	2017	24,467,897	4,861
57	CELLMARK	2017	24,434,763	757
58	CIRCLE K	2018	23,823,000	1,707
59	LUOSSAVAARA-KIIRUNAVAARA	2017	23,740,000	4,118
60	RATOS	2017	23,697,000	9,993
61	BILLERUDKORSNAS	2017	22,505,000	4,472
62	L E LUNDBERGFORETAGEN	2017	21,516,000	3,259
63	SÖDRA SKOGSAGARNA	2017	20,647,000	3,402
64	SL (STORSTOCKHOLMS LOKALTRAFIK)	2017	20,349,000	n/a
65	OK-Q8	2017	20,194,392	1,164
66	APOTEKET	2017	19,879,000	3,113
67	POSTNORD	2017	19,870,625	17,915
68	MTG (MODERN TIMES GROUP)	2017	19,141,000	3,280
69	NIBE	2017	19,064,000	14,271

70	GOTEBORGS STAD	2017	18,532,600	6,572
71	DIN BIL	2017	17,758,826	1,971
72	BRAVIDA	2017	17,293,000	10,643
73	SAMSUNG	2017	17,287,105	305
74	JM	2017	17,275,000	2,529
75	HOLMEN	2017	17,246,000	2,976
76	LOOMIS	2017	17,228,000	22,811
77	OCTAPHARMA	2017	17,043,781	6,782
78	LUNDIN PETROLEUM	2017	16,959,370	516
79	SWECO	2017	16,889,000	15,557
80	NORDSTJERNAN	2017	16,732,000	21,169
81	ARLA	2017	16,358,000	3,017
82	COOP	2017	16,331,620	3,381
83	AMF (AMF PENSIONSFORSAKRING)	2017	16,231,000	n/a
84	SWEDISH MATCH	2017	16,170,000	5,240
85	TETRA PAK	2017	16,127,000	3,763
86	STOCKHOLMS STAD	2017	16,032,200	2,831
87	EKMAN & CO	2017	16,002,856	283
88	NYNAS	2017	15,509,500	1,014
89	CAPIO	2017	15,425,000	13,314
90	GE HEALTHCARE BIO-SCIENCES	2017	15,033,392	1,612
91	INDUTRADE	2017	14,881,000	6,545
92	OPTIGROUP	2017	14,843,000	2,026
93	MARTIN & SERVERA	2017	14,726,712	3,196
94	ANDERS HEDIN INVEST	2017	14,594,394	2,008
95	SCANDIC HOTELS	2017	14,583,000	16,761
96	BONAVA	2017	14,479,000	1,807
97	DOMETIC	2017	14,097,000	8,769
98	LANDSTINGSHUSET I STOCKHOLM	2017	14,047,937	12,577
99	PERSTORP HOLDING	2017	13,596,000	1,549
100	ELEKTROSKANDIA	2017	13,348,619	2,122
101	FOLKSAM	2017	13,151,000	n/a
102	ELTEL	2017	13,137,604	7,999
103	TECH DATA	2017	13,119,670	257
104	OUTOKUMPU STAINLESS	2017	12,991,000	1,533
105	BERGENDAHL & SON	2017	12,942,153	4,823
106	APOTEK HJARTAT	2017	12,848,428	2,869
107	NOBIA	2017	12,810,000	4,676

108	ATEA SVERIGE	2017	12,740,520	2,196
109	HEDIN BIL	2017	12,700,039	1,711
110	ÅF	2017	12,668,000	9,865
111	AKELIUS RESIDENTIAL PROPERTY	2017	12,579,000	796
112	SCHENKER	2017	12,252,134	2,053
113	HEXPOL	2017	12,246,000	4,389
114	TELENOR	2017	11,939,093	1,530
115	ELGIGANTEN	2018	11,878,740	1,554
116	HI3G	2017	11,693,862	2,085
117	TUI	2017	11,478,014	611
118	GRÄNGES	2017	11,435,000	1,568
119	ELEKTA	2018	11,333,000	3,716
120	ATTENDO	2017	11,169,000	15,871
121	SIEMENS INDUSTRIAL TURBOMACHINERY	2017	11,117,947	2,588
122	EQUINOR OTS	2017	11,079,755	n/a
123	EPIROC	2017	11,017,917	1,653
124	LILJEDAHL GROUP	2017	10,945,401	1,221
125	THOMAS COOK	2017	10,929,691	589
126	ACADEMEDIA	2018	10,810,000	11,863
127	ACM 2001	2018	10,810,000	11,863
128	MOLNLYCKE	2017	10,710,000	466
129	PRAKTIKERTJANST	2017	10,562,700	9,043
130	SIRELA	2017	10,496,587	8,726
131	INTRUM JUSTITIA	2017	10,485,000	6,293
132	DUSTIN	2018	10,308,300	1,152
133	TAMRO	2017	10,088,903	550
134	INVESTMENT AB LATOUR	2017	10,059,000	4,902
135	LIFCO	2017	10,048,000	4,758
139	DNB BANK	2017	10,000,000	350
140	SANTANDER	2017	10,000,000	350
138	TRYGG-HANSA	2017	10,000,000	1,750
137	FORSVARETS MATERIELVERK	2017	10,000,000	3,500
136	UPPSALA LÄNS LANDSTING	2017	10,000,000	10,000
141	BEIJER REF	2017	9,849,439	2,717
142	RADISSON	2017	9,521,465	5,033
143	BERGENDAHL FOOD	2017	9,405,757	838
144	ELANDERS	2017	9,389,200	6,997
145	FORTUM	2017	9,350,643	592

146	E'ON ENERGILOSNINGAR	2017	9,229,570	276
147	OVAKO	2017	9,117,328	2,920
148	NOBINA	2017	9,094,000	9,629
149	HILDING ANDERS (HILDING)	2017	9,072,000	9,312
150	CITY GROSS	2017	9,027,709	2,812
151	VÄSTTRAFIK	2017	8,920,486	310
152	LÄNSFORSAKRINGAR	2017	8,609,000	1,847
153	AXIS	2017	8,604,200	2,865
154	FORVALTNINGSAKTIEBOLAGET FRAMTIDEN	2017	8,464,441	1,035
155	RIKSBYGGEN	2017	8,436,270	2,728
156	SAMHALL	2017	8,281,000	19,459
157	LINDAB	2017	8,255,000	5,083
158	CLAS OHLSON	2018	8,234,900	2,951
159	ASSEMBLIN	2017	8,169,327	5,693
160	NALKA INVEST	2017	8,072,595	3,323
161	ADDTECH	2017	8,049,000	2,358
162	LINDENGRUPPEN	2017	7,972,000	3,111
163	COOR SERVICE MANAGEMENT (COOR)	2017	7,943,000	6,695
164	LINKOPINGS STADSHUS	2017	7,854,000	1,293
165	GKN AEROSPACE SWEDEN	2017	7,839,000	2,012
166	SJ	2017	7,807,000	3,680
167	AB SVENSKA SPEL	2017	7,791,000	1,694
168	DHL (DHL FREIGHT)	2017	7,786,909	1,958
169	ARJO	2017	7,717,000	5,853
170	SCAN (HKSCAN SWEDEN)	2017	7,683,097	1,791
171	SVEVIA	2017	7,610,000	1,833
172	STORA ENSO	2017	7,571,600	1,558
173	VALMET	2017	7,568,000	1,424
174	KRONANS APOTEK	2017	7,524,418	2,710
179	SVENSKA KRAFTNÄT	2017	7,500,000	750
178	DANSKE BANK	2017	7,500,000	1,750
177	BAUHAUS	2017	7,500,000	2,500
176	LIDL	2017	7,500,000	3,500
175	TRAFIKVERKET	2017	7,500,000	7,500
180	RINGHALS	2017	7,484,928	1,451
181	DAHL SVERIGE	2017	7,403,197	1,020
182	BECKERS (AKTIEBOLAGET WILH. BECKER)	2017	7,392,000	2,943
183	SYSTEMAIR	2018	7,337,500	5,465

184	CAMFIL	2017	7,293,700	4,225
185	STOCKHOLM EXERGI	2017	7,255,891	703
186	COM HEM	2017	7,170,000	966
187	MELLBY GÅRD	2018	7,162,000	2,609
188	SCANDI STANDARD	2017	7,142,400	2,264
189	ELLEVIO	2017	7,034,000	433
190	SVEASKOG	2017	6,990,000	846
191	NEMUS HOLDING	2017	6,980,512	1,582
192	NORDEA	2017	6,977,217	250
193	DEROME	2017	6,905,157	1,752
194	E.ON	2017	6,793,000	256
195	ACTR HOLDING	2017	6,754,000	5,888
196	NOLATO	2017	6,732,000	7,249
197	IAC (INTERNATIONAL AUTOMOTIVE COMPONENTS GROUP SWEDEN)	2017	6,730,558	1,552
198	IBM	2017	6,669,232	1,575
199	MUNTERS	2017	6,660,000	3,496
200	VEIDEKKE	2017	6,590,787	1,228
201	FORSMARKS KRAFTGRUPP	2017	6,558,070	1,161
202	HUMANA ASSISTANS	2017	6,557,000	10,003
203	ORIOLA	2017	6,554,327	289
204	SWEDISH ORPHAN BIOVITRUM	2017	6,511,302	800
205	JULA	2017	6,502,538	2,060
206	KJB HOLDING	2017	6,502,538	2,060
207	VASAKRONAN	2017	6,490,000	382
208	GAMBRO LUNDIA	2017	6,458,000	668
209	ITAB	2017	6,433,000	3,599
210	INWIDO	2017	6,382,000	4,361
211	APOLLO (DER TOURISTIK NORDIC)	2017	6,316,742	425
212	SKANOVA	2017	6,269,697	423
213	RAGN-SELLSFÖRETAGEN	2017	6,198,440	2,941
214	CLOETTA	2017	6,106,000	2,467
215	ERLANDSSON	2017	6,014,414	1,956
216	THULE	2017	6,003,000	2,119
217	MEKONOMEN	2017	6,000,000	2,286
218	GUNNEBO	2017	5,994,000	5,210
219	AB PERSSON INVEST	2017	5,960,923	1,326
220	SWEDAVIA	2017	5,926,000	3,074
221	FASTIGHETS AB BALDER	2017	5,923,000	610

222	IKANO	2017	5,922,678	901
223	AMBEA	2017	5,887,000	15,299
224	THE ABSOLUT COMPANY (ABSOLUTE VODKA)	2017	5,840,500	489
225	HEMKÖP	2017	5,796,342	1,640
226	SECO TOOLS	2017	5,782,000	1,406
227	THOMAS CONCRETE	2017	5,762,700	1,717
228	BOSCH	2017	5,745,839	392
229	MEDICOVER	2017	5,711,402	8,097
230	CABONLINE	2017	5,695,934	1,373
231	WSP	2017	5,682,963	4,761
232	DSV ROAD	2017	5,672,693	1,408
233	PWC	2018	5,649,413	3,567
234	NEW WAVE (TORSTEN JANSSON HOLDING)	2017	5,648,000	2,495
235	MOMENTUM GROUP	2017	5,620,000	1,647
236	NEW WAVE GROUP	2017	5,617,400	2,495
237	SERNEKE	2017	5,605,000	942
238	FAM	2017	5,589,000	564
239	VIDA	2017	5,497,818	1,056
240	RECIPHARM	2017	5,487,300	4,575
241	BOMBARDIER	2017	5,466,848	1,693
242	MTR	2017	5,455,927	4,443
243	DELAVAL	2017	5,447,500	632
244	WALDIR	2017	5,437,117	719
245	ANTICIMEX	2017	5,433,727	5,565
246	METSA BOARD	2017	5,410,005	735
247	ORKLA FOODS	2017	5,406,078	1,511
248	BEIJER BYGGMATERIAL	2017	5,398,050	1,383
249	STADIUM	2017	5,391,112	2,019
250	BYGGMAX	2017	5,355,900	1,061
251	CGI (CGI Sverige)	2017	5,289,202	3,554
252	KLS UGGLARPS	2017	5,252,762	999
253	AB FAGERHULT	2017	5,227,900	3,241
254	CASTELLUM	2017	5,182,000	416
255	BILTEMA	2017	5,113,845	1,048
256	SWEROCK	2017	5,107,718	939
257	POLYGON	2017	5,107,101	3,279
258	LOKA HOLDING (SPENDRUPS)	2017	5,089,600	1,189
259	UPPLANDS MOTOR	2017	5,032,868	816

260	TIETO	2017	5,028,219	1,628
261	REXEL	2017	4,966,342	770
262	SKELLEFTEÅ STADSHUS	2017	4,966,336	904
263	NETONNET	2017	4,923,012	640
264	ÅHLENS	2017	4,910,690	2,166
265	ATG (AKTIEBOLAGET TRAV OCH GALOPP)	2017	4,880,400	271
266	SÖDERSJUKHUSET	2017	4,871,026	4,724
267	NETTO MARKNAD	2017	4,866,073	1,361
268	TEKNISKA VERKEN I LINKOPING	2017	4,839,000	875
269	SVERIGES TELEVISION (SVT)	2017	4,803,696	2,309
270	SVERIGES RIKSBANK	2017	4,789,000	n/a
271	KAPPAHL	2018	4,760,000	2,884
272	CAVERION	2017	4,756,878	3,219
273	BERGMAN & BEVING	2017	4,754,000	1,458
274	HELSINGBORGS STADS FORVALTNING	2017	4,729,868	1,162
275	BETSSON	2017	4,716,458	1,873
276	NKT CABLES	2017	4,705,324	911
277	KEOLIS	2017	4,678,900	5,262
278	HALDEX	2017	4,462,000	2,176
279	DUNI	2017	4,452,000	2,412
280	KARL HEDIN	2017	4,403,959	981
281	VOLATI	2017	4,362,000	1,750
282	QLIRO	2017	4,359,900	694
283	BE GROUP	2017	4,351,000	700
284	SMURFIT KAPPA KRAFTLINER PITEÅ	2017	4,339,647	551
285	ONEMED	2017	4,317,000	782
286	MÖLLER BIL	2017	4,296,063	674
287	ADIENT SWEDEN	2017	4,285,513	607
288	ISS FACILITY SERVICES	2017	4,281,304	6,392
289	PANDOX	2017	4,269,000	1,130
290	GEKÅS	2017	4,263,013	913
291	AKZO NOBEL	2017	4,240,561	1,105
292	TRIOPLAST	2017	4,234,743	1,009
293	BRAGANZA	2017	4,231,856	1,584
294	EQT (IGT HOLDING III)	2017	4,217,000	3,318
295	IFS AB (INDUSTRIAL AND FINANCIAL SYSTEMS, IFS)	2017	4,217,000	3,318
296	ACCENTURE	2018	4,201,208	1,108
297	MIDROC	2017	4,201,115	1,619

298	KINNARPS HOLDING	2017	4,161,611	2,279
299	KLARNA	2017	4,158,045	1,380
300	CAPGEMINI	2017	4,142,540	1,353
301	SETRA GROUP	2017	4,136,000	793
302	FRESENIUS KABI	2017	4,089,017	974
303	INFRANORD	2017	4,082,000	1,798
304	HCL TECHNOLOGIES SWEDEN	2017	4,079,362	1,112
305	AQ GROUP	2017	4,064,434	5,548
306	HÖGANAS	2017	4,053,807	625
307	SVENSKA FODER	2017	4,029,492	301
308	VASTERÅS STADSHUS	2017	4,014,323	904
309	DANIR DEVELOPMENT	2017	4,011,181	3,597
310	GREENFOOD	2017	4,001,373	854
311	ALIMAK GROUP	2017	4,000,700	2,397
312	ERNST & YOUNG (E&Y)	2017	3,998,179	2,458
313	R12 KAPITAL	2017	3,971,973	1,469
314	BEIJER ALMA	2017	3,971,496	2,544
315	VALEDO PARTNERS	2017	3,967,720	2,658
316	GREEN CARGO	2017	3,964,000	1,816
317	SKÅNEMEJERIER	2017	3,960,059	697
318	DENTSPLY	2017	3,959,235	905
319	SWECON	2017	3,958,908	471
320	SVENSK CATER	2017	3,957,220	699
321	BYGGHEMMA	2017	3,955,542	812
322	RUNSVENGRUPPEN	2017	3,935,000	1,170
323	GREENCARRIER	2017	3,914,097	798
324	UMEÅ KOMMUNFORETAG	2017	3,913,664	820
325	CEVT (CHINA-EURO VEHICLE TECHNOLOGY)	2017	3,912,256	1,026
326	ÖOB	2017	3,905,296	1,050
327	FRISTADS KANSAS	2017	3,889,978	1,587
328	DANDERYDS SJUKHUS	2017	3,887,222	3,948
329	AGA!	2017	3,882,000	859
330	SÖDERTÄLJE KOMMUN	2017	3,867,508	774
331	TELGE	2017	3,867,508	774
332	HOLMGREN GROUP	2017	3,836,084	642
333	NEFAB	2017	3,834,894	2,681
334	TIBNOR	2017	3,828,200	483
335	LÄNSFORSÄKRINGAR	2017	3,825,500	n.a.

336	MIO	2018	3,824,041	504
337	JCE	2017	3,805,942	2,997
338	CHALMERS	2017	3,695,443	3,066
339	COCA-COLA	2017	3,692,000	782
340	ENTERCARD	2017	3,657,980	420
341	HERENCO	2017	3,654,471	1,633
342	LANTMANNEN MASKIN	2017	3,651,680	784
343	SIEMENS	2017	3,616,184	1,198
344	TOVEKS BIL	2017	3,592,724	623
345	HUAWEI	2017	3,584,326	387
346	BISNODE	2017	3,575,800	2,069
347	SKELLEFTEÅ KRAFTAKTIEBOLAG	2017	3,564,115	587
348	EBERSPACHER	2017	3,552,093	821
349	BDX FORETAGEN	2017	3,548,709	489
350	FAIRFORD	2017	3,536,873	2,085
351	SIGMA	2017	3,515,282	3,317
352	JYSK	2017	3,469,231	1,460
353	LAGERCRANTZ GROUP	2017	3,469,000	1,387
354	CARLSBERG	2017	3,468,489	286
355	PHADIA	2017	3,465,316	568
356	BILMETRO	2017	3,421,668	583
357	AHLMARKS (O.F. AHLMARK & CO EFTR.)	2017	3,411,165	1,325
358	OPTIMERA SVENSKA	2017	3,401,165	863
359	SOLAR SVERIGE	2017	3,340,000	632
360	KGK	2017	3,339,670	960
361	TARKETT	2017	3,337,823	658
362	LINDEX	2017	3,301,830	1,303
363	YARA	2017	3,287,017	306
364	UNILEVER	2017	3,284,150	347
365	TAGE REJMES BIL	2017	3,279,738	708
366	PROACT IT GROUP	2017	3,258,268	799
367	ADECCO SWEDEN	2017	3,219,517	5,198
368	BUFAB	2017	3,206,000	1,119
369	SBAB BANK	2017	3,163,000	506
370	NEDERMAN	2017	3,152,900	1,803
371	INSTALCO	2017	3,147,000	1,539
372	MÄLARENERGI	2017	3,129,561	696
373	PULSEN	2018	3,120,819	1,279

374	HOLMGRENS BIL	2017	3,111,113	452
375	SCHNEIDER ELECTRIC	2017	3,105,623	881
376	QLIKTECH	2017	3,105,435	468
377	PARFAIT	2017	3,100,194	255
378	SCANDAGRA	2017	3,099,350	343
379	RESURS BANK	2017	3,086,653	763
380	SINCH (CLX COMMUNICATIONS)	2017	3,078,155	340
381	KAHRS	2017	3,077,848	1,752
382	CYGATE	2017	3,076,228	778
383	SWEDOL	2017	3,075,600	903
384	SAINT-GOBAIN	2017	3,070,783	874
385	ACADEMIC WORK HOLDING	2017	3,059,006	4,694
386	APP EUROPE	2017	3,057,799	1,140
387	LWW GROUP	2017	3,056,758	337
388	PÅGENGRUPPEN	2017	3,048,704	1,483
389	TRANSDEV	2017	3,035,251	2,805
390	KOMATSU FOREST	2017	3,026,184	616
391	MYCRONIC	2017	3,019,033	1,045
392	CRAMO	2017	3,019,000	832
393	SÖDERBERG & PARTNERS	2017	3,008,583	997
394	VBG GROUP	2017	3,005,478	1,502
395	MAX (MAX Hamburgare, Hamburgerkedjan Max)	2017	3,002,656	2,606
416	MELLANSKOG	2017	3,000,000	350
417	MODERNA FORSAKRINGAR	2017	3,000,000	350
418	NORRA SKOGSÄGARNA	2017	3,000,000	350
419	SVERIGES KOMMUNER OCH LANDSTING	2017	3,000,000	350
420	VA SYD	2017	3,000,000	350
413	FORTIFIKATIONSVERKET	2017	3,000,000	750
414	NORRMEJERIER	2017	3,000,000	750
415	TOTALFORSVARETS FORSKNINGSINSTITUT	2017	3,000,000	750
410	LUFTFARTSVERKET	2017	3,000,000	1,250
411	OREBRO UNIVERSITET	2017	3,000,000	1,250
412	SJOFARTSVERKET	2017	3,000,000	1,250
409	SOLLENTUNA KOMMUN	2017	3,000,000	2,500
407	LINKOPINGS UNIVERSITET	2017	3,000,000	3,500
408	STATENS INSTITUTIONSSTYRELSE	2017	3,000,000	3,500
406	TRELLEBORGS KOMMUN	2017	3,000,000	4,500
401	GOTEBORGS UNIVERSITET	2017	3,000,000	7,500

402	KALMAR KOMMUN	2017	3,000,000	7,500
403	KAROLINSKA INSTITUTET	2017	3,000,000	7,500
404	LUNDS UNIVERSITET	2017	3,000,000	7,500
405	UPPSALA UNIVERSITET	2017	3,000,000	7,500
396	JONKOPINGS LÄNS LANDSTING	2017	3,000,000	10,000
397	LUNDS KOMMUN	2017	3,000,000	10,000
398	SKÅNE LÄNS LANDSTING	2017	3,000,000	10,000
399	STOCKHOLMS KOMMUN	2017	3,000,000	10,000
400	STOCKHOLMS LÄNS LANDSTING	2017	3,000,000	10,000
421	RANDSTAD	2017	2,999,717	4,884
422	SYNSAM	2017	2,995,200	1,997
423	FINGERPRINT CARDS	2017	2,994,200	415
424	UDDEHOLMS	2017	2,991,690	901
425	OBOS	2017	2,971,175	871
426	WESTINGHOUSE	2017	2971000	824
427	HANS ANDERSSON	2017	2,939,240	412
428	KRAFTRINGEN	2017	2,937,188	506
429	INTERSPORT	2017	2,936,544	1,007
430	ARVID NORDQUIST	2017	2909459	255
431	SVERIGES RADIO	2017	2,908,813	2,214
432	HANDICARE	2017	2,901,121	1,142
433	ESKILSTUNA KOMMUN	2017	2,898,000	1,047
434	ARRIVA	2017	2,893,082	2,785
435	VIANADA	2017	2,884,700	1,113
436	THE BOSTON CONSULTING GROUP (BCG)	2017	2,880,806	539
437	BULTEN	2017	2,879,000	1,305
438	ÖREBRO KOMUN	2017	2,871,549	837
439	NORDIC SUGAR	2017	2,863,854	366
440	ASSEMBLIN	2017	2,861,731	2,512
441	BRANDT BIL (BRODERNA BRANDT BILAKTIEBOLAG)	2017	2,857,668	478
442	GRANITOR	2017	2,821,006	2,003
443	UNICARRIERS	2017	2,819,100	1,095
444	PROFURA	2018	2,816,000	812
445	ATRIA	2017	2,809,260	935
446	FRÖSUNDA OMSORG	2017	2,802,593	4,191
447	GRIMALDI	2017	2,784,800	1,077
448	SVENSKA BOSTADER	2017	2,784,000	267
449	XXL SPORT & VILDMARK	2017	2,781,902	881

450	NORDIC PAPER	2017	2,776,225	623
451	CARGOTEC	2017	2,771,374	616
452	OEM	2017	2,746,300	872
453	GAVLE STAD	2017	2,744,108	579
454	INOVYN	2017	2,734,922	319
455	KNOWIT	2017	2,733,501	2,065
456	ATTEVIKS BIL	2017	2,729,737	434
457	GEODIS	2017	2,712,532	349
458	RUSTA AB	2018	2,710,971	2,286
459	BRAATHENS (Flyg BRA)	2017	2,698,505	842
460	Daniel Wellington	2017	2,693,036	545
461	BOREALIS	2017	2,689,961	911
462	MALMO STAD	2017	2,689,538	701
463	DELOITTE	2018	2,685,498	1,318
464	ÖRESUNDSKRAFT	2017	2,674,153	354
465	CRANE	2017	2,657,503	408
466	ANICURA	2017	2,646,581	2,807
467	MANPOWER	2017	2,623,105	5,509
468	LERNIA	2017	2,613,523	4,657
469	MALMÖ MEJERI	2017	2,608,849	326
470	AJ POSTORDER	2017	2,581,687	859
471	FERRONORDIC	2017	2,572,413	802
472	KRONFÅGEL	2017	2,566,218	812
473	STRUKTON	2017	2,565,848	1,052
474	ATRIUM LJUNGBERG	2017	2,563,000	296
475	DUROC	2018	2,557,900	740
476	SVEA EKONOMI	2017	2,551,235	1,033
477	SKISTAR	2018	2,548,204	1,283
478	CARNEGIE INVESTMENT BANK	2017	2,543,457	590
479	NESTLÉ	2017	2,541,503	575
480	STRÄNGBETONG	2017	2,524,519	1,037
481	DAFGÅRDS	2017	2,522,704	1,022
482	ADDNODE	2017	2,519,860	1,511
483	HYDRO EXTRUSION	2017	2,507,289	948
484	EINAR MATTSSON	2017	2,500,316	339
485	V-TAB	2017	2,490,232	2,060
486	3M	2017	2,489,441	638
487	NHPEA TISSUE HOLDINGS	2017	2,479,586	731

488	CATELLA	2017	2,477,000	626
489	GOTLANDSBOLAGET	2017	2,470,134	730
490	TROJABORG	2017	2,470,134	730
491	REJLERS	2017	2,470,100	1,994
492	ACANDO	2017	2,446,432	1,935
493	ETRAVELI (Flygresor.se, SEAT24, Flygvaruhuset, travelfinder)	2017	2,441,438	372
494	METSÄ TISSUE	2017	2,441,034	502
495	KING	2017	2,436,662	642
496	FINDUS	2017	2,417,033	468
497	METSO	2017	2,413,474	678
498	SANTA MARIA	2017	2,409,527	448
499	KPMG	2017	2,394,368	1,525
500	SOBRO	2017	2,383,217	1,257

Appendix E – Unfiltered Ranking Based on Innovation Score

Ranking	Companies	Revenue	Employees	Original Number of articles	Original mean of the sentiment score	Number of articles adjusted to size	Innovation score
1	IKEA	27626807	6957	225	0,0053	10,2115	0,0544
2	ABB	33060000	8027	150	0,0063	6,0478	0,0383
3	Saab	31477000	16427	140	0,0061	5,8343	0,0358
4	Stora Enso	7571600	1558	72	0,0052	6,0940	0,0314
5	Castellum	5182000	416	24	0,0108	2,2648	0,0245
6	Findus	2417033	468	26	0,0082	2,8297	0,0231
7	Klarna	4158045	1380	42	0,0054	4,1686	0,0227
8	Siemens	11117947	2588	56	0,0054	4,1110	0,0222
9	Spotify	31808094	1091	134	0,0037	5,5453	0,0207
10	Serneke	5605000	942	34	0,0064	3,1444	0,0201
11	CEVT	3912256	1026	24	0,0083	2,4120	0,0200
12	Tieto	5028219	1628	21	0,0087	1,9964	0,0175
13	Stena	33723000	11531	63	0,0067	2,5059	0,0167
14	Valmet	7568000	1424	27	0,0068	2,2856	0,0156
15	Epiroc	11017917	1653	27	0,0076	1,9896	0,0152
16	Mellanskog	3000000	350	27	0,0053	2,8465	0,0151
17	NCC	54629000	17762	73	0,0071	2,0395	0,0144
18	Arla	16358000	3017	45	0,0051	2,7621	0,0141
19	ICA Gruppen	107334000	22137	159	0,0054	2,5379	0,0138
20	Scania	126825000	42369	158	0,0062	2,1769	0,0136
21	Veidekke	6590787	1228	22	0,0065	1,9443	0,0126
22	Coop	16331620	3381	37	0,0051	2,2729	0,0116
23	Uddeholms	2991690	901	13	0,0083	1,3711	0,0114
24	ATG	4880400	271	17	0,0067	1,6278	0,0109
25	IBM	6669232	1575	27	0,0046	2,3778	0,0108
26	Atrium Ljungberg	2563000	296	12	0,0080	1,2955	0,0103
27	Vasakronan	6490000	382	21	0,0055	1,8644	0,0102
28	Synsam	2995200	1997	10	0,0091	1,0545	0,0096
29	Holmen	17246000	2976	24	0,0066	1,4333	0,0095
30	Swedbank	44222000	14865	66	0,0042	2,1646	0,0092
31	Yara	3287017	306	11	0,0081	1,1421	0,0092
32	Riksbyggen	8436270	2728	15	0,0074	1,2239	0,0091

33	Accenture	4201208	1108	11	0,0082	1,0894	0,0089
34	Sigma	3515282	3317	19	0,0046	1,9491	0,0089
35	Fortum	9350643	592	16	0,0070	1,2577	0,0088
36	Ericsson	202410000	100735	163	0,0059	1,4672	0,0087
37	AGA	3882000	859	11	0,0078	1,1072	0,0086
38	Samsung	17287105	305	45	0,0032	2,6841	0,0086
39	Sweco	16889000	15557	37	0,0039	2,2340	0,0086
40	Ovako	9117328	2920	19	0,0057	1,5076	0,0085
41	Ambea	5887000	15299	4	0,0230	0,3651	0,0084
42	SSAB	66779000	16158	57	0,0060	1,3577	0,0082
43	Volkswagen	29540849	435	85	0,0022	3,6941	0,0080
44	Bombardier	5466848	1693	10	0,0083	0,9309	0,0077
45	SKF	78037000	45678	56	0,0064	1,1735	0,0075
46	Nordic Paper	2776225	623	13	0,0054	1,3872	0,0075
47	Sandvik	98253000	43376	71	0,0061	1,2237	0,0075
48	EQT	4217000	3318	10	0,0075	0,9896	0,0074
49	DHL	7786909	1958	17	0,0051	1,4256	0,0073
50	Boliden	49662000	5684	45	0,0054	1,3529	0,0073
51	AMF	16231000	350	20	0,0059	1,2325	0,0073
52	Husqvarna	39455000	13807	33	0,0061	1,1760	0,0071
53	PEAB	50180000	14344	35	0,0068	1,0440	0,0071
54	VIDA	5497818	1056	14	0,0054	1,3013	0,0071
55	Unilever	3284150	347	15	0,0045	1,5576	0,0070
56	Lidl	7500000	3500	15	0,0055	1,2735	0,0070
57	Sony	36794675	861	39	0,0046	1,4604	0,0068
58	Huawei	3584326	387	44	0,0015	4,4976	0,0067
59	Cargotec	2771374	616	9	0,0067	0,9606	0,0064
60	Nordea	6977217	250	31	0,0024	2,6929	0,0064
61	SCA	66121000	4031	64	0,0042	1,5367	0,0064
62	Academedia	10810000	11863	8	0,0107	0,5941	0,0063
63	Deloitte	2685498	1318	17	0,0034	1,8230	0,0063
64	Nobina	9094000	9629	13	0,0060	1,0325	0,0062
65	Atea	12740520	2196	12	0,0075	0,8305	0,0062
66	Tetra Pak	16127000	3763	26	0,0039	1,6075	0,0062
67	Coca-Cola	3692000	782	10	0,0061	1,0165	0,0062
68	Komatsu Forest	3026184	616	8	0,0073	0,8422	0,0062
69	Skandinaviska Enskilda Banken	45866000	14751	53	0,0036	1,6918	0,0062
70	KPMG	2394368	1525	12	0,0047	1,3077	0,0061

71	Telenor	11939093	1530	18	0,0046	1,2820	0,0060
72	Volvo Cars	214166000	37969	125	0,0055	1,0676	0,0059
73	SAS	44718000	10146	64	0,0028	2,0818	0,0059
74	OBOS	2971175	871	9	0,0061	0,9503	0,0058
75	Axis	8604200	2865	7	0,0103	0,5672	0,0058
76	Svenska Handelsbanken	41674000	11832	31	0,0054	1,0619	0,0057
77	Daniel Wellington	2693036	545	6	0,0089	0,6432	0,0057
78	Metso	2413474	678	4	0,0128	0,4354	0,0056
79	Scan	7683097	1791	13	0,0051	1,0950	0,0056
80	Stadium	5391112	2019	10	0,0059	0,9343	0,0055
81	IFS Ab	4217000	3318	6	0,0091	0,5937	0,0054
82	CGI	5289202	3554	7	0,0080	0,6572	0,0053
83	FAM	5589000	564	7	0,0081	0,6479	0,0052
84	Telia	92622000	25472	78	0,0037	1,4143	0,0052
85	SL	20349000	650	18	0,0052	0,9822	0,0051
86	Skanska	157877000	40400	77	0,0058	0,8710	0,0051
87	Clas Ohlson	8234900	2951	17	0,0036	1,3989	0,0051
88	AkzoNobel	4240561	1105	8	0,0064	0,7907	0,0050
89	Schenker	12252134	2053	11	0,0063	0,7747	0,0049
90	Carlsberg	3468489	286	9	0,0053	0,9255	0,0049
91	Billerudkorsnäs	22505000	4472	18	0,0052	0,9267	0,0048
92	Preem	69217000	1458	36	0,0056	0,8328	0,0047
93	WSP	5682963	4761	28	0,0018	2,5801	0,0047
94	AXFOOD	46451000	9903	36	0,0041	1,1383	0,0046
95	The Absolut Company	5840500	489	8	0,0063	0,7317	0,0046
96	MIO	3824041	504	9	0,0050	0,9086	0,0046
97	Capio	15425000	13314	12	0,0058	0,7587	0,0044
98	Radisson	9521465	5033	7	0,0077	0,5465	0,0042
99	Apollo	6316742	425	9	0,0051	0,8053	0,0041
100	Derome	6905157	1752	10	0,0047	0,8714	0,0041
101	Erlandsson	6014414	1956	6	0,0075	0,5444	0,0041
102	Orkla Foods	5406078	1511	8	0,0053	0,7469	0,0040
103	H&M	200004000	123178	107	0,0041	0,9739	0,0039
104	Recipharm	5487300	4575	3	0,0141	0,2790	0,0039
105	Jula	6502538	2060	7	0,0063	0,6211	0,0039
106	Loka Holding	5089600	1189	6	0,0069	0,5687	0,0039
107	Bravida	17293000	10643	11	0,0059	0,6560	0,0039

108	Svevia	7610000	1833	13	0,0035	1,0985	0,0039
109	Knowit	2733501	2065	6	0,0060	0,6417	0,0038
110	Hans Andersson	2939240	412	4	0,0088	0,4231	0,0037
111	Danske Bank	7500000	1750	19	0,0023	1,6131	0,0037
112	Intersport	2936544	1007	4	0,0086	0,4231	0,0036
113	Toyota	34842000	13335	37	0,0025	1,4391	0,0036
114	Gunnebo	5994000	5210	11	0,0035	0,9990	0,0035
115	Lindex	3301830	1303	12	0,0028	1,2449	0,0035
116	DeLaval	5447500	632	11	0,0034	1,0249	0,0035
117	Arriva	2893082	2785	3	0,0104	0,3181	0,0033
118	Assemblin	2861731	2512	6	0,0052	0,6373	0,0033
119	Ellevio	7034000	433	5	0,0074	0,4332	0,0032
120	Norrmejerier	3000000	750	5	0,0060	0,5271	0,0032
121	Bonnier	27098000	9410	31	0,0022	1,4243	0,0032
122	Netonnet	4923012	640	8	0,0041	0,7644	0,0031
123	Willys	24467897	4861	10	0,0063	0,4896	0,0031
124	Duni	4452000	2412	4	0,0078	0,3912	0,0031
125	AB Volvo	335068000	87104	85	0,0064	0,4757	0,0030
126	TUI	11478014	611	7	0,0059	0,5070	0,0030
127	Randstad	2999717	4884	4	0,0071	0,4217	0,0030
128	Transdev	3035251	2805	2	0,0142	0,2105	0,0030
129	Nalka Invest	8072595	3323	3	0,0120	0,2485	0,0030
130	Atlas Copco	119940000	47599	38	0,0053	0,5501	0,0029
131	Trioplast	4234743	1009	3	0,0098	0,2966	0,0029
132	Capgemini	4142540	1353	3	0,0096	0,2980	0,0029
133	Folksam	13151000	4000	20	0,0021	1,3645	0,0029
134	Mekonomen	6000000	2286	3	0,0104	0,2724	0,0028
135	Lernia	2613523	4657	4	0,0066	0,4306	0,0028
136	Jysk	2657503	408	3	0,0086	0,3222	0,0028
137	Din Bil	17758826	1971	10	0,0047	0,5880	0,0028
138	Skånemejerier	3960059	697	5	0,0055	0,5013	0,0028
139	Autoliv	61349000	47886	27	0,0040	0,6885	0,0027
140	Max Hamburgare	3002656	2606	4	0,0064	0,4216	0,0027
141	Hilding Anders	9072000	9312	4	0,0084	0,3180	0,0027
142	GKN Aerospace	7839000	2012	5	0,0062	0,4184	0,0026
143	Alimak Group	4000700	2397	3	0,0087	0,3001	0,0026
144	Cloetta	6106000	2467	3	0,0094	0,2711	0,0026
145	NKT Cables	4705324	911	2	0,0131	0,1932	0,0025

146	KLS Ugglarps	5252762	999	3	0,0088	0,2821	0,0025
147	Schneider Electric	3105623	881	5	0,0047	0,5242	0,0024
148	Elekta	11333000	3716	11	0,0030	0,8011	0,0024
149	Academic Work	3059006	4694	5	0,0046	0,5255	0,0024
150	Electrolux	122273000	56708	43	0,0039	0,6120	0,0024
151	Nolato	6732000	7249	5	0,0053	0,4391	0,0023
152	Midroc	4201115	1619	5	0,0047	0,4952	0,0023
153	Getinge	29680000	10684	10	0,0053	0,4333	0,0023
154	Nibe	19064000	14271	11	0,0036	0,6225	0,0022
155	Bauhaus	7500000	2500	6	0,0043	0,5094	0,0022
156	Inwido	6382000	4361	4	0,0060	0,3569	0,0021
157	Arvid Nordquist	2909459	255	4	0,0050	0,4238	0,0021
158	Assa Abloy	76608000	47426	14	0,0070	0,2979	0,0021
159	Bosch	5745839	392	11	0,0021	1,0106	0,0021
160	Infranord	4082000	1798	3	0,0069	0,2989	0,0021
161	Skistar	2548204	1283	2	0,0094	0,2161	0,0020
162	Biltema	5113845	1048	7	0,0029	0,6627	0,0019
163	Haldex	4462000	2176	8	0,0025	0,7820	0,0019
164	Bergman & Beving	4754000	1458	2	0,0100	0,1927	0,0019
165	Hexagon	34536167	18315	5	0,0098	0,1957	0,0019
166	Attendo	11169000	15871	5	0,0051	0,3664	0,0019
167	Elgiganten	11878740	1554	5	0,0051	0,3569	0,0018
168	AQ Group	4064434	5548	3	0,0060	0,2992	0,0018
169	JM	17275000	2529	11	0,0027	0,6564	0,0018
170	Arjo	7717000	5853	6	0,0035	0,5047	0,0018
171	Green Cargo	3964000	1816	2	0,0084	0,2005	0,0017
172	Dustin	10308300	1152	4	0,0055	0,3028	0,0017
173	Rejlers	2470100	1994	9	0,0017	0,9766	0,0017
174	Kraftringen	2937188	506	4	0,0038	0,4231	0,0016
175	Trelleborg	31877000	23152	11	0,0035	0,4545	0,0016
176	MTR	5455927	4443	4	0,0042	0,3726	0,0015
177	Com Hem	7170000	966	6	0,0030	0,5168	0,0015
178	Mycronic	3019033	1045	3	0,0049	0,3160	0,0015
179	Nynas	15509500	1014	4	0,0061	0,2522	0,0015
180	Swedish Match	16170000	5240	6	0,0041	0,3705	0,0015
181	Westinghouse	2971000	824	4	0,0036	0,4224	0,0015
182	Bonava	14479000	1807	3	0,0077	0,1956	0,0015
183	Bisnode	3575800	2069	2	0,0073	0,2045	0,0015

184	Atria	2809260	935	3	0,0046	0,3196	0,0015
185	Addtech	8049000	2358	3	0,0059	0,2488	0,0015
186	Bygghemma	3955542	812	3	0,0048	0,3008	0,0014
187	Circle K	23823000	1707	7	0,0040	0,3483	0,0014
188	Ahlsell	27522000	5471	3	0,0100	0,1365	0,0014
189	Grimaldi	2784800	1077	2	0,0064	0,2133	0,0014
190	VBG Group	3005478	1502	2	0,0064	0,2108	0,0014
191	Thule	6003000	2119	6	0,0025	0,5447	0,0014
192	Cramo	3019000	832	2	0,0064	0,2106	0,0013
193	Skandia	24802000	2400	21	0,0013	1,0197	0,0013
194	Axel Johnson	78120000	20372	10	0,0060	0,2094	0,0013
195	Munters	6660000	3496	6	0,0022	0,5286	0,0012
196	Betsson	4716458	1873	2	0,0060	0,1931	0,0012
197	3M	2489441	638	7	0,0015	0,7588	0,0012
198	Essity	109265000	18370	23	0,0031	0,3614	0,0011
199	Addlife	2355600	592	2	0,0052	0,2184	0,0011
200	KGK	3339670	960	2	0,0054	0,2071	0,0011
201	Tarkett	3337823	658	2	0,0051	0,2071	0,0011
202	Astrazeneca	60771000	5723	22	0,0019	0,5652	0,0011
203	Nobia	12810000	4676	2	0,0077	0,1381	0,0011
204	Borealis	2689961	911	5	0,0020	0,5361	0,0011
205	DNB	10000000	350	4	0,0034	0,3065	0,0010
206	Kronans Apotek	7524418	2710	2	0,0061	0,1696	0,0010
207	Alecta	38514000	348	5	0,0057	0,1813	0,0010
208	Byggmax	5355900	1061	3	0,0036	0,2807	0,0010
209	King	2436662	642	10	0,0009	1,0872	0,0010
210	DSV	5672693	1408	1	0,0108	0,0922	0,0010
211	New Wave	5648000	2495	7	0,0015	0,6461	0,0010
212	Anicura	2646581	2807	2	0,0044	0,2149	0,0010
213	Gotlandsbolaget	2470134	730	1	0,0087	0,1085	0,0009
214	Lindab	8255000	5083	6	0,0019	0,4933	0,0009
215	Alfa Laval	35902000	16367	13	0,0019	0,4952	0,0009
216	Ikano	5922678	901	5	0,0019	0,4556	0,0009
217	Bilia	27506000	4708	3	0,0060	0,1365	0,0008
218	Investor Ab	34398000	20054	1	0,0207	0,0392	0,0008
219	Samhall	8281000	19459	8	0,0012	0,6570	0,0008
220	Anticimex	5433727	5565	3	0,0027	0,2797	0,0008
221	Svenska Foder	4029492	301	1	0,0072	0,0999	0,0007

222	Karl Hedin	4403959	981	2	0,0036	0,1961	0,0007
223	Trygg-Hansa	10000000	1750	3	0,0030	0,2298	0,0007
224	Herenco	3654471	1633	1	0,0067	0,1018	0,0007
225	AAK	26565000	3399	5	0,0028	0,2326	0,0007
226	Einar Mattsson	2500316	339	6	0,0010	0,6500	0,0007
227	Cabonline	5695934	1373	1	0,0070	0,0921	0,0006
228	Jysk	3469231	1460	2	0,0028	0,2057	0,0006
229	Carl Bennet	49784000	27213	4	0,0047	0,1200	0,0006
230	Swerock	5107718	939	1	0,0058	0,0947	0,0006
231	Bufab	3206000	1119	1	0,0050	0,1043	0,0005
232	Systemair	7337500	5465	4	0,0015	0,3420	0,0005
233	R12 Kapital	3971973	1469	1	0,0050	0,1002	0,0005
234	Carnegie Investment Bank	2543457	590	1	0,0046	0,1081	0,0005
235	Medicover	5711402	8097	1	0,0045	0,0920	0,0004
236	Upplands Motor	5032868	816	1	0,0043	0,0950	0,0004
237	Iss Facility Services	4281304	6392	1	0,0040	0,0986	0,0004
238	City Gross	9027709	2812	2	0,0024	0,1593	0,0004
239	Instalco	3147000	1539	2	0,0018	0,2092	0,0004
240	E.ON	6793000	256	5	0,0008	0,4379	0,0004
241	Fresenius Kabi	4089017	974	1	0,0036	0,0996	0,0004
242	Skanova	6269697	423	1	0,0040	0,0897	0,0004
243	Brandt Bil	2857668	478	1	0,0032	0,1062	0,0003
244	Acando	2446432	1935	4	0,0007	0,4346	0,0003
245	Eltel	13137604	7999	1	0,0044	0,0683	0,0003
246	Volati	4362000	1750	1	0,0031	0,0982	0,0003
247	Ferronordic	2572413	802	1	0,0027	0,1079	0,0003
248	Loomis	17228000	22811	3	0,0016	0,1793	0,0003
249	Svensk Cater	3957220	699	1	0,0027	0,1003	0,0003
250	Ratos	23697000	9993	1	0,0055	0,0499	0,0003
251	Dometic	14097000	8769	3	0,0013	0,1982	0,0003
252	Danir	4011181	3597	1	0,0024	0,1000	0,0002
253	Beijer Alma	3971496	2544	2	0,0011	0,2004	0,0002
254	Nefab	3834894	2681	1	0,0019	0,1009	0,0002
255	Caverion	4756878	3219	4	0,0004	0,3853	0,0002
256	GE Healthcare Bio-Sciences	15033392	1612	4	0,0006	0,2561	0,0001
257	Lifco	10048000	4758	1	0,0014	0,0765	0,0001

258	Securitas	92220600	227460	4	0,0015	0,0728	0,0001
259	Duroc	2557900	740	1	0,0008	0,1080	0,0001
260	Saint-Gobain	3070783	874	1	0,0008	0,1050	0,0001
261	Coor Service Management	7943000	6695	1	0,0005	0,0833	0,0000
262	Scandic Hotels	14583000	16761	1	0,0006	0,0650	0,0000
263	IAC	6730558	1552	2	0,0000	0,1757	0,0000
265	Nederman	3152900	1803	2	0,0000	0,2091	0,0000
267	Ernst & Young	3998179	2458	1	0,0000	0,1001	0,0000
264	JCE	3805942	2997	1	0,0000	0,1011	0,0000
266	Seco Tools	5782000	1406	1	0,0000	0,0917	0,0000
268	Swedish Orphan Biovitrum	6511302	800	1	0,0000	0,0887	0,0000
269	ITAB	6433000	3599	2	-0,0002	0,1780	0,0000
270	Scandi Standard	7142400	2264	1	-0,0011	0,0862	-0,0001
271	Santa Maria	2409527	448	2	-0,0007	0,2178	-0,0002
272	Swedol	3075600	903	2	-0,0012	0,2100	-0,0003
273	Nordstjernan	16732000	21169	2	-0,0025	0,1213	-0,0003
274	Keolis	4678900	5262	3	-0,0017	0,2901	-0,0005
275	Stockholm Exergi	7255891	703	2	-0,0030	0,1716	-0,0005
276	Qliro	4359900	694	3	-0,0020	0,2947	-0,0006
277	Holmgrens Bil	3111113	452	2	-0,0029	0,2096	-0,0006
278	Kappahl	4760000	2884	13	-0,0005	1,2521	-0,0006
279	Fingerprint Cards	2994200	415	8	-0,0009	0,8437	-0,0008
280	Bulten	2879000	1305	1	-0,0081	0,1061	-0,0009
281	Swecon	3958908	471	3	-0,0035	0,3008	-0,0010
282	Rexel	4966342	770	3	-0,0040	0,2861	-0,0012
283	MTG	19141000	3280	11	-0,0025	0,6211	-0,0016
284	Strukton	2565848	1052	18	-0,0067	1,9430	-0,0130

Appendix F – Interview Questions

0. Interviewers introduction
   - 0.1. Who we are, what we are doing, how we are doing it and why are we interviewing this company;
   - 0.2. Explain that questions may be overlapping due to broad answers of the interviewee.
1. Interviewees introduction
   - 1.1. Is it okay to record the interview?
   - 1.2. Do you want to stay anonymous?
   - 1.3. Could you tell us about yourself and the company shortly?
   - 1.4. In your opinion, what do you think makes the company innovative?
2. Innovation Vision
   - 2.1. Is there a defined innovation vision? If so, please describe.
   - 2.2. Is there an overall vision for the company in terms of innovation? If so, please describe (Note: "it includes aspirations in innovation activities and desired impact of the innovations").
3. Innovation Policy
   - 3.1. What is the company's innovation policy? (Note: it provides a framework for setting innovation objectives; considers multiple aspects i.e. ethical and sustainability; includes commitment for improvement of the innovation management system)
   - 3.2. To what extent is it communicated/understood/applied within the organization?
4. Innovation Objectives
   - 4.1. Do you have innovation objectives and plans to achieve them? If so, please describe.
   - 4.2. How does the organization establish innovation objectives on a corporate level?
5. Innovation Strategy
   - 5.1. What is the company's innovation strategy (or strategy in general)? (Note: "innovation strategy is used for focusing on value realization under conditions of uncertainty" and "Can include descriptions of the context of the organization, the innovation vision, the innovation objectives and the plans to achieve them, as well as the necessary organizational structures, support and processes")
   - 5.2. In which cases do you establish dedicated organizational structures? (i.e. disruptive/radical innovation is competing with existing offerings; "different leadership styles, incentives, indicators, or cultures are needed"; requires special support; specific operations/processes require special adaptation)
6. Operation
   - 6.1. Do you have an innovation process? If so, please describe.
   - 6.2. How do you manage innovation initiatives? (Note: "An innovation initiative is an activity or a set of activities, formal or informal and can be an innovation project, an innovation program or any other kind of approach. An initiative can be proposed by anyone in the organization and is characterized by having a starting and ending point. The organization can establish one or more processes to manage these initiatives."
   - 6.3. What is the approximate percentage of successful innovation initiatives?
   - 6.4. What kind of innovation processes do you have? (Note: i.e. "a fast track formed by selected processes; with a non-linear sequence; iterative; implemented within or independently from other processes in the organization; connected to other processes in the organization; flexible and adaptable to the types of innovations the organization seeks to achieve")

7. Support
    7.1. Do you have any support functions for innovation? If so, please describe.
    7.2. How do you encourage innovation?
    7.3. How do you support innovation activities within the organization?
    7.4. How do you develop and manage competences related to innovation?
    7.5. What kind of tools and methods are used within the organization for innovation activities?
    7.6. What tools do you use to gain strategic intelligence? (Note: “Strategic intelligence can include activities to acquire, collect, interpret, analyze, evaluate, apply, and disseminate to decision-makers and other interested parties, the necessary data, information, and knowledge”. i.e. “data mining, analytics, prediction markets, environmental scanning, technology watching”, etc.)]
8. Assessment
    8.1. Do you do innovation assessments?
    8.2. How do you evaluate the innovation performance within the company?
9. Improvement
    9.1. Do you do innovation management improvements?
    9.2. How do you select opportunities for innovation management improvement?
10. Ending the conversation
    10.1. Is there anything you want to add?
    10.2. May we send a survey? (mention short)
    10.3. May we contact any of your colleagues for another interview?

Appendix G – Survey

Innovation survey

Please answer a few questions about yourself prior to starting the survey:

* Required

Name *

_____

Company name *

_____

Job title

_____

Years of experience working with innovation related tasks

_____

Anonymous answers *

a. Yes
b. No
c. Other: _____

Ten Types of Innovation

Please write the importance and performance of the following areas within innovation to your organization on a scale 1-5, where 1 is very low and 5 is very high:

There is also the option to select **No Answer**.

Type of innovation	Description	Performance	Importance
Profit Model Innovation	The way in which you make money		
Network Innovation	Connections with others to create value		
Structure Innovation	Alignment of your talent and assets		
Process Innovation	Signature or superior methods for doing your work		
Product Performance Innovation	Distinguishing features and functionality		
Product System Innovation	Complementary products and services		
Service Innovation	Support and enhancements that surround your offerings		
Channel Innovation	How your offerings are delivered to customers and users		
Brand Innovation	Representation of your offerings and business		
Customer Engagement Innovation	Distinctive interactions you foster		

Innovation management capabilities

Please write to what level does the organization complies with the following statements on a scale 1-5, where:

1. **Informal or ad hoc**: The capability is established in an informal or ad hoc manner. It is not defined or managed.
2. **Managed at basic level**: The capability is established at a basic level. It is to some extent, but not fully, managed.
3. **Defined and managed**: The capability is defined and established. It is managed in a pro-active manner.
4. **Systematically managed**: The capability is defined, established, and aligned. It is systematically and dynamically managed.

5. **Optimized**: The capability is continuously improved and optimized. It is managed based on active monitoring, feedback, and learning.

There is also the option to select **No Answer**.

Note: Bellow each question is a definition of what level 3 corresponds to.

Question No.	Description	Current level	Importance level
1.	**Understanding of external trends and drivers** This definition corresponds to level 3: External trends and drivers that are relevant for the purpose of the organization are regularly determined and analyzed. Areas of opportunity for potential value realization are determined.		
2.	**Understanding of internal capabilities and assets** This definition corresponds to level 3: Internal capabilities and assets that are relevant for the purpose of the organization are regularly determined and analyzed. Areas of opportunity for potential value realization are determined		
3.	**Culture supporting creativity and deployment** This definition corresponds to level 3: A culture that supports innovation activities, both in terms of creativity and deployment, is promoted in the organization and characterized by e.g. openness, risk taking, collaboration, diversity, and learning.		
4.	**External and internal innovation collaboration** This definition corresponds to level 3: An approach for the management of internal and external collaboration, e.g. for facilitating the sharing and access to knowledge, competence, and resources, is established, and is based on an understanding of the existing capabilities of the organization.		
5.	**Top management commitment** This definition corresponds to level 3: Top management is demonstrating leadership and commitment with respect to managing innovation activities, e.g. related to innovation strategy, objectives, culture, support, structures, processes, and communication. Leaders have established an inspiring vision and purpose and are continuously engaging people to achieve those aims.		
6.	**Focus on value realization** This definition corresponds to level 3: Top management is demonstrating leadership and commitment with respect to a focus on value, financial or non-financial, as the purpose and desired		

	outcome of innovation activities. Value is considered for the organization itself, its users, or customers, as well as other interested parties.		
7.	**Innovation vision and strategy** This definition corresponds to level 3: Top management has established, implemented, and is maintaining an innovation vision and an innovation strategy, or several innovation strategies if appropriate. The innovation vision provides the framework for setting the innovation strategy, policy, and objectives. A strategy can include descriptions of why innovation activities are important, the context of the organization, the innovation vision and policy, roles and responsibilities, innovation objectives and plans, as well as the structures, processes and support needed to achieve those objectives.		
8.	**Innovation policy** This definition corresponds to level 3: Top management has established, implemented, and is maintaining an innovation policy that is appropriate to the purpose of the organization. The innovation policy can describe the commitment to innovation activities and provides the framework for setting innovation strategy and objectives.		
9.	**Organizational roles, responsibilities** This definition corresponds to level 3: Top management has ensured that the organizational responsibilities for relevant roles are assigned, communicated, and understood in the organization. Responsibilities related to innovation activities can be assigned to existing roles, e.g. project manager, business development, or dedicated roles with a focus on innovation management.		
10.	**Innovation objectives and action plans** This definition corresponds to level 3: Innovation objectives are established at relevant functions and levels in the organization. The objectives are consistent with the innovation policy and are measurable or verifiable. Actions to address risks related to innovation activities are determined.		
11.	**Organizational structures for innovation activities** This definition corresponds to level 3: Top management has ensured that relevant and adaptable organizational structures are established and that they have the necessary resources and are appropriate to the expected types of innovations to be achieved, e.g. radical or disruptive innovations.		
12.	**Innovation portfolios** This definition corresponds to level 3: One or more innovation portfolios of innovation initiatives/projects are established, managed, and regularly evaluated. Each portfolio is aligned with the innovation strategy and objectives, and its performance is communicated to top management.		

13.	**Resources supporting innovation activities** This definition corresponds to level 3: Resources supporting innovation activities are determined and provided in a timely manner, e.g. people are empowered and have the necessary time to innovate, knowledge is effectively managed, and the necessary funding and infrastructures, physical and virtual, are available.		
14.	**Competence** This definition corresponds to level 3: The necessary competences are developed and managed, e.g. by providing training, for persons involved in innovation activities, and the need for outsourced competence, e.g. academia, consultants, or other partners, is considered		
15.	**Communication and awareness** This definition corresponds to level 3: Internal and external communications relevant for innovation activities are determined, and all relevant persons are aware of the importance of innovation activities for the organization and the innovation vision, strategy, policy, and objectives.		
16.	**Innovation tools and methods** This definition corresponds to level 3: Tools and methods for supporting innovation activities are determined, provided, and maintained, including e.g. descriptive, analytical, provocative, and communicative tools and methods.		
17.	**Intellectual property management** This definition corresponds to level 3: An approach for the management of intellectual property, e.g. patents, copyrights, and trademarks, is established in alignment with the innovation strategy, including the rationale for what intellectual property assets to be, and not to be, protected.		
18.	**Innovation initiatives/projects** This definition corresponds to level 3: Innovation initiatives/projects, including the necessary processes, structures, and resources, are planned, implemented, and controlled to address innovation opportunities. The scope, purpose, decision-making structure, the degree of internal and external collaboration, and roles and responsibilities for each initiative are established.		
19.	**Configuration of innovation processes** This definition corresponds to level 3: Innovation processes are configured and established to suit each innovation initiative/project depending on, e.g. the type of innovation to be achieved, internal or external collaboration, or other organizational factors. Initiatives can e.g. be implemented internally, in partnerships or through outsourcing or acquisitions.		
20.	**Processes to identify opportunities**		

	This definition corresponds to level 3: Processes to identify and define innovation opportunities are established, including e.g. the acquisition of insights and knowledge from internal and external sources about stated and unstated needs and expectations as well as the articulation of the value that can potentially be realized.		
21.	**Processes to create and validate concepts** This definition corresponds to level 3: Processes to create and validate innovation concepts are established, including e.g. the generation, selection and development of ideas and potential solutions from internal and external sources, as well as different validation approaches, e.g. tests and experiments to reduce uncertainties and gain new knowledge.		
22.	**Processes to develop and deploy solutions** This definition corresponds to level 3: Processes to develop and deploy solutions are established, including e.g. the consideration of the value realization or business model, intellectual property issues, legal requirements as well as the necessary deployment capabilities e.g. promotion, production, supply, and ecosystems. Processes to monitor and learn from the adoption of the innovation and the impact in terms of value realization are established.		
23.	**Innovation performance indicators** This definition corresponds to level 3: Innovation performance indicators are determined based on what needs to be monitored and measured, e.g. the innovation strategy and objectives. Input-, throughput-, and output-related indicators are considered.		
24.	**Performance evaluation and improvement** This definition corresponds to level 3: Innovation performance is regularly analyzed and evaluated in relation to e.g. the innovation strategy and objectives. Opportunities for improvement are determined and the necessary actions are implemented.		

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