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A Race to the Top in the Era of Artificial Intelligence

A Qualitative Study examining challenges & opportunities
for small and medium sized Swedish companies in AI adoption

Johanna Dahlqvist & Olivia Pivén

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Supervisor: Ethan Gifford
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A Race to the Top in the Era of Artificial Intelligence - *A Qualitative Study examining challenges & opportunities for small and medium sized Swedish companies in AI adoption*

Written by Johanna Dahlqvist and Olivia Pivén

School of Business, Economics and Law, University of Gothenburg, Vasagatan 1, P.O. Box 600, SE 405 30 Gothenburg, Sweden
Institute of Innovation and Entrepreneurship

Contact: johannamathea@gmail.com ; oliviapiven@gmail.com

Abstract

Background & Purpose:

This study focuses on challenges to AI adoption in small- and medium sized enterprises (SMEs) in Sweden, as well as solutions to these challenges. The background, and the reason for studying the topic, lies in Sweden's stated vision of becoming one of the world leaders in adopting the powers of Artificial Intelligence (AI). Despite this vision, the research regarding AI adoption in Swedish companies, especially in Swedish SMEs, is very sparse.

The purpose of this study is to identify challenges experienced by Swedish SMEs in adopting AI and, by interviewing companies and individuals with experience in AI implementation, identifying recommendations on how to solve or mitigate these challenges. These recommendations are, in the last stages of the thesis, adapted to fit to the context of the Swedish SMEs, i.e. to the Swedish business culture and to companies with fairly limited resources.

Methodology:

This is a qualitative study in which 10 interviews are held. Three interviews are held with Swedish AI aspirants, i.e. Swedish SMEs that have a wish to implement AI. The remaining six interviews are held with Swedish and American companies and individuals that have knowledge and experience of working with AI. These interviewees are referred to as experts. The interview findings are analyzed by a thematic analysis based on categories and themes found in the literature and, in some cases, that emerged during the interviews. The thematic analysis results in seven challenges and seven recommendations regarding AI adoption.

Findings & Conclusions:

Seven challenges and seven recommendations are found. The challenges include immaturity of the AI-technology, compatibility with the company, evaluating, developing and implementing the technology, lack of resources, lack of knowledge, establishing a culture of innovation and the effects that the external environment has. The recommendations include learning about fields related to AI, using external forces, embracing being a smaller company, promoting change, motivating and inspiring with soft factors, developing a culture of innovation and understanding the specific company context.

Simply put, Swedish SMEs need to thoroughly assess their current capabilities and start learning about fields related to AI as a first step. Once this is done, they need to evaluate whether to use external forces (such as off-she-shelf AI solutions and/or consultants) and, if so, to which extent. They should also take advantage of being a smaller company in the sense that their AI-solutions can be much simpler than for larger companies. Lastly, they should learn about what country specific factors that might make the implementation of AI easier or more difficult. Such factors include Swedes being innovation friendly, the existence of free learning opportunities and the in Sweden common flat organizational structure.

Keywords: *Artificial Intelligence, Technology/Innovation Diffusion, Digitalization, Strategic management, Change management, Culture of innovation, Innovation management*

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All in all, this process has been tough and demanding, but it has also been an awarding journey, physically and mentally. We have learned a lot both about the topic of AI and about ourselves, and we are proud and happy to deliver this thesis as our final contribution of our university experience at the School of Business, Economics and Law.

Thank you, and happy reading!

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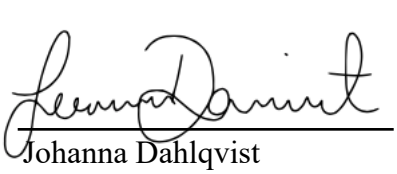
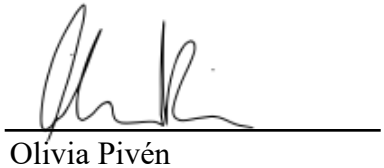


Johanna Dahlqvist



Olivia Pivén

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1. Introduction

This section provides an introduction to the topic of Artificial Intelligence and its relevance. It also presents the aim, the research questions and a description of the thesis disposition.

1.1. Background

In an ever-changing world, companies need to work hard to keep momentum. Now and then, scientific revolutions, so called paradigm shifts, take place, forcing actors to reevaluate their ways of thinking and acting. Examples of such shifts include everything from steam and electric power to the introduction of internet (Swan, 2015). Technology drives economic development and now, research sheds light on the power of artificial intelligence (AI) and its effect on society. (Makridakis, 2017; Rosenberg, 2004). It can be argued that AI has the potential to unleash the next rush of disruption in almost every single industry (Busch, 2019).

Leveraging the power of AI can be an important source of competitive advantage for companies now and in the near future, and as more and more companies adopt it, the risk of falling behind increases for those who do not. According to Narrative Science (2020) AI will have a significant impact on almost all company processes, from strategy to specific job tasks. Moreover, AI is predicted to substantially contribute to the world GDP. By 2030, AI is expected to increase the world GDP with 15 trillion US dollars. This, according to the consulting firm PWC, makes AI today's biggest commercial opportunity (Rao & Verweij, 2017).

The outlooks of AI indicate that will be important for companies in the near future. This is something that Sweden has understood, which is shown by a stated vision to become one of the leading countries in capturing the possibilities of AI. The goal behind this vision is to strengthen the welfare and competitive advantage of Sweden and of Swedish companies (Regeringskansliet, 2018). However, while bigger Swedish companies seem to be prepared in terms of AI investments (Söderlund, 2019; Wallström, 2019) the situation for small- and medium sized Swedish enterprises (SMEs) is unclear. Even though the research generally addressing digitalization and digital strategies is vast, even in a Swedish perspective, there is a very limited amount of research dealing with strategies for AI-implementation and use. In terms of SMEs, and Swedish SMEs in particular, it is extremely difficult to find any information at all relating to the current or future use of AI.

Conclusively, the future importance of AI combined with Sweden's stated vision and the lack of research create a need to understand the situation for Swedish companies in general and especially the situation for Swedish SMEs since the research regarding them is particularly sparse.
Because of this, this thesis will focus on Swedish SMEs that wish to implement AI but that have not yet done so. The challenges of implementing AI in Swedish SMEs will be presented, and recommendations on how to solve or mitigate these challenges will be identified by interviewing AI-experts in Silicon Valley – an center of innovation and technology.

1.2. Artificial Intelligence

AI is a technology that makes it possible for machines to act intelligently. It uses large amounts of data and learns from it with the use of algorithms programmed by a human (Tecuci, 2012). Given the hype around the topic, one may think that that AI is a new field in science. However, the concept of intelligent machines was introduced in 1950 by Alan Turing who investigated the question "can machines think?" by conducting an experiment called the Turing test. In the test, one person –a subject– is put in a room. In another room, there is one computer and one person. The subject is tasked with detecting who is who based on typewritten answers to asked questions (Turing, 1950). The subject experience difficulties in determining who is who, showing that machines can act intelligently, resembling a human-being. The concept of AI has existed since then, but the term "artificial intelligence" was first coined in 1956, and later revised in 1998 by John McCarthy, who defined it as "the technology to create intelligent machines" (1998).

Since the early 2000's, the field has been heavily researched, and it has experienced several hypes. However, the application and usefulness of the technology has not been clear until fairly recently. In Gartner's Hype Cycle for Artificial Intelligence 2019, illustrating technologies' capabilities from innovation to mainstream through the stages of innovation trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment and plateau of productivity, this becomes clear. When looking at the AI-capabilities, speech recognition is the only one that has reached the plateau of productivity. Capabilities such as deep and machine learning, natural language processing, robotic process automation and autonomous vehicles are still in the phase of disillusionment (Gartner, 2019), which indicates a lack of maturity for most AI-capabilities.

1.2.1. The Technology

AI combines large amounts of data and detects pattern by using algorithms. It is a series of "if-then" conditions, and the more conditions, the more detailed the outcome (Wilson & Daugherty, 2018). The type of AI that is used today is called narrow AI, and it focuses on one single task. It performs pre-defined tasks and is used in products like Siri, Alpha-Go and self-driving cars. In contrast, strong AI is AI that would make it possible for machines to think by themselves. Narrow AI is used to test hypotheses about consciousness and intelligence while strong AI would have the possibility to use intelligence to solve a problem. This would require a consciousness, which no machines have (Saquib, 2019; Searle, 1980).

There are several subfields to AI, including deep learning, machine learning and natural language processing. All of these use the capability to analyze and understand huge amounts of data (Hauser, n.d.; SAS, n.d.). Machine learning is the subfield that is most widely used today. It is characterized by its automatic model building capability, allowing it to find patterns and in data without being specifically programmed on what to find (Samuel, 1959). The data goes through a neural network entailing input in the form of data and conditions, hidden layers, and output in the form of a result, such as a recommendation, in a process similar to the human brain (Hauser, n.d.; SAS, n.d.).

While the technology behind AI is complex, the codes and algorithms themselves are by some considered to be only a minor part of the challenges connected to the development and use of AI. Implementing AI in an organization might require much more than a data scientist and an algorithm at one single point in time. There are many organizing processes that need to be considered, and some of them are highly people-intensive, both during the implementation and during maintenance and follow-up. It is necessary to be aware of all of the processes and activities connected to AI and to make sure that the company has the relevant competence and resources to deal with them. Thus, even though the technical aspect of AI may seem complex, there are a lot of surrounding activities and processes that need to be dealt with that include both technical, organizational and infrastructural dimensions (Sculley et al., 2015).

1.2.2. Business Applications

AI has changed the way that companies do business, how customer relationships are managed and ideas that drive revolutionary innovations are developed (Capgemini, 2018). It is predicted that AI will be a strong contributor for companies to gain or keep their competitive advantage, both in the near time and in the future (Purdy & Daugherty, 2016). Some industries have a clearer application of AI than others, but opportunities within AI exist in more or less every single sector and business function. AI can be applied in an infinite number of ways, such as developing customer service with chatbots, within planning, for forecasting, autonomous robots, and within decision making (Hurlburt, 2017; Wilson & Daugherty, 2018). The possibility of being able to use AI in decision making and improvement of customer experience has been said to specifically influence the AI adoption (Fast & Horvitz, 2017).

The development and use of AI has increased during recent years (Malhotra & Chui, 2018). Perhaps due to the increasing amount of data and the availability of a wide range of tools for data management, which simplify the use of AI in the business world (Danielsson, 2020). Many argue that the full potential of the technology will be shown when it complements the competencies of human workers, which indicates a need for human workers to understand the technology in order to make the most of it. The strengths of AI, in particular its speed, scalability and quantitative potential, can strongly enhance the skills of human workers, creating a highly qualitative result (Wilson & Daugherty, 2018). However, in order to succeed with this, a clear strategy needs to be in place and developing an AI strategy is considered to be one of the most vital factors for a successful technology progression (Andrews, 2017).

1.2.3. AI World Leaders

AI is being developed at various rates around the world. The United States, together with China, are the countries that have come the furthest and possess the largest and most well-funded AI companies in the world. Both countries have large populations, creating opportunities for big data sets which is one of the key prerequisites for AI. Moreover, they are two of the world's biggest

economies which opens up for large technological investments. The Chinese government makes huge investments in research within the area with the purpose of advancing their AI-competence, capitalize on their AI-knowledge and become the new global leader (Srivastava, 2019b). The US is, however, currently the global leader in terms of pace of development, company growth and adoption (Vinnova, 2018; Walch, 2020) and many successful tech companies were founded in the US.

Many, if not most, successful tech and AI companies in the US originates from the area of Silicon Valley, located in south San Francisco in California. Several of these are still operating there. Examples of such companies include Google, Apple, Cisco Systems, IBM and Facebook – all successful within technology creation and adoption (Walch, 2020). Silicon Valley is indeed known worldwide for its many high-tech start-ups, which is why it is interesting to study in relation to AI.

Silicon Valley has a unique culture. The San Francisco area has for a long time been known for its history of firm funding, and especially of high-tech start-ups and Silicon Valley is especially characterized by this. This start-up culture stems from the high level of venture capital funding of companies and is further strengthened by, for example, deans at the nearby Stanford University who, in the 50's, started to encourage PhDs to start their own companies in the area. Thus, the culture in Silicon Valley is characterized by a high level of funding, well-developed research institutions and highly skilled researchers and scientists. All in all, since this culture differs immensely from almost all other areas in the world, it is difficult for other countries to copy strategies from companies in this area. In fact, it is the strength of this culture and the level of high-tech capabilities that make it difficult for other countries to catch up (Moore & Davis, 2004).

1.2.4. AI in Sweden

In Europe, Great Britain is currently the leader of the development of AI-technology, while Swedish companies are falling behind (Markusson, 2018). There is data suggesting that Sweden's contributions to AI and AI research is limited and that Sweden (and Europe) is losing advantage to the US. American research is represented in almost half of the content in AI conferences while Swedish research is around 0,6%, and Chinese research around 20%. Even if the numbers are altered to fit per capita, it is clear that the research participation for countries such as Singapore, Switzerland and Israel is much greater than for Sweden (Vinnova, 2018). This shows that Swedish AI research indeed is behind that of many other countries. This can, in turn, have a negative effect on the AI development and adoption in the country. This is because the more that is known about a topic, the less uncertain it will be to invest money into it (The European Commission, 2017). Thus, more research about AI in Sweden can lead to a higher level of AI adoption in the country, and the current lack of research might be one of the reasons to why Sweden seems to have fallen behind.

Although the research about AI in Swedish companies is sparse, there is some research on the topic of data analytics, which can be used to understand some foundational factors to AI given that knowledge within data facilitates easier implementation and success of AI (Narrative Science, 2016). Some reports have found that companies that are skilled in dealing with big data are more inclined to work with AI (Narrative Science, 2016), highlighting the importance of knowledge in fields related to AI. One study, performed in 2018, investigates the readiness of Swedish companies in regard to data analytics, and it finds that Swedish companies, in terms of data analytics, have the necessary tools to manage data and they understand the value of data-driven decisions. However, there is a lack of organizational readiness, i.e. having the required processes and being able to track activities. Almost 20% of the companies stated not to have enough resources to support data analytics and almost 40% state a lack of the necessary data. Lastly, a vast majority stated a need for a strategy or a roadmap (Gürdür, El-khoury, & Törngren, 2019).

In Sweden, AI is expected to be an essential element to the future economic development, and to have a large impact on the country's competitiveness in almost all sectors. Some of the factors estimated to pose challenges to the AI development and implementation in Sweden are appropriate business models, data access and relevant competence (Vinnova, 2018). Sweden has several strengths in terms of being able to develop and maintain advanced AI solutions and the potential for Swedish businesses to adopt and utilize AI is fairly high. Sweden has a digitalized, technology-friendly population, the national infrastructure is good which allows for data transmission and storage, and the culture is considered innovation friendly (Vinnova, 2018). However, there are also country-specific weaknesses. The main challenges seem to lie within leadership and project responsibility, data ownership, security risks as well as the lack of relevant competence (Malhotra & Chui, 2018; Vinnova, 2018). Moreover, many Swedish companies are experiencing difficulties to go beyond the pilot project stage. That is, they struggle to scale up their projects globally compared to international competitors (Markusson, 2018).

One fundamental problem that hinders the development of AI in Swedish companies is that some entrepreneurs do not see enough benefits with using AI today, and these low expectations on the return of investments make the projects unprioritized (Vinnova, 2018). It also seems that Nordic companies generally lack digital strategies (Kirvelä, Heikkilä, & Lind, 2017; Kirvelä & Lundmark, 2018), as 8 out of 10 Nordic companies state an urgency to develop an AI strategy. Factors such as in-house technology access and the much-needed clarity of valuable business cases pose a challenge in the adoption (Kirvelä & Lundmark, 2018). It is also stated that SMEs experience especially great challenges in terms of resources and capabilities (Vinnova, 2018).

In contrast to not seeing benefits of AI, a report made by the Boston Consulting Group argues that Nordic companies have a good understanding of what AI can do for them. The governmental support and the research and development interest is stated to be strong in the Nordic countries, providing a foundation for exploration (Kirvelä & Lundmark, 2018). However, the interest and

attitude of Swedish companies differs between studies. Some argue that Swedish companies have a strong interest in AI, just like its Nordic neighbors, and that they have already made investments in AI (Costello, 2019; Kirvelä & Lundmark, 2018; Wallström, 2019). Moreover, Sweden is in the top three in almost all categories of the Global Innovation Index (Cornell University, INSEAD, & WIPO, 2019). Despite this, some state that the interest, readiness and perceived necessity of AI is low (Kirvelä & Lundmark, 2018; Svea Ekonomi, 2019; Wernberg, 2019).

1.2.5. Effects of AI

AI is predicted to contribute with more than 15 trillion USD to the global economy by 2030 (Probst, Pedersen, & Dakkak-Arnoux, 2017; Rao & Verweij, 2017) and a large-scale study shows that up to 80% of companies state that AI creates moderate to significant value for them (Chui & Malhotra, 2018). While the economic value emerging from increased efficiency or new opportunities is important, other gains are not to be forgotten. AI has the potential to affect both social, economic, individual, technical and environmental sustainability (Khakurel, Penzenstadler, Porras, Knutas, & Zhang, 2018).

AI can strengthen communities and companies by enabling more accurate fraud detection (Wisskirchen et al., 2017). It can contribute to smart cities and companies in which analyzing and finding solutions to problems experienced by communities or employees (Borenstein & Arkin, 2017). It can save time and money for companies by making processes more efficient and independent by human labor, and it will contribute substantially to the GDP globally (Rao & Verweij, 2017). On an individual level, i.e. the employees, a positive effect can be achieved when AI is used to perform the most time-consuming work tasks so that people do not have to. If AI is used to decrease the number of working hours for individuals, an overall improvement in health and well-being could potentially be seen (Khakurel, Melkas, & Porras, 2018).

The environmental aspect is interesting as well. AI can help in decision making and management, creating the opportunity to, for example, improve waste and pollution management (Al-Jarrah & Abu-Qdais, 2006; Ramchandran et al., 2017). Swedish companies, and SMEs in particular, have a strong focus on environmental goals in the sense that they are actively working with environmental sustainability (Tillväxtverket, 2016). This makes the environmental aspect of AI especially interesting for Swedish SMEs.

1.2.6. General Challenges with AI

There are challenges with AI that all companies should be aware of. In order for AI to work optimally, it needs data. On the one hand, this is becoming easier as the total amount of data in the world is heavily increasing. On the other hand, it might pose a challenge for smaller companies with limited resources or companies with limited data collection possibilities. Moreover, as the awareness of the risks of sharing personal data is increasing, which for example can be seen in the regulative area with the creation and implementation of data privacy laws such as GDPR (The

European Commission, 2016), individuals might be becoming more aware of the risks associated with sharing personal data, which could create obstacles to data collection. It might also be a challenge for companies that have failed to see the value of data and, thus, have refrained from collecting it. Without data, the development of any type of AI application will be difficult (Aboelmaged, 2014; Salleh, Alshawi, Sabli, Zolkafli, & Judi, 2011).

It is also important to note that algorithms are programmed by humans, which creates a risk of mistakes being made. If an algorithm is programmed in a certain way, it will produce certain results. If there is any bias or mistake in the programming phase, the results can be highly misleading. This shows the importance not only of being able to program correctly, but also to understand what the algorithms do on a business level so that the people interpreting the result can spot mistakes and unrealistic recommendations (Hao, 2019; West, Whittaker, & Crawford, 2019).

The AI technology is still immature, especially in business applications (Gartner, 2019), creating difficulties for companies to understand how it can be used in their specific industry, and what the benefits and challenges actually are. The recommendations on how to deal with the challenges are mainly presented in consulting reports. The academic research on the topic is sparse, which makes it difficult to find scientific advice. The consulting reports have suggestions on solutions, such as creating a strategy focused on AI, reevaluating organizational structures, creating a digital foundation, developing talent internally and deciding on a number of selected projects to invest in (Kirvelä et al., 2017; Kirvelä & Lundmark, 2018). It is also considered important to build a culture that supports experimentation and to connect AI to key performance indicators to make sure that AI projects are prioritized. It is generally recommended to treat data as any valuable asset, and to create data management roles. Lastly, companies are encouraged to engage with other actors in their ecosystems, such as competitors, governmental institutions, universities and startups (Gürdür et al., 2019; Kirvelä & Lundmark, 2018). Thus, there are some recommendations on how to mitigate the challenges related to AI. However, whether these recommendations are suitable for Swedish SMEs is unclear.

1.3. Problem Discussion

Sweden's vision is to become one of the leading countries in leveraging the power of AI (Vinnova, 2018). It is therefore of great importance that Swedish companies establish the right prerequisites to manage new technologies and capture the value of them. To exploit the opportunities of AI, Swedish companies have to reach a higher level of understanding of the benefits, opportunities and challenges of AI. It is important to note that Sweden as a country is not necessarily very far behind other countries. There are several successful Swedish companies and Sweden as a country is highly digitalized and technology friendly. However, Sweden is not one of the leading countries in AI, which it wishes to become, and the situation for smaller Swedish companies is unclear.

One factor contributing to the necessity of this thesis is that the research conducted within the area of AI implementation in Sweden is very limited. The message in most reports is that bigger companies in Sweden are positive and somewhat advanced in their AI investments (Söderlund, 2019; Wallström, 2019) while the situation for the SMEs is vague. Vinnova states that the innovation funded by them has increased in Swedish SMEs, which is a positive sign. However, they also state that a major weakness for the future success of Swedish SMEs lies within the fact that several of them lack the resources and competence to be able to develop and use AI (Vinnova, 2018).

Swedish companies might need to learn from successful tech companies from around the world if the vision is to be fulfilled. However, it is difficult to compare the AI-situation in Sweden with companies in countries like China and the US since they are fundamentally different from Sweden in several different aspects. China and the US are also different from each other; both have very large populations, but the US has stricter privacy laws than China. This makes the data collection more difficult. Meanwhile, China has advantages in the possibility to collect a large amount of data due to its very large population, but also in the fact that the government is investing a huge amount of resources in the race to become the leader of AI, with the US as its strongest competitor (Srivastava, 2019a). In this sense, it is needless to say that Sweden lacks both the population and the investment potential that China and the US have.

Despite the difficulties in comparing countries with Sweden, for the purpose of this thesis, the main focus of comparison will be the US. This choice is based on a number of reasons. Firstly, the cultural differences between the US and Sweden are arguably smaller than between China and Sweden (Hofstede, n.d.). In the US, the government has a smaller role in the development and support to specific companies and industries, and this situation is more similar to Sweden. Thus, it is likely easier for American interviewees to understand the challenges and opportunities faced by Swedish companies than it would be for Chinese companies to do so. Moreover, a lot of well-known tech companies originate from the US, which can make the situation easier for Swedish readers and companies to understand. On top of this, the ambition is to interview the companies physically, so the fact that there is a cluster of successful AI companies in the Silicon Valley makes the interview process smooth and allows for snowball effects in interviewing.

In conclusion, Sweden has set ambitious goals on the future development and use of AI, but the challenges are many and the solutions are few and abstract. Furthermore, several of the challenges identified in relation to AI and data analytics paint a picture of a lack of direction and a need for a clear roadmap on how to create value with AI. While it is difficult to compare the Swedish situation to another country, an effort will be made to identify what Swedish SMEs can learn from American experts which, hopefully, will lead Sweden closer to achieving its AI vision.

Key takeaways from Section 1.1-1.3:

- Technological development is constant and fast-paced, which increases the importance for companies to be able to assess possible use-cases for new technologies and innovations
- The Swedish government has a vision about becoming one of the leading nations in capturing and leveraging the value of AI but most Swedish companies are still unsure of if and how to apply it in their businesses.
- AI is a technology that resembles how the human brain works. It can perform repetitive and easy tasks, as well as more complex ones, such as forecasting and decision making.
- AI capabilities include deep learning, machine learning, natural language processing and computer vision, and some examples of business use cases include chatbots, disease detection on x-rays and self-driving vehicles.
- The leading countries within AI and AI investment are China and the US. However, Sweden often places high in digitalization indexes, which indicates a strength within the area.
- AI has the possibility to affect several areas in different ways, such as improved environmental sustainability (by, for example, lowering emissions due to increased product efficiency and quality of prediction and maintenance) and positive effects for individuals and society (due to less repetitive and tedious tasks and decreased work hours)
- Challenges with implementing AI include finding relevant competence, creating flexibility and securing support from executives.
- Potential mitigators to the challenges connected to AI are few and abstract, and the degree to which they are used by Swedish SMEs is unclear

1.4. Research Question & Objective

This thesis examines attitude and readiness to AI in Swedish small and medium sized companies (SMEs) as well as presents recommendations given by American and Swedish experts. The purpose is to provide guiding advice to Swedish SMEs in their future AI implementation.

The Swedish SMEs are referred to as aspirants since they all aspire to implement AI but are unsure of how to do it. To fulfill the purpose, recommendations on how to implement AI are identified with the help of American interviewees that are more advanced and experienced within AI, and they are therefore referred to as experts. A suggestion on how the aspirants can take their first steps into the age of AI is then presented by supporting the advice given by the American experts with input from Swedish equivalents (i.e. Swedish interviewees with AI knowledge). This is done by collecting recommendations and advice from the experts and combining it with the challenges stated by the aspirants. Simply put, the goal is to present guidelines for how to start using AI by presenting recommendations on how to solve the challenges that the aspirants experience. This is done by answering the overarching research question through three sub-questions. The research questions and the process of development of them are illustrated in Figure 1 below.

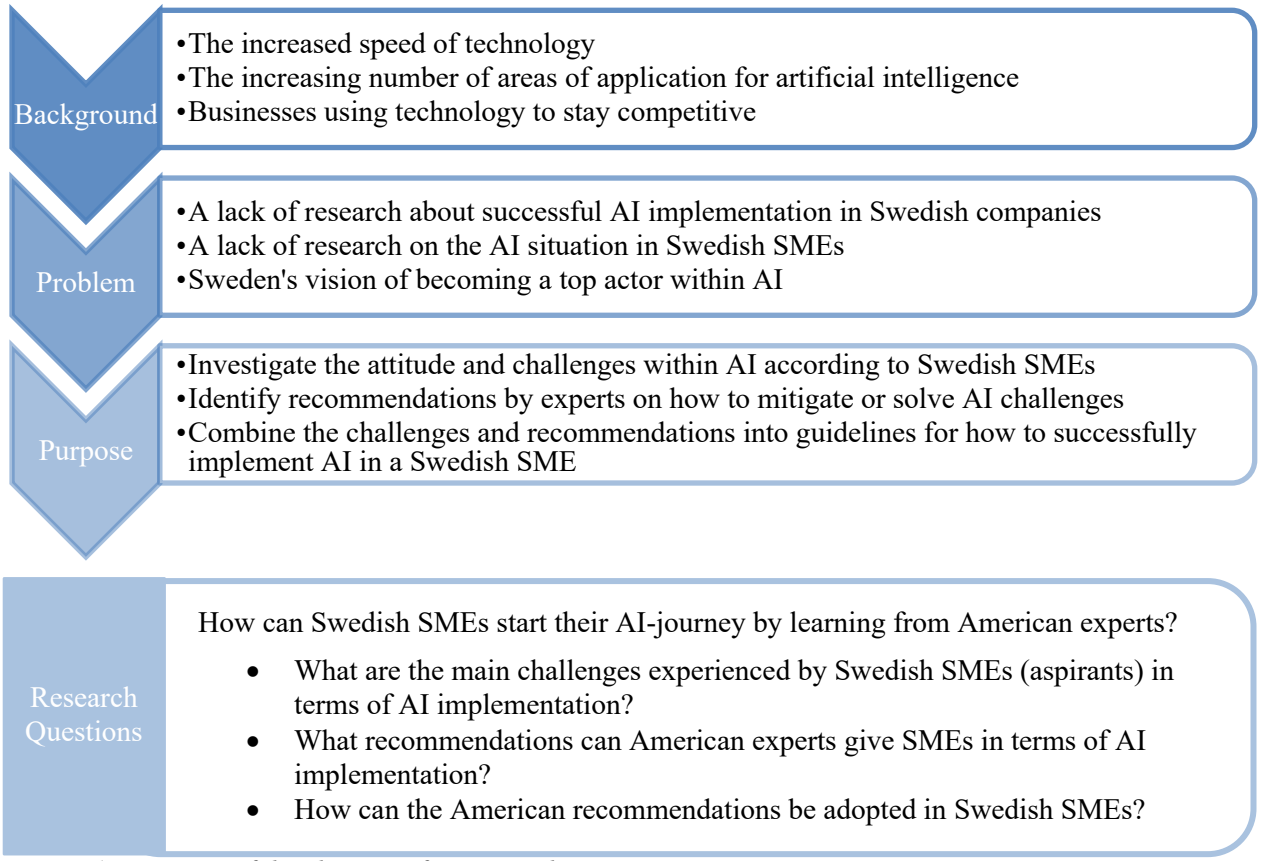

Figure 1 - Process of development for research question

1.5. Disposition

The following sections of the thesis includes a literature review in which relevant academic research regarding business modelling and strategies, organizational design and culture and change management is discussed. After this, the methodology, i.e. the research strategy and design, the data collection and analysis and the research quality are described and reflected upon. In chapter 4, the empirical findings are presented, and in chapter 5, these findings are discussed and analyzed. Lastly, the thesis is finished with some conclusive remarks in chapter 6.

Figure 2 - Disposition

2. Literature Review

This section provides a review of research relating to organizational decisions and factors of innovation implementation. Literature about diffusion of innovations is examined to understand how AI may diffuse. Organizational technological readiness factors are assessed to understand how companies may adopt innovations and literature dealing with organizational theory and organizational change is studied to understand how organizations may cope with innovations.

2.1. Diffusion of Innovations

One way to assess the diffusion of innovative technologies like AI is by using the diffusion of innovation (DOI) framework developed by E. Rogers (1995). The DOI framework consists of five factors that affect the diffusion, i.e. the spread, of innovations. These five factors are: relative advantage, compatibility, complexity, trialability and observability. The strength or level of these factors will affect the speed of the diffusion. By investigating the factors in terms of AI, an estimated "ease" of diffusion can be made. In countries and companies where the estimated strength or level of the factors is high, AI should be more likely to easily diffuse.

The relative advantage is the perceived positive effects of adopting a technology (Zhai, 2010). In the case of AI, it refers to how much better AI is considered to be at solving specific tasks than the current choice of technologies. The higher the relative advantage is, the higher the chances are that companies will adopt the technology (E. Rogers, 1995). Examples of the relative advantages that AI can create are cost reductions (Press, 2016), diversification (Ransbotham, Kiron, Gerbert, & Reeves, 2017), revenue increases and strengthening of competitive advantage (Liu, 2019).

Compatibility also has a positive effect on the diffusion (Ifinedo, 2005; Yan, Zhai, & Zhao, 2009; Yang, Sun, Zhang, & Wang, 2015; Zhai, 2010), and it specifically refers to ability to bring value while simultaneously satisfying the needs of the user (E. Rogers, 1995). Some argue that a successful implementation of AI requires a pre-defined use case that aligns with the business strategy. The greater the match, the higher the chance of diffusion (Chui, 2017; Ifinedo, 2005).

The complexity is about the degree of perceived difficulty in understanding of the innovation and this is negatively correlated to diffusion (E. Rogers, 1995). In the case of AI, this highlights the need to have an easy-to-use solution or to have enough knowledge to make the complexity obstacle obsolete. The complexity of the innovation can be challenging for SMEs since they sometimes lack knowledge, and complex innovations requires a certain type of knowledge (Brychan, 2000).

The trialability is about the possibility to try or experiment with the product or service, creating a chance for the product or service to be reinvented and improved upon which can increase the speed of diffusion (E. Rogers, 1995). The trialability can be especially critical for SMEs, as there is often

a greater lack of resources that can in turn be an obstacle to try or experiment with new products or services (Brychan, 2000).

Lastly, the observability is about being able to observe the results of an innovation (E. Rogers, 1995). For AI, the observability could, for example, be strengthened by success stories from other companies that have implemented AI in their business.

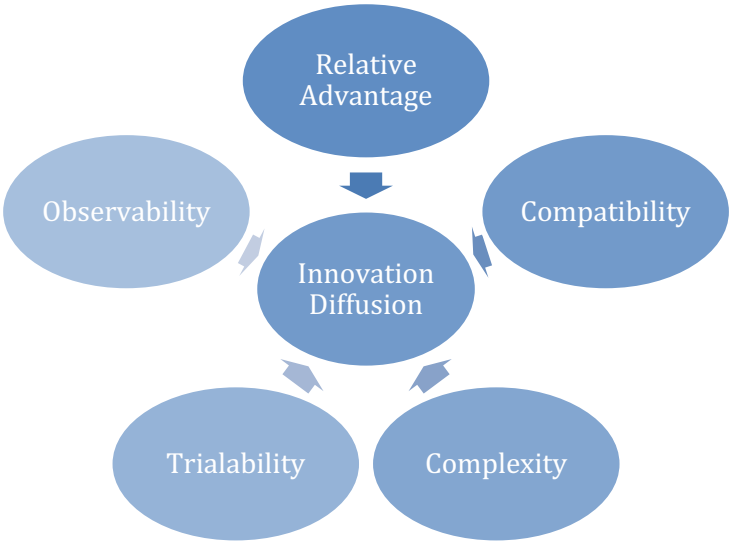

Figure 3 - Illustration: the five factors of innovation diffusion (Rogers, 1995)

2.2. Technological Readiness

In order for an adoption of a technology to take place, there needs to be technological readiness. One framework that can be used to assess this readiness and adoption potential in firms is the Technology, Organization and Environment (TOE) framework. The TOE framework explains how factors within the dimensions of technology, organization and environment affect the readiness for companies to adopt a technology. The main point is that the technological aspect of a new technology is not all that matters to the adoption (Tornatzky, Fleischer, & Chakrabarti, 1990).

2.2.1. Technological Dimension

The technological dimension of the TOE framework includes technologies that are relevant to the firm, both those already in use in the company and those that are available but have not yet been implemented. The technologies in the company are important in the adoption process since they indicate a limit of capacity and pace of technological change that the company can cope with (Collins, Hage, & Hull, 1988). The ones that exist in the external environment but that are not used by the company indicate which innovations that could be implemented and give examples of ways to use and adopt the technology (Baker, 2011; Tornatzky et al., 1990).

There are three groups of technologies that can exist outside of an organization. Firstly, there are those leading to incremental change, such as new updates of features of an old system or product. These entail the lowest level of risk and change. The second type are those leading to synthetic change and those leading to discontinuous change, and this is an already existing technology or idea combined with a complete new one. Lastly, the ones that lead to a discontinuous change is something completely new, also known as radical innovations. Firms that are operating in industries involving discontinuous change need to constantly make decisions about which innovations to adopt to stay competitive (Baker, 2011; Tornatzky et al., 1990). When adopting innovations, firms also need to evaluate if they are competence enhancing or destroying. Competence enhancing innovations allow companies to gradually build and develop their current competences while competence destroying innovations replace existing competences in the company, making them much more complex to implement (M. L. Tushman & Anderson, 1986).

2.2.2. Organizational Dimension

The organizational dimension assesses availability of the organizational resources needed for an implementation, in terms of top management support, organization size and available resources (Duan, Deng, & Corbitt, 2010; Idris, 2015; Yan et al., 2009; Yang et al., 2015; Zhai, 2010). Several organizational theories and researchers puts top management support as an absolutely necessity for succeeding with an implementation (Wade & Hulland, 2004; Yang et al., 2015; Zhai, 2010). Other than that, champions (individuals promoting the implementation) are positively associated with technology adoption, as are cross-functional teams (Tornatzky et al., 1990) and decentralized structures (Burns & Stalker, 1962; Daft & Becker, 1978). However, it is important to add that decentralized structures might pose a challenge in the implementation phase due to its potential lack of communication standards and clearly defined roles (Zaltman, Duncan, & Holbeck, 1973).

Research suggests that the larger the company, the higher the possibility of investing in, and adopting, a new technology (Cyert & March, 1963). Large companies are also exposed to a stronger competitive pressure which might contribute to a higher level of adoption (Zhai, 2010). However, the size factor is debated and should not be accepted as a fact (Kimberly, 1976). Lastly, as for resources, the main issue is about slack, i.e. available resources in terms of, for example, human capital or technology (Aboelmaged, 2014). However, it is argued that even though having slack resources can foster innovation adoption, it is not always a necessity (Tornatzky et al., 1990).

2.2.3. Environmental Dimension

Lastly, the environmental readiness is composed of pressure from competitors and governmental regulations. Companies tend to change strategies and way of working depending on what happens in the surrounding environment. The environmental readiness refers to how a company's external environment affects its decision to adopt a technology like AI. Competitive pressure may alter the competitive advantage for the companies in the industry, and this might in turn motivate companies to adopt innovations (Aboelmaged, 2014; Yang et al., 2015). Meanwhile, governmental

regulations and initiatives might be considered as either fostering or hindering adoption of technologies (Yeh, Lee, & Pai, 2015). Lastly, for the individual employees in companies, it is interesting to note that external factors such as strong societal safety nets could have the ability to make individuals more willing to adopt technological innovations (Alem & Broussard, 2013).

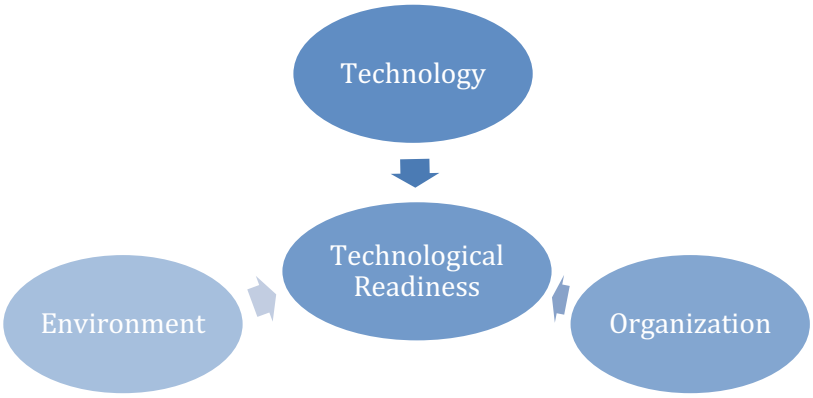

Figure 4 - Illustration: the TOE framework dimensions (Tornatzky et al.,1990)

2.3. Organizational Literature

Since this thesis aims to provide guidelines on how companies can think when implementing AI, it is considered necessary to understand how companies are structured, how decisions are made, what the communication looks like and how organizations deal with change – this in order to understand what company processes could and should look like when implementing an innovation.

2.3.1. Business Modelling

To understand how a company operates and how, where and when a new technology can be used, it is important to understand the concept of business models. The business model is the foundation for the activities in a company, illustrating how value is created and captured (Bouwman, Nikou, Molina-Castillo, & de Reuver, 2018). The business model is important to understand in the light of companies introducing new technologies since the same product or service brought to market may be either a success or a failure depending on the business model (Chesbrough, 2010).

Due to the ever-changing business climate, it is important to be able to alter or innovate the business model to fit different circumstances. Business model innovation is when a company changes their business model in a way that affects the customers and stakeholders (Bouwman et al., 2018). It often revolves around the use of internet and applications (Bouwman, de Vos, & Haaker, 2008) or innovation & technology management (Casadesus-Masanell & Ricart, 2010; Hedman & Kalling, 2003; Methlie & Pedersen, 2007; Teece, 2010; Zott & Amit, 2008, 2010). It is, however, not easy. The main difficulties involve conflicts arising between the new business model and the old one, as well as between the new business model and the existing assets and

competences in the company. Another challenge concerns cognitive obstacles to change among the employees (Casadesus-Masanell & Ricart, 2010; Chesbrough, 2010; Hedman & Kalling, 2003; Teece, 2010; Waldner, Poetz, Grimpe, & Eurich, 2015).

One explanation to why businesses sometimes are late in adopting new technologies or business models lies in the concept of disrupting innovations, described by Christensen (2015). The main reason for this lack of proactive behavior is not a lack of understanding of the value of a new technology, but rather the conflict between existing practices and new ones. When new technologies come around, they are often characterized by a lower margin than existing ones. Thus, it does not make financial business sense to adopt it. However, some of these seemingly inferior technologies slowly gain ground by taking over the least profitable segments that incumbents' control. The incumbents might not see the danger in this as they are able to prosper on their most profitable segments alone. By taking the least profitable segments, the new technology steadily diffuses to new segments. In some cases, these technologies become so superior that they are able to compete with the incumbent. At this point, it might be too late to fight the new technology.

Disrupting innovation highlights the importance of being able to adapt a business model, but it does not fully explain why the incumbents are unable to spot the disruption. One possible explanation to this is the success trap, which means that companies with successful business models have, rationally, no reason to change. The success of business models acts as a filter of what kind of, and how, information is dealt with in corporate decisions (Chesbrough, 2010). This statement is similar to dominant logic; a concept used to described the myopia of some companies in their pre-set beliefs on how a they should create value based on how value has been created historically (Prahalad & Bettis, 1986). The dominant logic can be seen as a decision-making bias and this is especially relevant in today's climate where a large amount of information needs to be processed. This type of information-dense climate is also common in early stages of research and development (Chesbrough, 2010), which is important for innovations like AI. While it might be needed to be able to filter information to make sense of it, effort should be put on finding a filtering strategy that does not act in accordance with confirmation biases but rather against them.

In order to innovate a business model, companies need to fully understand the processes underlying the business model and conduct experiments. Experimenting is key, but it may also be challenging since some organizational processes might need to change fundamentally. The company needs to accept failing as long as the failure is fast and affordable, and specific managers need to be appointed to drive the change. These managers need not only be responsible both for the implementation and of encouraging a cultural change in order to overcome the dominant logic and for innovation to fully prosper (Chesbrough, 2010).

The value in technologies like AI may be latent until commercialized through a fitting business model (Chesbrough, 2010). Large international firms such as Uber, Amazon and Airbnb have

successfully innovated their business models using AI (Lee, Suh, Roy, & Baucus, 2019), which shows that it can be valuable for companies to do so. In order to use AI in new business models, companies need to be innovative and embrace an entrepreneurial mindset (Lee et al., 2019), which indicates that innovation, either of business models or of processes, is a way for companies to keep their competitive advantage and keep or improve their market position (Sosna, Trevinyo-Rodríguez, & Velamuri, 2010; Wirtz, Schilke, & Ullrich, 2010).

2.3.2. Business Strategies

A number of companies state a lack of strategic direction in terms of AI. In order to understand what an AI strategy could entail it is important to define what a business strategy is. A business strategy is defined by the Oxford dictionary as "an overall longer-term policy for a firm that coordinate the separate functional areas of business, defining the business objectives, analyzes the internal and external environments and determined the direction of the firm" (Law, 2016). There are several different types of strategies, such as intended strategy, i.e. strategy based on a specifically thought-out plan, realized strategy which is the actual strategy that the company implements and, lastly, emergent strategy which is strategy that emerges from a combination of the intended strategy and external circumstances. These types of strategies illuminate the two schools of strategical thinking: the design school, which sees strategy as a rational process of planning and deliberation, and the learning school, which focuses on emergence of strategy (Grant, 2016).

A successful strategy should include goals that are consistent with each other, and consistent between short and long term. It should also be coherent with the environment in which the company works. To build a successful strategy, the company needs to assess its resources and make sure that the strategy leverages on them. This, combined with an effective implementation of the strategy, increases the probability for the strategy to be successful (Grant, 2016).

2.3.3. Organizational Design

When a seemingly effective strategy is developed, the organizational design, or structure, needs to be assessed since some strategies require a remake of the structure. The organizational structure impacts the way that information flows, how decisions are made and what the company prioritizes, as it places people, divisions and activities in an illustrated organizational chart (Grant, 2016). Thus, the organizational structure has an impact on, for example, what technologies are invested in and how much effort that is allocated to new innovative projects, such as AI.

One way that information can flow is from the top to the bottom - this is known as a top-down approach and it essentially means that the managers and executives make decisions while the employees on the lower levels performs. This type of structure is known for being efficient for standardized work, but it leaves little room for innovation (Grant, 2016). Using a top-down

approach has also been said to constitute a barrier for strategy execution, together with conflicting priorities, managerial inefficiency and poor communication, coordination and leadership.

In contrast, using a leadership style that combines top-down direction and upward influence, clear strategies and priorities, open communication and a focus on development of leadership skills among mid-level managers are seen as success factors for strategy execution (Beer & Eisenstat, 2000). Swedish companies are generally known for being flat and having an unstructured flow of information, which some argue is a reason to why Swedish companies are so innovative (Isaksson, 2008; Tuvhag, 2014; Wästberg, 2009).

Another way of organizing how information flows, how decisions are made and how processes are conducted in a company in a way that is positive for innovation is to create an ambidextrous organization. This is both an actual organizational structure as well as a way of thinking, and the goal is to maximize the return from current assets and knowledge while not losing momentum and keep up with competitors and potential disruptors. It aims to combine exploitation of current assets and processes with the exploration of new ones. It requires that the company is able to make continuous improvements to existing areas while simultaneously exploring breakthrough innovations. Suggested solutions to this puzzle include funding of exploratory research, using cross-functional teams and adopting a focus-shifting approach; that is, focusing on exploitation during one period and on exploration during another. One approach that has been pinpointed to work is to have separate divisions for exploitation and exploration while maintaining a connection between the divisions with the senior management as the link. This type of structure is what is known as an ambidextrous organization and in order to build a successful ambidextrous organization, it is vital to have top-level managerial support (M. L. Tushman & O'Reilly III, 1996).

2.3.4. Organizational Culture

Organizational culture is defined as the combination of assumptions, beliefs, values, norms and language patterns that are shared by the employees of an organization. It can be summarized as the shared identity of the organization's members, assuming that there is a consensus among members. It argues that employees' behavior is a product of collective norms, values and assumptions in the organization, which are often stronger than the formal rules and norms of rational behavior (Huff, 2007; Schein, 2010).

An organizational culture can both enable and obstruct what an organization can achieve (Schein, 2010). One reason to why businesses sometimes lag in adopting new technologies is that they are unsuccessful in creating an innovative culture. Research concerning the creation of an innovative culture puts a lot of focus on having an appropriate organizational structure, a suitable leadership style and a creative and acceptable culture for innovation within the organization (O. R. Tushman, 2004). In order for a company to continuously progress and compete in an ever-changing climate, they need a culture that supports innovations and change. Whether a change concerns development

of new innovative products or innovation of the entire business model, the company culture needs to support creativity and give space for employees' testing and failure. One example of how to foster such creativity is to allow for brainstorming sessions and to make sure that it is known that all ideas and initiatives of creativity are welcomed (Goffin & Mitchell, 2016).

A common structural mistake when managers try to create an innovative culture is to put the work of innovation to a separate part of the organization. Isolation of the creative and innovative part of the business can create frustration among the mainstream business managers who often are responsible for the revenue and make them less prone to contribute to change (Kanter, 2006). Thus, leaders need to encourage future-oriented projects and action throughout the organization. Without a culture of innovation, it is difficult to break the status quo, avoid organizational inertia or steer against a dominant logic. However, the difficult part of innovation is not the idea creation itself, it is the following implementation of the new ideas and the management of change (Ahmad, 2004).

2.3.5. Change Management

Change is difficult for most people as it requires them to do something that is unknown. Because of these challenges, change management is a widespread subject that more or less all companies have to use. The purpose of change management is to support companies with the challenges associated with change by providing tools and techniques to support the "people side" of change in a business environment (Hiatt & Creasy, 2003)

Organizational change happens when organizations for some reason, often due to evolvements in in the external environment, change in order to increase their effectiveness or to avoid failure (Jones, 2013; Moran & Brightman, 2000). Oftentimes, such a change is motivated by a wish to stay competitive (Boss, 2016). Technology is a major force that creates a need for companies to change. One theory, known as the adaptation theory, illustrates how changes in organizations take place as effects of changes in the external environment. It also states that an organization will be more likely to survive if it can respond to these external changes fast enough (Hannan & Freeman, 1984), which is also strengthened with other research stating that organizations that can adapt to their external environment are more likely to prosper (Grant, 2016). One alteration of this model highlights the importance of corporate culture and its role in allowing change to happen, including the capability of embracing new technologies and innovation (Kitchell, 1995). This model, together with the adaptation model, suggests that companies need to have an innovation and change friendly culture and that they need to be able to adopt new technologies in a timely manner.

A demand for change in an organization can be influenced both by internal and external factors, and a common reason for organizational change is the need to respond to new market demands or changes in technology. One of the main reasons to why change management is difficult is resistance, or inertia (Jones, 2013). The reasons for such resistance or inertia among employees include fears that their knowledge will not be utilized, fears that they will not be able to be

successful in the new situation, personal negative feelings towards the ones conducting the change initiative and many, many more (Kotter & Schlesinger, 1979).

Many change initiatives fail, meaning that they either are not finished or that they require more resources in terms of, for example, money and time than expected. However, it is also important to remember that this does not mean that companies are incapable of change – it just means that it happens in slowly (Hannan & Freeman, 1984). The fact that employees tend to be reluctant towards change is the main reason to why guiding change is one of the most challenging and demanding task a leader has (Kanter, 2012). One way to cope with change and resistance is to appoint a change champion. The change champion should be someone with the capacity to inspire, motivate and drive the change in the organization. He or she should also have support from the employees and from the top management, be passionate about the change initiative and have knowledge about the underlying processes and technicalities of the business. A change champion could be vital for the success of the change initiative (Kirsch, 2006; Thompson, 2009).

On top of having a change champion, ensuring top and middle management support is vital. Without it, it can be close to impossible to successfully complete a change initiative. The management needs to take initiatives and be supportive, but they also need to be charismatic and have the faith of the employees in order for the employees to trust and follow them through the difficult process that a change initiative is (Michaelis, Stegmaier, & Sonntag, 2009).

2.3.6. Digitalization

With the foundation in the area of general business strategies, it is important to shine some light on theories around digitalization in order to connect the topic of organizational structure and design to the topic of AI and technology. Digitalization is considered not only to be about the technical dimension, such as updating IT-infrastructure and systems, but also about the strategic aspect. It is closely connected to change management since it requires rethinking and reimagining of processes and tasks that maybe have been done in the same way for a long time. It is about breaking the dominant logic and biases in the company and think creatively. One of the main factors in digitalization is organizational agility, i.e. the ability to adapt to new circumstances. According to D. Rogers (2016), companies need to successfully allocate resources between projects, change the measurement focus and align incentives to make sure that the behavior and actions that are rewarded are those that drives the company forward in the digitalization.

For SMEs, the digitalization can be tricky. Emerging technologies is one common external factor that push organizations to undergo change, often through digitalization (Phillips & Gully, 2012). SMEs tend to lag behind when it comes to digitalization, which is why managers in SMEs are recommended to put up a specific digital strategy. SME-managers need to train and support their employees to acquire the necessary digitalization skills. In order to adopt new technologies, a company needs skilled employees (Eller, Alford, Kallmünzer, & Peters, 2020). The recruitment of

required skill is a challenge that is highlighted for SMEs in particular, and the lack of skilled employees is a significant barrier in order to succeed with a digital transformation (Eller et al., 2020). As a part of the digital strategy, managers are recommended to build a digital identity with new values, norms and principles that support the digitalization (Eller et al., 2020).

When a company goes through digitalization, great management skills are required. A lack of skilled management has been found to be an obstacle to digitalization, and this is likely to be common in SMEs since managers in SMEs generally are focused on operational tasks and tend to focus less on decisions regarding strategy and long-term planning (Eller et al., 2020). Further, digitalization and financial performance do not always align with each other and, thus, a digitalization might need to be measured with KPIs that are non-financial (Kotarba, 2017). However, there are also strengths of being an SMEs. They tend to be more innovative (Beliaeva, Ferasso, Kraus, & Damke, 2019), flexible and have a coherent culture (Bouncken & Barwinski, 2020). They are also more easily able to share new norms and values among employees due to their size and flexibility (Bouncken & Barwinski, 2020), and these characteristics positively affect organizational change and should therefore be exploited by the SMEs.

2.3.7. Overcoming resistance

Digitalization is one type of change that a company goes through, and thus, resistance to this change is bound to happen (Garcia, Bardhi, & Friedrich, 2007). Technologies like AI require effort in the implementation, specifically in terms of developing new skills. This, in turn, creates a need for change both in company culture, employee behavior and top management activities and support (Halaweh & Massry, 2015). It is challenging as it requires change on several levels, both in processes and behaviors (Andersson & Rosenqvist, 2018; Parviainen, Tihinen, Kääriäinen, & Teppola, 2017). Resistance can occur for several reasons, both personal and professional, and one of these reasons is cognitive biases (Stryja & Satzger, 2019) which is when people resist change even in cases where they rationally realize that the effect of changing might be more favorable for them or their company.

It is known that decision making is often characterized by the use of heuristics, i.e. rules of thumb, which makes the decision-process faster, but that also can lead to wrong decisions (Kahneman, Knetsch, & Thaler, 1991). Heuristics are often used in decisions regarding innovations. This is shown in research stating that individuals often favor old products to innovative ones even if the innovative ones are objectively better (Gourville, 2006). Thus, one of the reasons for resistance can be cognitive biases or heuristics, leading to less innovation adoption in companies.

One strategy that can be used for overcoming biases digital nudging. Nudging is a strategy that involves small actions tricking the mind to think in new ways by shaping the setting surrounding a decision (Goldstein, Johnson, Herrmann, & Heitmann, 2008; Münscher, Vetter, & Scheuerle, 2016). One effective way to nudge is to affect defaults, i.e. the decision that is taken when the

decision maker is not actively choosing anything at all (Johnson & Goldstein, 2003). Defaults have been shown to be very effective in steering decisions in several different areas (Chernev, 2004; Pichert & Katsikopoulos, 2008; Thaler, Sunstein, & Balz, 2012).

Digital nudging is connected to decisions in digital environments (Schneider, Weinmann, & vom Brocke, 2015; Weinmann, Schneider, & vom Brocke, 2016). There is one study that combines the theories of nudging and defaults and tests its effects on innovation adoption among consumers. It shows that in almost 50% of the cases, resistance to innovation is a result of a lack of action rather than an actual opposition to an innovation. This research indicates that digital nudging might increase the chance of an innovation being adopted (Stryja & Satzger, 2019).

Key takeaways from Section 2.1-2.4.6.:

- The diffusion of innovation can be assessed with the DOI framework, consisting of five factors. These factors are relative advantage, compatibility, complexity, trialability and observability.
- The technological readiness can be assessed with the TOE framework, consisting of three dimensions that affect the technological readiness. These dimensions are technology, organization and environment.
- Areas within organizational research is examined; specifically business modelling and strategies, organizational design and culture, change management and digitalization.
- Companies need to act proactively and reactively, be able to adapt their business model and strategy to fit a dynamic environment and be aware of the risk of falling into the "success trap".
- The organizational design and culture of the company need to allow for the experimentation that innovation often requires and handle potential internal resistance during changes
- Examples of ways to digitalize a company is to follow the "roadmap for tackling digital transformation", focus on employee support and development, and to always be aware and try to avoid heuristics and biases, for example by using digital nudges that forces individuals to think in new ways.

3. Methodology

This section describes the collection of primary and secondary data, and the method of analysis, consisting of an iterative approach and thematic analysis. The quality of the research is discussed, highlighting strengths and weaknesses in order to increase the trustworthiness and transparency.

3.1. Research Design

The research process started by choosing the subject of AI and its strategic role in companies. This choice was based on personal interest and societal trends. Once the subject was chosen, literature about AI from a business perspective was read in order to build an understanding. Once this was done, the work with conducting a literature review started. This step was characterized by reading, formulation of keywords and keeping a critical mindset. When the literature review was considered comprehensive enough to provide an understanding that allowed for interview themes to be constructed, that process was started. The interview themes and questions were constructed simultaneously as the literature review was improved upon and as the interviewees were reached out to. Once the interview guide was set and interviewees were found, the process of interviewing, transcribing and constructing the empirical section of the thesis was conducted. After this, the analysis of the collected data was completed while constantly iterating and improving the other sections in order to make the content as coherent and relevant as possible. Lastly, the conclusion was written, the thesis was proofread, and potential improvements were extensively discussed in order to deliver a thesis with the highest quality possible.

A case study was conducted because of the depth that it allows, which is important when wanting to understand a novel field. In case studies, it is important that the study objects are relevant in their own right. One reason to conduct a multiple case study, which this is, is that it allows for comparison and contrasting of more than one case. While this limits the depth compared to a single case study, the wider scope is prioritized. since there are many different types of companies and immersing too deep into one single company would not make sense. It was hoped that focusing on multiple cases would create a more generally applicable result than a single case study. However, it is important to note limitations of a case study, such as the lack of possibility to generalize the result, the difficulty of replication and the risk of focusing too strongly on the differences between the cases and too little on the similarities (Bryman & Bell, 2011).

3.2. Research Strategy

A qualitative approach was taken to enable a deeper understanding of the topic of AI implementation and use in Swedish SMEs. This was mainly based on the fact that the academic research on how Swedish SMEs use AI is very sparse and because it allows for iteration and for new topics to emerge, which was considered important in order to present literature that is as relevant as possible to the topic.

It can be noted that a quantitative approach could have been chosen with the purpose of examining, for example, the *effect* of an AI strategy on profitability. However, again, based on the limited amount of research, and seeing as AI is an immature subject in terms of business applications, the exploratory and qualitative research was considered to be more suited as a first step. It is, however, important to remember that the qualitative approach comes with some disadvantages compared to quantitative research. It might lack objectivity since it concerns people's subjective opinions rather than objective facts. It also relies on the judgement of the researchers, which further risks limiting the objectivity of the data and the result. Moreover, the possibility to replicate the study is limited, seeing as social settings are dynamic and under constant change (Bryman & Bell, 2011), meaning that answers received from the same interviewee might be different at different points in time.

In this thesis, the reasoning is abductive. We do not claim to develop guidelines and conclusions that are generally applicable for all companies since the observations made are only a small and non-representative sample. Instead, we try to create the best possible prediction with the limited sample that we have. This approach also allows for literature to be collected both before the data collection as well as simultaneously with it. Again, seeing as this topic is fairly sparsely researched, it was considered advantageous to allow for continuous theoretical addition, i.e. iteration.

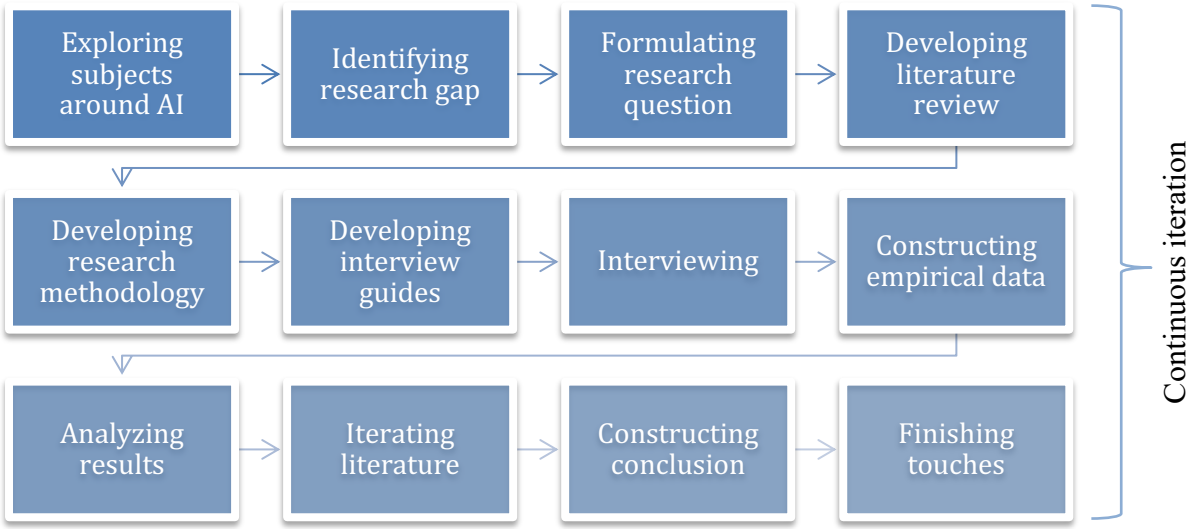

Figure 5 - Illustration of research process

3.3. Research Method

The data collection is characterized by gathering primary and secondary data. The first step was to collect secondary data which was done through a literature review and discussions among the two of us. The primary data consists of data from interviews performed in San Francisco, US, and in Gothenburg, Sweden. Combining different research methods, such as secondary and primary data, is a means of cross-checking data and findings. This is also one type of triangulation, which can strengthen the quality of research (Bryman & Bell, 2011).

3.3.1. Secondary Data Collection

The secondary data mainly consists of articles collected through scientific online sources found through Super Search (a searching assistant for scientific articles provided by the University of Gothenburg), such as EBSCO, SpringerLink and Emerald Insight. A part of this data also consists of outlooks from consulting companies such as Gartner, Deloitte and BCG due to their diligence in trend reports and industry observations. Reports from institutions like the European Commission and the innovation agency Vinnova are also used due to their relevant insights and trustworthiness.

In order to construct a comprehensive and relevant literature review, a systematic approach was taken. This is a useful method to find relevant information when navigating through a large amount of literature which especially was done when examining organizational research. It also facilitates a more systematic, objective, transparent and replicable search process of the data (Baumeister, 2012). In order to successfully do this, inclusion and exclusion criteria are developed. This allows for easier selection of literature as well as transparency as it illustrates what the thesis deals with and not. In table 1, included and excluded topics are presented. The rationale behind choosing the topics lies in relevance to the topic and to the research questions.

Table 1 - Literature inclusion and exclusion criteria

Included	Excluded
• AI and its enabling and preventing factors • General knowledge of organizational theory, e.g. business strategies and business models • Digitalization • How companies view external initiatives, sometimes governmental ones	• Detailed explanations of how to conduct business strategies, structures etc. • Advice aimed at non-profit organizations • How AI works on a technical level • What actual effects governmental and other external initiatives have

The keywords were chosen in line with the research topic and the objective of the thesis. To assure that relevant literature was not overlooked, different combinations of the keywords and synonyms to the keywords were used. Moreover, a check for standardized keywords was conducted to make sure that the formulation of the keywords did not become an obstacle to finding relevant literature. Table 2 illustrates a majority of the keywords used. However, some articles and papers were also found by using a snowball method and by using references in one paper to find another.

Table 2 – Keywords

Keywords	
• Artificial intelligence, AI • Digitalization • Change management • Strategic management • Business strategy • Culture of innovation • Business model, business model innovation	• Innovation management • Technology management • Artificial intelligence + sustainability • Artificial intelligence + effects • Artificial intelligence in companies • Artificial intelligence + Sweden/Swedish • Artificial intelligence + challenges

3.3.2. Primary Data Collection

The primary data comes from 10 interviews with 11 interviewees. The interviews were semi-structured to allow for new subjects to emerge. In order for the interviews to be both flexible and structured, interview guides were developed; one for the aspirants and one for the experts (see Appendix 1: Interview Guide for Aspirants and Appendix 2: Interview Guide for Experts).

The interview guides were based on secondary data, i.e. literature about diffusion of innovation, technological readiness and organizational theory. The interview guides acted as a foundation for the interviews, but the interviewee was free to go off-topic and discuss what he or she deemed relevant or interesting. Nevertheless, in all interviews it was made sure that all topics were at least briefly covered. The reason for this was that it was considered necessary to be able to compare and contrast the data from all interviews with each other, and this would only be possible if all interviewees were given a chance to discuss the same topics. To strengthen the quality of the interview guide and the questions, test interviews were conducted with colleagues from the university. These test interviewees provided feedback on how the questions were formulated and on the order of them, upon which the questions were improved.

In order to make sure that the same topics were discussed in all of the interviews while still leaving room for the interviewees to bring up their own topics, the interviewees were actively encouraged to speak freely and to add whatever topic they found relevant. At the end of each interview, the interviewee was asked if there was something that he or she wanted to add, or something that he or she thought had been overlooked. By doing this, the possibility of getting a nuanced result increased and the risk of having chosen too few or wrong questions decreased. The strength of the research was also increased by using a saturation approach. That is, the data collection went on until no new relevant information was found (Bryman & Bell, 2011).

All interviewees were given the chance to receive a sample of interview questions before the interview in order for them to be able to prepare on main themes and to find relevant information before the interview. This approach might not always be appropriate, for example if the questions are about the respondents' feelings or opinions, since sending the questions ahead of time might then not lead to a truthful and spontaneous answer. However, since the purpose of the interviews in this study was to get thought-out and sound advice and recommendations, sending the questions and topics before the interview was considered to be the best option. It is, however, important to note that not all of the respondents received sample questions prior to the interview. This was either due to their own unwillingness or due to communication issues. This has been accounted for and no interviewees were considered to have any difficulties answering the questions regardless of whether they had been sent sample questions prior to the interview or not.

Purposive sampling was used in this thesis. This is a non-probability sampling, which means that there is no aim to choose interviewees randomly. Our aim was to strategically choose the sample

based on the proposed research question and pre-defined criteria. These criteria specifically included size, location and attitude towards (as well as experience within) AI. All aspirant companies should be small or medium sized, meaning that the two out of three conditions need to be fulfilled: i) the number of employees is below 250, ii) the turnover is below EUR 50 million and iii) the balance sheet is below EUR 43 million (Europeiska Kommisionen, n.d.). All aspirant companies were to be based in and have their headquarter in Sweden in order to make sure that they were not characterized by the American business culture. This was so that conclusions linked specifically to Swedish SMEs could be drawn. A number of Swedish companies (aspirants) were chosen based on previously mentioned criteria. With the help of Business Retriever, a list of Swedish SMEs was generated and all of the companies that were judged to suit the purpose were contacted. Almost all companies on the list were included. However, companies assumed not to be interested, such as very small convenience or lifestyle stores, were not contacted.

Since companies' attitude and readiness of AI often is internal information, it was difficult to access before contacting potential interviewees. Therefore, when reaching out to the companies, a description of the background and the aim of the thesis was provided together with the criteria for the interviewees. In the description, it was explained that an interview would only be relevant if the company fits into the description. By using this method, a self-selection was made by the companies, resulting in an effective way to make sure that the respondents fit into the scope and relevancy of the research area. However, using this approach also creates a risk of having a sample that is skewed and unrepresentative, since a certain type of companies or people will likely be the ones who accept the proposal. This is a fact that is known, and when analyzing the data, extra effort is put into trying to spot tendencies or patterns showing a skewness or "abnormal" answers in comparison from what "average" companies would likely say. This is difficult and subjective from the researchers' points of view, which is a challenge that a lot of qualitative research faces.

The American respondents were not characterized by limitations in terms of company size. However, they were required to work at companies that are or have been successful within AI or have other equivalent professional experience within AI or digitalization. The American experts were interviewed with the purpose to learn about best practices, processes and success factors that could be used as recommendations to for the aspirants in their mission to implement AI. The American respondents (called experts) were to be based in or around the San Francisco Bay-area and were chosen based on expertise within the field of AI, either due to the company's use of AI or to the respondents' experience or knowledge of AI and strategic digital decision making.

Six American experts were interviewed. However, two Swedish experts were also interviewed because it was considered necessary to build a bridge between the American experts and the Swedish aspirants given the cultural differences. Thus, two Swedish experts were interviewed for recommendations, and the recommendations from the Swedish experts were then compared with those of the American experts in order to make sure that the differences were not too big. It was

decided that if there was a notable discrepancy between the recommendations of the Swedish and the American experts, a thorough section about cultural differences would need to be added.

Lastly, since purposive sampling was used, the possibility to generalize the results to an entire population is limited. The reason for the purposive sampling was to get interviewees that could provide solid information on the challenges and opportunities with implementing and using AI in a business. It was not considered viable to randomly choose subjects since that would require a too large number of subjects given the limitations in time. Moreover, further challenging the generalizability is the choice of not narrowing respondents down to one industry. This was decided since AI is still a fairly immature technology, the research around it is sparse and the business application and investment in AI is unclear for Swedish SMEs. Thus, narrowing it down to one industry would create difficulties in finding companies with the right characteristics for the purpose. Moreover, given the circumstances of the pandemic COVID-19, the process of finding interviewees and conducting interviews was compromised, making it difficult to, on the other end, achieve the higher number of interviews required to represent several different industries. Table 3 illustrates titles and experiences as well as date, duration, location and interview language.

Table 3 - Interview respondents and information

Interviewee	Company	Title/Experience	Date	Duration	Location	Language
Aspirants						
Arian Ansari	Brainspot: Headhunting & recruiting	Research consultant	25/2-2020	45 min	Sweden	Swedish
Anton Johansson	Mycorena. Biotech startup	Intellectual property and finance employee	26/2-2020	45 min	Sweden	Swedish
Henrik Höjer	Nordic Water Products. Water treatment solutions company	Product development manager	26/2-2020	40 min	Sweden	Swedish
Swedish Experts						
Richard Hedman	Volvo Group	Senior Research & Technology Development Engineer. Involved in companywide AI-implementation	19/2-2020	60 min	Sweden	Swedish
Anna Andersson*	Translator*	Product manager at technology department	2/3-2020	60 min	Online	English

American experts						
Rickard Brüel Gabrielsson	AI Research Lab*	Co-founder. Building "plug-and-play" AI. Ph.D. within AI	11/3-2020	60 min	US	English
Matthew Williams*	TechGroup*	Vice President & Head of AI. 25 years' experience within high-tech management and engineering	11/3-2020	60 min	US	English
James Davis* Luke Smith*	Energica*	Enterprise Data Architect, Senior Director, Business Transformation	12/3-2020	60 min	Online	English
Lars Nilsson	SalesSource, Cloudera, Swedish Chamber of Commerce	Company founder and professional advisor to startups in Silicon Valley	12/3-2020	60 min	US	English
David Eriksson	Uber AI Labs	Senior Research Scientist & Ph.D in Machine Learning from Cornell University	13/3-2020	45 min	US	English

** Marked interviewees are given fictious names for the purpose of anonymization.*

3.3.3. Data Analysis

An iterative approach was taken in the analysis in order to be able to revisit the literature during the course of the research process. This provided an opportunity to achieve a full, relevant and comprehensive literature review, thus contributing to an analysis that is better supported. The analysis was thematic, i.e. the findings were coded, categorized and analyzed by finding patterns. This created an easier way to analyze the large amounts of data. Consequently, a thematic analysis was chosen since this is a qualitative research with a large amount of data (text) in the form of interview transcripts. Moreover, a thematic analysis focuses on examining themes and patterns of meanings in the data. (Nowell, Norris, White, & Moules, 2017). Therefore, this approach was considered appropriate since the identified themes in this research were not predetermined before the interviews were conducted, and the thematic analysis allowed for these topics to emerge.

The coding process was done in Word and Excel. The data was color-coded according to subjects (codes). A combination of predetermined codes emerging from literature, theory and the interview questions and of emerging codes that were discovered through the interviews was used. One example of a predetermined code is "internal challenges", which was found in the literature, and one example of an emerging code is "non-financial AI-effects", such as environmental sustainability which emerged during the interviews. After the data was color coded in Word, the quotes and lines of text were moved into Excel in order to create a structure and to be able to sort

the codes into wider themes. The codes constitute the foundation for the analysis; they are closely connected to the data and it is easy to see the connection between the data and the codes.

Moving the color-coded data from Word to Excel made it possible to sort the codes into themes. The themes were constructed by combining groups of codes. After this, the themes were examined, upon which some themes were merged while some continued to stand separately. When the themes were constructed, connection to the literature was examined in order to understand if more literature was needed or if it could be considered complete. Moreover, the themes were reviewed to make sure that they were coherent with each other, that they were a realistic depiction of what was said in the interviews and to make sure that they were relevant for the research questions.

It is important to state that this process might lead to losing data, since data was moved from one program to another. However, after the data was sorted into codes and themes, the original interview data was reviewed multiple times to make sure that no important information had gone missing. Also, we want to note that the coding process is subjective, which might create problems. This problem was partly mitigated by allowing the use of two codes for the same line of data, thus allowing for a higher level of complexity and decreasing the existence of one strict interpretation of each code. However, the subjectivity still risks being an issue (Bryman & Bell, 2011).

3.4. Research Quality & Limitations

In all research, prioritization and trade-offs are made, not seldom subjectively based on preferences by the authors. In this research, there are limitations. These limitations are in this section discussed and reflected upon, not to make them less important, but to increase the transparency and make sure that everything that can be done to provide an unbiased result is in fact done.

First of all, AI is defined broadly in this study, even though it is very versatile. If AI would have been defined more narrowly, e.g. concerning only one subfield, there would be a risk for confusion among the aspirants given their lack of knowledge. Also, the experts might have given advice that would be too technical for the purpose of this thesis. Thus, AI is defined broadly and includes all subcategories.

In order to mitigate the cultural differences between Sweden and the US, two Swedish experts are interviewed with the purpose of giving recommendations just like the American ones. This way, a comparison between the experts can be made, and if the recommendations are not too different, the chance is greater that the advice given by the American experts can be used by the Swedish aspirants. However, we acknowledge that the cultural differences might lead the American experts to have a different view of how easy or difficult AI is, which is a limitation of the study.

While a strong effort was put into doing the research as objectively as possible, our previous knowledge may have played a role in what was searched for during the literature collection. It is

likely that some sources are implicitly valued higher than others given personal experience with them. It is also important to remember that human biases affect the way that data is interpreted, which creates room for misinterpretations in compilation of literature. Thus, it is not argued that the literature is fully complete or perfect. There is always a risk of missing important research papers and of including studies that are imperfect. However, it has been done according to general research recommendations and it should therefore be usable at the very least.

The sampling was purposive, creating a risk for bias. The respondents were chosen based on origin and size and an email was sent to potential interviewees. In the email, it was stated that an eligible company is "a small or medium-sized Swedish company that is interested in adopting AI in their business but do not know how". This created a self-selection, forcing them to assess if they belonged to the eligible group. Thus, the sampling is skewed towards companies that are positive towards AI and this, in turn, excludes companies that could provide an understanding of why some companies are not interested in implementing AI. Moreover, even though the selection of respondents included SMEs, it is not argued that size is the main factor to why it is difficult to implement AI. We did not investigate how the industry in which the company is active affects its willingness or ability to implement AI. Lastly, the total number of interviewees was 11 and even though the industries vary, the sample cannot be considered representative to all companies.

The interview guide bears challenges in terms of replicability and subjectivity. It lies in the nature of semi-structured interviews to allow the interviewees to go off-topic as long as all topics are eventually discussed. This can lead to questions and themes being discussed in different order depending on how the interviewee responds. In turn, the order and sequence in which the themes were discussed may have affected the answers. For example, if many questions about management support were discussed and the next question was about what they believe to be most important when implementing innovations, it is likely that they will mention management support as an important factor because they have recently discussed it. An effort to decrease the occurrence of this bias is made by constantly reflecting upon the previous question when compiling the empirical result as well as the analysis. Moreover, all interviewees got the chance to approve or revise what they said during the interviews, which limits the risk of misinterpretation from our side.

In terms of the analysis, a thematic approach was used, and this entails several difficulties. The main difficulty is the complexity and the large amounts of data to process. Finding themes and repetitions in large amounts of can be time consuming and difficult, and it might be a challenge not to let personal opinions affect the interpretations. In order to make the process as effective as possible, it is important to establish a process for how to process the information in order not to get lost in the data (Bryman & Bell, 2011), which was done by following general guidelines on and also by allowing the respondents to approve the data and the analysis of it.

Traditional methods to assess the quality of research are difficult to apply to qualitative studies. For example, the external reliability is difficult since social settings change. In terms of AI, the field is constantly developing, as are opinions and feelings about it, and therefore, conducting this same study would likely not generate the same result at a later point in time. The internal reliability is challenging because it becomes a matter of interpretation, which is not necessarily the same between two or more researchers. The external validity is likely low since the results are not possible to generalize due to the small sample. The internal validity, however, can be strong as it is a measure of the coherence between observations and theories, which is inherently strong in qualitative research due to its depth (Bryman & Bell, 2011; LeCompte & Goetz, 1982).

Rather than using traditional measures, specifically developed measures for qualitative research have been used, including credibility, transferability, dependability and confirmability. To make sure that there is credibility, the research was carried out according to good practice, respondent validation was conducted, and triangulation was used. To assure transferability, thick descriptions were used, which are detailed descriptions regarding, for example, the different research methods and approaches in order to increase the possibility for the reader to assess the validity of them. The dependability is also a way to assess the trustworthiness of the research. In order to achieve this, an auditing approach was adopted. In order to allow for this, records were kept in terms of interview transcripts, research notes and descriptions of all decisions taken. Lastly, the confirmability, which is a way to assess the objectivity was challenging since a large part of the research consists of interpretation of statements. However, it has been strengthened by acting in good faith, not consciously let personal values steer the result and by using audits (Bryman & Bell, 2011; Guba & Lincoln, 1994; Lincoln & Guba, 1985).

In Figure 6, the estimated levels (1-5) of the quality is illustrated in order to increase the transparency by providing an estimation of the quality of the research. This estimation is not objective, and it is up to the reader to do their own quality assessment.

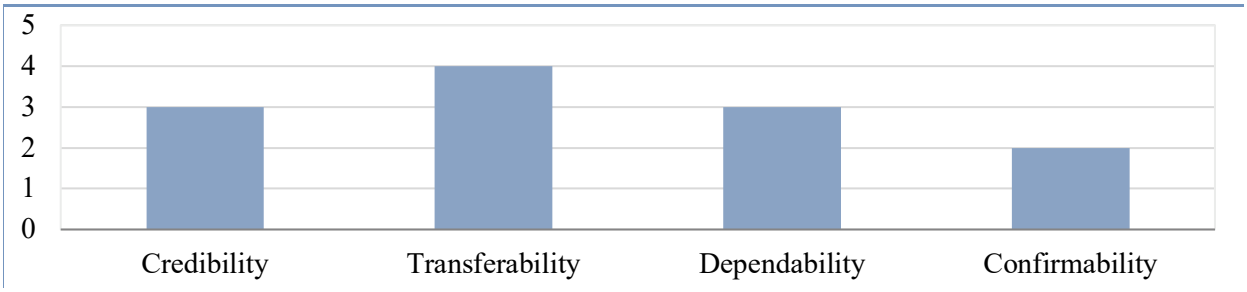

Figure 6 - Estimation of levels for quality assessment factors

4. Empirical Findings

This chapter presents the empirical findings from interviews structured into themes. The gathered data from the aspirants and the experts is divided into two different sections.

4.1. Swedish Companies – Aspirants

Below follow findings summarized from the interviews conducted with 3 Swedish SMEs, divided into 6 different themes. The themes and questions are based on literature and aim to build an understanding of attitude, readiness and obstacles in respect to AI in the interviewed companies. The interview guide can be found in Appendix 1.

4.1.1. Company Information

Brainspot is a Gothenburg-based company focusing on headhunting, but they are also active as consultants within business strategies. Their main clients are scale-ups and, traditionally, sub-suppliers to bigger headhunting firms. They help companies to find potential recruits to C-level positions, and their clients are spread over several different industries. The interview with Arian Ansari was conducted in Gothenburg on the 25th of February and lasted for 45 minutes.

Mycorena is a young start-up within the biotech industry. They produce and sell fungi protein from their sites at Ringön in Gothenburg. Currently, their customers are mainly bigger food companies and conglomerates that can use the product in their own products. The interview was conducted in Gothenburg with Anton Johansson on the 26th of February and lasted for 45 minutes.

Nordic Water Products (hereafter NWP) is a globally active, Gothenburg-based company providing water treatment solutions for drinking and sewage water, with a core competence in process engineering. Europe is their main market and the customers are producers of water treatment plants (including municipalities and industries). The 45-minute long interview was conducted with Henrik Höjer on the 26th of February.

Table 4 - Swedish company interview respondents and information

Interviewee	Title/Experience	Company information	Number of employees	Annual turnover 2018 (K SEK)
Brainspot Executive Arian Ansari	Research consultant	Headhunting & recruitment company based in Gothenburg. Founded in 2012.	3	1 950
Mycorena Anton Johansson	Intellectual property and finance	Biotech startup based in Gothenburg. Founded in 2017.	10	250
NWP Henrik Höjer	Product development manager	Water treatment solutions company in Gothenburg. Founded 1990.	200	460 000

4.1.2. Knowledge & Experience

Experience & knowledge within AI and related fields

The level of knowledge and experience within AI are similar between the aspirants. Ansari at Brainspot explains that he has limited previous experience of AI, both professionally and personally. Brainspot uses LinkedIn in their daily work, and LinkedIn, in turn, uses AI in their services that Brainspot uses. In that sense, Brainspot is an indirect AI-user. Johansson at Mycorena expresses a personal interest in AI but has no experience working with AI, and Höjer states that he has no experience or particular knowledge within AI, either professionally or personally.

In terms of experience in fields that are related or similar to AI (such as big data), the level is very limited. Ansari and Johansson express no such knowledge or experience. Höjer states that at NWP, there is a discussion about connected machines and internet of things. Höjer also explains that there are collaborations going on in different parts of the company and that one of those collaborations has an innovation focus and is conducted with two universities and another company. On top of that, NWP also has an ongoing project focused on internet of things.

View or experience of innovative projects

All aspirants express some experience and knowledge within project management at their companies. Johansson at Mycorena states that they have a supportive culture that allow employees to try new and innovative projects. However, even though the management is open to new ideas, they have become stricter in terms of how many to allow and what type of new projects they take on. The management has, over time, developed stronger requirements for the purpose of the projects to be clear and aligned with the overall business strategy. He emphasizes that innovation projects need a specific purpose and a clear goal to make sure they are relevant, because Mycorena is beyond the stage where they implement projects just because it would be interesting.

At Brainspot, a culture of innovation exists, according to Ansari. He explains that the management is supportive of innovative projects and exciting initiatives. Ansari exemplifies this openness to initiatives with a recent project that involved a new way of working with strategy decisions at companies. This project was easily and quickly adopted into the company, and the main challenge with the project was not the management but the customers. Höjer states that NWP is generally positive to innovation and conducting new projects. They have cooperated with students before in other areas, and because of that they see collaborations with students as a viable possibility to introduce AI in the company or to evaluate the opportunities.

4.1.3. Reasons to invest in AI

In general, all of the aspirants express a willingness to invest in AI or to implement it in their business. When discussing the value of AI and the reasons to invest in the technology, the answers differ somewhat between the companies, but the common theme is efficiency.

Brainspot currently does not employ any AI internally, but they are interested in exploring what AI could do for them if they developed their own AI service. Ansari discusses the possibilities of searching and sorting through potential candidates faster for their recruiting services.

Johansson at Mycorena say that the main stakeholders of Mycorena have a large interest in sustainability in regard to climate impact and their Swedish production. It would be advantageous if an AI-method could allow Mycorena to easier predict and present their emissions to their stakeholders, as well as facilitate their work with reducing emissions, and that is one of the motivating factors behind the AI-interest. Johansson says that Mycorena sees a lot of opportunities on a visual level, and most potential projects falls within the purpose of environmental and climate improvements. One of the reasons to why initiatives within AI have been of interest within the company is because of the opportunity to apply for grants and funding from Sweden's innovation agency Vinnova.

In connection to the value of AI, Höjer explains that the environmental value is one advantage that makes the project easier to sell in. Höjer explained that he has noticed a start of a tipping point in which the softer values, such as the environmental factors, of their types of solutions are gaining more weight. He says that previously, the main – and almost only – focus has been on the hard, economic factors, which makes innovation projects challenging, because they have to be motivated by an economic upside. This might be difficult if the subject is new and untested, like AI. However, this is the only challenge in regard to the management, as they are positive to projects with an environmental upside and that are right in time. In general, NWP has a positive attitude towards AI-implementation, and they are interested in what it can do for them now and in the future.

NWP is owned by a venture capitalist firm that invests in green (environmentally friendly) companies, and thus, a project that would increase the environmental sustainability would likely be appreciated and supported. However, Höjer also states that even if the owners would not be focused on green projects, he would fight for a project like AI because he believes in its future potential. He also says that they want to initiate an AI project, "not necessarily because the customers want it today, but because it needs to be implemented for the sake of our future". Höjer also argues that the strategy of NWP is highly compatible with an innovative project like the implementation of AI, provided that the right use case is identified first. Their strategy includes using as little energy and water as possible, and it is believed that AI can help NWP to do so. Moreover, the effects of AI, such as efficiency, would be highly appreciated by the customers once implemented.

Lastly, Höjer explains that what competitors do is considered important, and another strong motivation behind the interest in adopting an AI solution is to be able to strengthen the company's competitive advantage. If a competitor was to introduce an AI solution, NWP would feel a strong pressure to do the same – quickly. "The worst thing that could happen is being at a fair and seeing

that a competitor shows that they have an AI-solution", he says. He also states that it sends a message about what the company is and what it stands for, and that although he does not know for sure, he assumes that most competitors have the same mindset around this as NWP has.

4.1.4. AI Applications

The employees at Brainspot spend a large amount of time on LinkedIn, in which AI is used in the algorithms and functions. In that sense, they work with AI, but via LinkedIn. The other companies do not use AI in anyway in their daily work.

However, all of the companies have some ideas about what AI could be used for in their companies. Brainspot mainly works with recruitment to C-level positions (such as CEO, CTO, COO), and the potential AI application that they have in mind is within headhunting. It could, as mentioned, make the processes of finding potential candidates faster and smoother.

NWP considers the use of AI in order to optimize the decision making and predictions. Höjer states that they are interested in using AI to optimize, for example, flows of water in the water treatment plants, and to predict maintenance and analyze the efficiency of the plants. They are currently discussing what kind of information that they have that can be used for this purpose, and also how the connection of machines could be done. The goal would be to make the processes as efficient as possible in order to save water and be more environmentally friendly. The main reason for the interest of AI, Höjer explains, is that it is a technology that will become more and more relevant, and in order to keep up with the trend, it is important to start early.

Johansson at Mycorena considers several applications of AI-technology. One area of use that he discusses is in making the calculations of the emission of the company's production easier. Johansson also sees opportunities to streamline their production processes, and to easier predict how much output their manufacturing plants can generate.

4.1.5. Weaknesses & Challenges

Internal challenges to AI implementation

All of the companies expressed examples of internal challenges that might constitute an obstacle to successful AI-implementation. Ansari explains that the main challenges for Brainspot in terms of AI right now is both financial resources and the fact that their data – which consists of resumés of potential recruits – is owned by LinkedIn. He explains that Brainspot does not have enough financial strength to hire management consultants to evaluate a potential AI-implementation. Johansson agrees with the problem of data access and discusses the fact that the biggest challenge for Mycorena with implementing AI is the lack of relevant data. He says that an implementation of AI would have been of even more interest to Mycorena if the relevant data had been available.

Moreover, Mycorena considers themselves to be beyond the experimentation stage where they implement projects just to try new things. The intention of the projects, nowadays, has to be specific and measurable, with a clear division of responsibilities between the employees, which is difficult both in terms of time and financial resources. Ansari agrees with this and says that financial resources are restrained for Brainspot, and therefore, they do not consider themselves to have the time or money to be able to experiment just for the sake of it.

Ansari mentions the difficulty in identifying different options that exist on the market. They simply do not know exactly what solutions that exist and how they can be used. He also says that he believes that the required level of clarity of the problem (i.e. how clear a problem needs to be in order to be able to use AI as a solution) partly depends on the amount of resources that the company has. If the company has a lot of time and money, they can afford to experiment more with cases that are less clear. The time is an issue for Brainspot. The company only consists of three employees which inevitably leads to a high workload for all of them. Thus, it is difficult to free up time to focus on separate projects that is not directly connected to their daily activities. He also states that it is possible that Brainspot does not have the required type of knowledge to conduct an AI-project, or even to evaluate if and how such a project could be done. Due to this, the risk is considered too high in relation to the potential reward.

Despite the support for creativity, it is (due to the lack of resources in terms of time and money) difficult to support innovative initiatives in practice even though there is a culture of innovation in theory. Also, Ansari explains that a further challenge is to package a new project in a way that makes obvious sense to customers given that it is different from what they are used to.

Johansson believes that Mycorena lacks important knowledge about how to build an AI-model, as well as the necessary understanding of what kind of data is required in order to build a good and useful model. He stresses that Mycorena first of all needs a clear idea of what to achieve with a potential model to measure their production output. There is an uncertainty as to what the crucial parameters are, and how these would interact with each other. He also expresses uncertainty regarding the relevance of the potential measurement and if it would be used, he would want to be sure that the specific measurement is accurate and the most relevant method to use for prediction. He also highlights that Mycorena consists of a small team where Johansson says that no one has a role where such an initiative would fall naturally within their function of the company, which creates a further challenge.

Höjer states that in order for an AI-solution to work, the machines need to be connected and constantly upload data to a server. This is something that the customers typically are unwilling or unable to approve of, which constitutes a challenge. Moreover, he adds, NWP probably does not have the right knowledge to properly assess the opportunities of an AI-project. There is currently no department that has the resources to analyze incoming data. One issue is that the employees

have a lot on their plates, and thus, it could be a challenge to spare time for a project like this. Additionally, the company processes are controlled by orders, so if there is an incoming order, that needs to be prioritized. However, Höjer adds that if NWP decided to conduct an AI project, they would first make sure that the required resources could be allocated to it.

External challenges to AI implementation

As for external challenges, Ansari is doubtful that LinkedIn would let a separate AI-service borrow or buy their data, which an AI service used by Brainspot would need to do. He stresses the fact that LinkedIn is a monopolist in the market of updated employee information. There is no other place where Brainspot can get that amount of relevant data. Thus, Ansari argues that it would be very difficult to create an AI-service of their own if they do not have access to the data on LinkedIn.

Moreover, one challenge that Ansari sees with using AI in headhunting is the risk of getting a selection of potential candidates that is based on a faulty algorithm due to the fact that the technology is still immature and not able to incorporate softer values. He exemplifies with a company that used AI in their recruiting and ended up only with men because their AI identified men holding higher level positions than women. This would be destroying for Brainspot since one of their main goals is to focus on soft values and be different from the headhunters that only focuses on resumes and titles. Trying to use AI and fail due to its immaturity would be a waste of time – something that Brainspot cannot afford.

According to Höjer, the greatest challenge in implementing AI would be to convince the customers of the project. Höjer mentions one specific challenge related to the customers, and that is the customers' unwillingness or inability (due to regulations protecting the plants or sites) to share their data, which makes the collection of data difficult.

4.1.6. Ideas & Advice

Ansari and Höjer shares some ideas on how to make AI-implementation and use easier for companies like theirs. Ansari says that it would be useful to have a service that makes it possible to sort through different existing options on the market depending on the needs of the company. He says that such a service could eliminate, or at least mitigate, the challenge of not wanting to take a risk of initiating a project that might not work at all in the company. Ansari also stresses the fact that he believes it would be easier to conduct an AI project if the company had a separate department or team with the purpose to do so.

Ansari discusses that, if the resources are limited, it is probably important to have a specific purpose and goal in mind when developing and implementing AI. Meanwhile, Höjer thinks that it is necessary to start working on projects within AI even though the knowledge is not entirely there yet, just to get started.

Brainspot does not have enough financial strength to hire management consultants to evaluate a potential AI-implementation, but they have considered collaborations with universities in the area. They are open to the idea of working with students on their theses and in that way learn more about what possible applications and use cases that exists. Höjer also mentions that there have been discussions at the company about the possibility to work with university students and let them write their theses together with NWP with the purpose of investigating topics like this. This would solve both the problem of the lack of knowledge and that of time constraints among the NWP employees. Höjer is also open for the possibility to hire an external consultant, but the option with the students is more attractive to him.

4.1.7. Externalities & Future Visions

Brainspot has applied for EU-funding for one of their recent projects, but they found it tedious and time-consuming, and that has scared them off from applying for funding and grants in general. Johansson at Mycorena explains that one of their main underlying motives to their interest in AI is to be able to apply for grants and similar economic support, for example from Vinnova. Meanwhile, NWP has no experience with external initiatives similar to Vinnova's funding for AI-projects. However, NWP has a long history of collaborating with both universities, companies and municipalities in other projects, and Höjer is positive to the idea of collaborating with external parties on AI-projects as well.

Competitors are also discussed. The use of AI in the water treatment industry is very limited, if at all existent, according to Höjer. However, what competitors do is considered important, and one of the main reasons behind the interest in adopting an AI solution is to be able to strengthen a competitive advantage in the market. If a competitor was to introduce an AI solution, NWP would feel a strong pressure to do the same as fast as possible.

Key takeaways from Section 4.1.

- None of the respondents have professional experience of implementing or working with AI.
- All have knowledge in project management or of sustaining a culture of innovation.
- All aspirants show interest in implementing AI
- Implementing AI and being able to say that you are working with AI is seen as a strong competitive advantage for the future
- Two of the aspirants believe that AI is aligned with the overall strategy, especially with their environmental goals. Only one believes that AI is not compatible with their core value.
- Management is generally positive towards innovation projects if it can be motivated by environmental upsides. However, management focus a lot on economic factors, which can make innovation projects challenging.
- There is a general positivity to collaboration with external parties, such as universities.
- The aspirants state that they would like to see more successful use cases within their industries, and that it would be useful to be able to sort through existing AI-solutions.

4.2. American & Swedish Experts

Below follow the findings summarized from the semi structured interviews conducted with 8 interviewees regarded as experts, both Swedish and American. The findings are divided into 6 different themes. The themes and questions are based on literature and aimed to get a general understanding of attitude, readiness and obstacles in respect to AI as well as to get advice, solutions and mitigators to the, by the aspirants, experienced obstacles. The interview guide can be found in Appendix 2.

4.2.1. Company Information

Volvo Group is a big, Swedish company that offers transport solutions, trucks, buses, construction equipment, financial services and marine and industrial power solutions. Volvo group was founded in 1927 and has its headquarters in Gothenburg. Volvo group has production in 18 countries and are selling their products in 190 different markets, 104.000 employees and a yearly revenue of 432 billion SEK. The interview was conducted with Richard Hedman on the 19th of February in Gothenburg and it lasted for 60 minutes.

Translator is a translation service company that was founded in 1969, and now spans over 7 countries. It consists of several smaller companies and globally the company has around 400 employees. The yearly revenue for the entire Translator group was 950 million SEK in 2019. The interview with Anna Andersson was conducted on the 2nd of March over an online video call and lasted for 60 minutes.

AI Research Lab is a research lab at Stanford that has been funded to develop a commercially viable AI-solution for companies. The exact product or service is not yet developed, but the work is in progress. It has existed since the summer of 2019 and there are currently two people working with it. The interview with Rickard Brüel Gabrielsson, who is one of the co-founders and who has a PhD within AI, was conducted at Stanford University on the 11th of March and lasted for 60 minutes.

TechGroup is a multinational consulting firm with focus on technology solutions and services. TechGroup provide information technology services and business process outsourcing to companies across various industries and markets. The interview with Matthew Williams was conducted in San Mateo on the 11th of March and lasted for 60 minutes.

Energica, is an American company that invests in, and operates, renewable energy projects with wind, solar, transmission, storage and advanced energy technologies. The company has ongoing projects in the US, Canada, Japan and Mexico. There are less than 500 employees and the revenue is more than 500 million USD. The interview with Energica was conducted with James Davis and Luke Smith by a video-conference call and lasted for 60 minutes.

Lars Nilsson is active in three different organizations. First, the Swedish-American Chamber of Commerce in San Francisco & Silicon Valley, which works as a facilitator of transatlantic trade with the aim to share knowledge between Sweden and Nothern Californa and create a business-friendly environment. The other organization that he is active in is SalesSource, a business services consulting firm based in San Francisco, focused on helping technology companies with sales processes and technology integration. Lastly, he is also active in a company called TrueVentures, which is a venture capital firm. The interview with Nilsson was conducted with Lars Nilsson in San Francisco on the 12th of March and lasted for 60 minutes.

Uber is an American TaaS (transport as a service) company, founded in San Francisco in 2009, offering taxi and car-sharing services as well as food delivery and electric bikes and scooters. Uber is active in almost 800 metropolitan areas around the globe and has around 110 million users. Uber has 22.500 employees and a revenue of 4 billion USD. The interview with David Eriksson who works at Uber AI Labs took place in San Francisco on the 13th of March and lasted for 40 minutes.

Table 5 - Expert interview respondents and information

Interviewee	Title & experience	Company info	No. of employees	2018-19 revenue
Richard Hedman Volvo Group	Senior Research & Technology Development Engineer. Involved in companywide implementation of AI	Offers transport solutions, trucks, buses, construction equipment, financial services and more.	104.000	USD 41,5B
Anna Andersson* Translator*	Product manager at technology department	Translation services company based in Gothenburg.	400	USD 92M
Rickard Brüel Gabrielsson AI Research Lab*	Co-founder of AI Research Lab. MIT PhD within AI.	Research lab building "plug-and-play" AI	2	N/A
Matthew Williams* TechGroup*	Vice President & Head of AI. 25 years experience within high-tech management and engineering	Technology-focused consulting company with worldwide operations	131.500	USD 5B
James Davis* Luke Smith* Energica	(Enterprise Data Architect) Senior Director, Business Transformation	Renewable energy developer, owner and operator	<500	>USD 500M
Lars Nilsson SalesSource & TrueVentures	Founder of $1,5B company. Professional advisor to startups in Silicon Valley.	B2B advisor in sales and technology integration. Investing in startups.	2 & 50	USD 0-2M
David Eriksson Uber AI Labs	Senior Research Scientist & Ph.D. in Machine Learning from Cornell University	Transportation company offering taxi- and car sharing services by app	22.500	USD 4B

** Marked interviewees are given fictious names for the purpose of anonymization.*

4.2.2. Knowledge & Experience

Experience & knowledge within AI and related fields

The respondents have various professional experience and knowledge within AI and in fields related to AI. Gabrielsson has a BSc within math and a MSc in computer science from Stanford, he has been active in two different research teams at Stanford and he is currently working on a PhD within AI at Massachusetts Institute of Technology.

Davis is an enterprise data architect, and Smith is the senior director of business transformation at Energica. Davis has data-related experience from several different industries and is also proficient in business intelligence, data warehousing, data science, big data analytics, software engineering, product management and consulting. Smith has vast experience within leadership, for example within project planning, project management, manufacturing, operations management and engineering.

Hedman works at the Quality and Engineering-department at the Swedish automotive company Volvo Group, where he is responsible for coordinating research projects mainly within the areas of IoT, AI, analytics and Industry 4.0. Andersson works as a Product manager within technology solutions at the technology department at Translator and has 10 years of experience within digital transformation and innovation. She is involved in managing their online machine translation platform, built as a translation service operated with a Microsoft software.

Eriksson is an AI researcher and has an academic background from Cornell University from which he has obtained a PhD within AI and machine learning (ML). At Uber AI Labs, he works with optimization of ML models, which means that he improves ML models by tuning their hyperparameters. Matthew Williams is currently the Vice President & Head of AI at the multinational consulting company TechGroup. Williams has over 25 years of experience within high-tech management and engineering. Lastly, Nilsson has 25 years of sales and operations experience in the technology sector within enterprise software and selling solutions. He is currently the CEO of SalesSource, a business services consulting firm focused on helping technology companies with sales processes and technology integration.

View or experience of innovative projects

Andersson discusses the importance of taking risks within an organization. “The management’s willingness to take on risks can be vital in this type of area”, she says. Every failure and risk that is taken will give the company valuable learning experiences and insights that can be used for future projects.

At Energica, the management work actively to spur the innovative spirit within the company. Smith says that they want to push the employees to come up with viable business use cases, and

sometimes projects are supported even if there is no business case provided that it is a good opportunity to learn something instead. They are always asking "why are we not doing this?" and are constantly evaluating new projects and ideas. However, this is not a strategy that Smith recommends for smaller companies with limited resources.

4.2.3. Reasons to invest in AI

All experts express a large potential for AI and mention various reasons to invest in the technology, regardless of industry. "There are industries and companies that will benefit more from it, such as the automotive industry, but all companies and all industries can benefit in some way", Eriksson at Uber AI Labs says. Gabrielsson even sees potential for AI in companies without access to a large amount of data. He says that there are a lot of solutions out there today that are not in need of a lot of data to provide a recommendation or solution. "AI is possible to adapt to almost any situation", he says.

Eriksson exemplifies the effects that AI can have on a large company like Uber: "we have small margins but a very large volume – saving two to three cents per ride generates a huge effect". Eriksson says that "If a company creates a solution that works well, it might become very difficult to compete with them. Not only in terms of the customer experience, but also in terms of cost structures – using AI can lead to a strong competitive advantage within costs and prices". He also adds that no matter the company and its strategy, there is probably always a way to motivate the management. Advantages with using AI can always be found because the technology is so diverse. Eriksson discusses companies' willingness to invest in AI, and states that since companies in general have a profit-maximizing purpose, the management needs to be motivated by financial values in new projects such as AI.

Smith states that using AI would not directly be a way to compete, but that it would be more about generally saving resources in terms of labor and money. He also states that when it comes to consider implementing AI, size does not matter: "size is irrelevant – all companies should consider it". Gabrielsson is confident that all companies can profoundly benefit from AI in one way or another. He also says that all companies that have some sort of ambition to grow and keep operating should consider AI for their business, even if it is just for a very small and seemingly inconsequential activity.

The interviewees at Energica discuss the difficulties in prioritizing projects with less well-defined output. Energica has invested in the required knowledge for AI and they have several ideas on how to apply AI, but there are still many other projects that they can spend their time and money on which are easier to motivate as they are clearer in their purpose. Williams also discusses the topic and explains that the immaturity around the technology results in an unwillingness to invest. What is missing today is well-functioning AI cases, managers need to see successful use-cases within their own industry in order to dare to invest.

One reason to invest in AI is the many different potential use cases, Gabrielsson states. And on the topic of potential applications of AI, Gabrielsson exemplifies activities such as optimizing online reviews and advertising or making invoicing more efficient. An area that Energica has investigated is that of invoicing and, more specifically, fraud detection. They have also discussed the potential use of AI for predictive maintenance. Both Davis and Smith at Energica agree that by using ML, they can shorten response times and make problems easier to fix. Overall, the main reason that Energica states for using AI is that the internally generated data is not fully used or leveraged as of today. Smith says that "what makes me excited is that we can look backwards, but we can also use that same data to actually go forward". They aim to, with AI, solve problems that are difficult or impossible to solve manually. To this, Gabrielsson adds that "most companies have something that can be improved upon, so it is almost always possible to implement AI somewhere".

4.2.4. AI Applications

All interviewed companies work with AI at some level today. Volvo Group have a widespread application of AI today in numerous of their functions and departments. A broad range of AI-applications is used within the company, everything from predictive analytics used to predict when machines will break, to machine learning software to automation of repetitive tasks. Volvo Group has also come a long way in the development of Internet of Things, self-driving vehicles and other projects.

TechGroup have recently expanded their services with a department focused solely on solutions based on AI, the department that the interviewee Matthew Williams is in charge of. TechGroup helps customers with various management and technology solutions, and the customers have different level of previous experience within AI.

Uber is a big company, and AI lies in its core value proposition. Since Uber uses several different kinds of AI in their core offering, the experience within the company is vast.

Translator uses AI in their machine translation engine. Translator took the step towards implementing AI in their translation services a couple of years ago, and they chose to develop the model by a third party. Translator later realized that they gather a lot of own valuable customer specific data that can be used together with AI, which lead them to build their own machine translation engine that could be used on top of the already existing one. This resulted in an enhanced machine translation engine that is customized and has better output and quality.

Energica, as a company, is currently going through a lot of changes, Smith explains. The technology is constantly changing and evaluating possible applications and figuring out the best way to spend their money is a priority to the company. Smith states that Energica's AI strategy is not to develop their own technology completely, but to use a platform that they can leverage for

all the activities into which they want to incorporate AI, such as accounting, forecasting and decision making. He also says that it would be very helpful if there was some sort of guide or playbook to give to a small company to make the situation of implementing AI easier.

4.2.5. Weaknesses & Challenges

Internal challenges to AI implementation

Andersson states that an internal AI implementation requires the right type of knowledge within the company, and it takes a lot of time to develop it by yourself. These are the main reasons to why Translator decided to hire a third party to develop their AI-based translation service. A decision that later lead to internal challenges and limitations. As soon as an issue arise, or when the company wants to try something new, it becomes clear that they are dependent on an external provider, Andersson explains. She explains that, since AI is a complex area, it is difficult to improvise or solely rely on improving already existing resources within the company. An organization therefore needs to have dedicated resources, for example skilled engineers, preferably with past experience in AI, in order to successfully implement AI.

Gabrielsson agrees that it can be difficult to understand AI without prior knowledge. He says that AI is sometimes a black box between the input and the output, “You put something into the model, and you get a result without really understanding what happened”. “It is vital to know what you want the data to do, and to be able to spot patterns in the data”, Gabrielsson says. He mentions the importance of knowledge about data and the capability to make data-driven decisions several times during the interview. “I do not believe that it is necessary to have a specific problem that only AI can solve, but you do need knowledge about what AI can do. Being able to understand data is highly important if AI-implementation and use is to be successful, Gabrielsson adds. Davis, too, agrees that it takes experience and practice to understand AI, and that there is a limited amount of people who knows how to do that.

To this, Eriksson adds that for a big company, it might be easier to hire someone for the job and create internal knowledge right away, while this might be trickier for a smaller company as hiring one person might result in a big increase of the workforce. The bigger the company, the smaller the investment of hiring one new person. However, he also highlights the need of understanding how the technology and the models work. Eriksson discusses several challenges with implementing and using AI, and he states that it probably differs between small and large companies. Small companies may more easily be able to build a simple model and put it to some use, because a small company is not in need of a very advanced model.

On the topic of using external versus internal knowledge, Hedman discusses the importance of internal knowledge and stresses that even if a company choose to outsource the development of AI, they always need to have employees with a deep understanding of how it actually works in order to instruct and work closely with the developer. He also emphasizes that AI comes with a lot

of need for maintenance, “It’s not just to come up with a good application of AI and go for it, an AI-function needs a lot of maintenance as well”.

In terms of data, there are several different challenges discussed. One challenge that Smith acknowledges for smaller companies in particular is the lack of infrastructure when it comes to AI implementation. ML and algorithms are just a small part of AI, and using the technology often requires a lot of infrastructure. The lack of infrastructure and data are the two main challenges for smaller companies, he says. So, either companies need to collect data as part of their business model or they need to invest in a data scientist that can help them. This is not only needed for the implementation of AI but also for the maintenance of the data and the technology. However, he adds, it is fully possible to teach people that skill internally in the company. He also states that while it is up to each and every company to decide whether they want to develop skills internally or hire external consultants, it is important to at least have someone in the company who understands the processes and how it all works. Moreover, when it comes to the people in the organization, Smith expresses the need of having people on board. “You should have someone with experience in implementing similar projects in order to make it work”.

According to Eriksson, one of the main challenges, generally, is to achieve the right level of cleanliness and relevance in the data. Larger companies might need to have a lot of data and build a more advanced model to be able to make a difference to the company, while smaller companies can use simpler solutions. He says that “without enough data, it will be tricky”. Eriksson also states that the data needs to be structured in order to make sense and be usable, and this is of course more challenging the more data you have. He also adds that it is indeed difficult to know what clean data looks like, which makes it difficult for smaller companies or companies with limited knowledge. He also says that the main difference between working with AI in a large versus in a small company is the speed of learning and the speed of doing. The processes are generally slower in a large company since there is a predefined process for how to conduct various tasks.

Another internal challenge, that Gabrielsson mentions, is the willingness to change within the organization. “Most people and companies do not change until something hurts, and at that point it is actually already often too late”, he says. Davis explains that people in general do not like change, and how it is difficult to be open to change, so in order to try to make it easier, it is important to talk a lot to everyone that will be affected. One of the main challenges that Smith describes is to successfully motivate AI projects due to their sometimes initial lower financial returns. Gabrielsson discuss a similar problem, stating that many managers make decisions based on gut feeling, which creates a big problem since the understanding of data is important for a successful AI-implementation, and due to its novelty, the understanding of AI is still quite low.

In terms of choosing projects and motivate them to the management, Smith highlights the importance of delivering value and selecting the right projects. He says that “if we implemented

everything that sounded cool, we would have wasted a lot of money". One thing that companies really want when implementing anything novel is a success story, Smith states, and those are still limited, making it challenging to motivate such projects.

Williams does not consider the top management to be the biggest problem. He says that a common issue is that the highest-level managers are typically in favor of adopting and embracing new technology since they are measured on the company growth and profitability. The middle management, however, are generally measured on productivity, and output. Since an implementation of a new technology sometimes disrupt the current core activity, the different incentives can result in that the middle management hinder new innovative projects. He also discusses the problem with the risk of new technology cannibalizing the already existing technology, which is undesirable.

External challenges to AI implementation

In terms of external challenges concerning the implementation of AI, Andersson emphasizes difficulties regarding customers reception of new technology. "It has been a long journey, and it still is, to make a whole organization, including the technical part of the company, sales representatives and customers, to actually understand the new technology." An issue that arose was customer concerns regarding safety. Customers wanted to make sure that they understood how the company managed their data and where the data was stored.

Another external challenge concerning AI is the immaturity of the technology. Williams states that the technology is not enough well-understood and mature today. "There is definitely enough hype around AI, and people get intrigued by it, but the problem is that they do not have enough belief in the technology to invest their own money into it", he explains.

On the topic of hiring external knowledge to develop AI, Gabrielsson says that even though it is fully possible to buy an off-the-shelf AI solution, someone at the company needs to have some level of understanding of how it works if it is to be as successful as it can be. In San Francisco, there are many people with the right knowledge available, and if they are not available, many are easy to "lure over" from other companies. In Sweden, you might need to look a little longer to find the necessary knowledge. Eriksson also mentions the possibility to hire knowledge externally, but there is a risk that such an action will become expensive.

Hedman mentions the law of GDPR as one external challenge that comes with implementing AI in a business, considering that an AI-model generally is based on a large amount of data. Hedman claims that the tricky part is to make lawyers without any technical background understand the purpose, and what they are trying to accomplish with an AI-project.

4.2.6. Ideas & Advice

Ideas and advice on how to do AI

Gabrielsson explains that a lot of problems in companies can be easily solved if the data in the company is understood by the people in charge. “AI can be used for low-hanging fruits as well, which is important to remember”, he says. Moreover, he believes that basically any company could start working with AI as long as they do it in the right way and the right scale. “It is fully possible to create solutions that can bring a lot of value, and that any company could afford”, he states.

Eriksson believes that adopting AI somewhere in a company just to learn about it, without having a specific problem that needs to be solved, might be a good strategy for a startup. The main reason for this is that it is easier to receive funding if you have AI in your product or company. Eriksson also adds that it is possible to buy or lease some solutions quickly and easily. However, as soon as it is a company that is bigger than a startup, there needs to be a specific problem to solve, or at least a purpose, with the implementation. “It is vital to know what you want the data to do, and to be able to spot patterns in the data”, he says.

According to Hedman at Volvo Group, AI is too broad to “just start with”. He believes that it is better to have complex problem to solve first, and that AI could potentially be a solution to it. With that as a starting point, an organization can continue its AI-transformation, learn more about the technology and hopefully find other AI-solutions in several parts of the company. Smith and Davis also believe that it is important to have something specific in mind when implementing AI. “You need to have something that it can do for you. The technology is so exciting, so you really should find some way to use it”, Smith says.

For companies that are small and have limited resources, Smith strongly recommends investigating problem areas first. “They need to know their problem”, he says. He continues by recommending making a list of problems that AI can and cannot solve, and then list possible solutions. After that, the list can be improved by categorizing the different cases by, for example, access to data and other factors. Once you understand the algorithm, you can easily give feedback to it and be able to constantly improve it, he says. However, the main and overall recommendation that he has is to “pick your first project wisely”.

According to Hedman at Volvo Group, a successful AI-implementation needs to be managed by a designated “AI-Champion”. An AI-Champion should be someone with good insight and understanding of the business perspective of the company, have previous experience within change management and some expertise and knowledge in AI. Moreover, the AI-Champion should preferably have a good influence at a management level in the organization. Gabrielsson also discusses the need for a champion within the organization. He says: “at least one person that is convinced and that is able to convince others is needed. In general, most people probably think

that AI is a good thing, but not everyone is ready to make a change. That is why an inspiring person is needed to successfully drive the project forward and make it happen".

Moreover, Gabrielsson talks about the need of having set goals for projects like this. He does not think that it is necessary to have a separate division or a separate strategy for it, but there needs to be goals that are directed at the AI-initiative and its impacts directly. The strategy for AI or technology could be incorporated into the general business strategy, he says.

Andersson also believes that it is very important that an AI project is included and counted as one of the company's core activities. It is also essential that the project aligns with the overall business strategy. "AI projects cannot survive in an isolated part of the company, if the project is not a part of the overall company strategy, it will never be enough prioritized and completed.", Andersson explains. Eriksson agrees about the need for understanding and compatibility from the management and between the core values of the company and new technologies.

Andersson recommend companies to organize cross functional teams when developing an innovative product or technology such as AI. The development of a new product or technology can benefit from valuable insights and knowledge from team members across the organization, Andersson says. It is important to involve employees from several departments, such as sales, operations, technology and support, that can contribute with various skills from different areas. Moreover, a company needs to be in an overall good place in order to take on a project like this. She uses her current company's reorganization as an example of an environment in which it was a challenge to launch a new complex project. She also believes that a manager's role in this type of unexplored area is invaluable. An AI-transformation requires dedicated managers and great leadership.

Change management

Smith expresses the need of having people on board for this type of projects. He explains that people in general do not like change, and how it is difficult to be open to change, so in order to try to make it easier, it is important to talk a lot to everyone who will be affected. Here, he highlights the importance of personal communication by discussing the value added by the individual employee. "Do not copy and paste motivation speeches – people want to be important and if what people does matters and they feel that, they will be happy", he concludes.

"People need to be on-board with what is going on – if you are doing an initiative in which it is necessary to collect data on how people work, the employees need to embrace this and, for example, accept being filmed, wearing a microphone or having their activities logged", Gabrielsson states. He adds the fact that all companies are unique and that different companies require and are used to different types of leadership. While some companies and employees are

more used to and comfortable with a hands-on leadership, some need more hands-off style, and it is important to adapt the project to the situation, Gabrielsson says.

Andersson also emphasizes the need for support from the whole organization. She says that the chances of making a successful outcome is a lot higher if you involve employees from the whole organization. The new product or idea needs to be understood and clear to everyone in all parts of the organization. Eriksson also discusses the importance of being able to "sell" the project to the rest of the company. "There is always a way to persuade the management", Eriksson says.

Culture of innovation

Hedman at Volvo Group also emphasize how important it is to have a supportive management with a positive view of initiatives such as AI-projects. Smith and Davis also highlight the importance of having a culture of innovation, as well as the role of management.

Andersson emphasizes the importance of being aware of the cultural benefits of taking on a new innovative project. Thus, in order to spur the innovative spirit, Andersson recommend companies to try to invest in projects even without any actual proof that it will work, just to practice taking on innovative projects in general.

One general recommendation that Andersson highlights regarding new tech projects is the importance of experimentation and research within a company. "Even though it is smoother and makes more sense to develop new solutions based on already existing use cases that can be applied to current problems, you do not always know what you need until it exists.", she says. It is, however, more difficult to convince the management in investing in such projects, Andersson continues. She suggests that this type of complex projects should be presented on a very simple and basic level in order to be convincing. The easiest way to get the management on board is to boil down the project to its essence, and focus on the project's benefits and opportunities, while still showing awareness of potential risks.

Regarding data needs, Eriksson at Uber says that it is not necessarily vital to have perfect data from the start, but there needs to be some data to work with. The collection of data can be very time consuming, why it is helpful if a company already have gathered their own data when they are starting the development of AI, Williams explains. There is, however, a misconception that an AI-model needs a lot of data to function. "Some types of models do not need a big amount of data, and a company can start collecting the data that is needed", he says.

Gabrielsson highlights the need to evaluate various different use cases before deciding on exactly what to do with the technology in order for it to make sense. The general recommendation that Gabrielsson gives to small, Swedish companies with limited resources is to collect the data that is available within the company, even if it feels like it is too little or too trivial. Once the data is

collected, he says that one or a few people should just decide to look at that data for a specific amount of time every day. “Just look at it, search for a pattern, understand how the numbers depend on each other and on other parameters and try to understand what would happen if something changed”

Williams explains that it is not only the obvious areas that AI can be applied to, neither is it the “coolest” areas of AI. He therefore recommends companies to review all parts of the company as a potential problem that can be solved with AI.

Develop AI Externally

One general recommendation that Eriksson gives to smaller companies that want to get started with AI is to bring external knowledge in. If there are limited financial resources in the company, one way is to use an intern working on a PhD within AI or ML. This will suffice in terms of knowledge, especially if it is a smaller company since the requirements of the model are less intense. It will also bring the advantage of being short-term, which eliminates the concern of having to hire someone without knowing if they will really be needed in the future.

Smith also mentions one implementation approach using a third party to help with getting started. If a company is unsure of how to proceed, a consultant can be hired, and once a business case is found, a person specifically hired for that project can be hired. That way, they can evaluate the business case without necessarily having to hire a new full-time employee.

Smith emphasizes the possibility to augment an existing dataset with bought data. Energica uses a combination of their own data and data from, for example, weather forecasts. “The secret sauce to the dataset is the company-specific data”, he says. “If you are just buying all of the data, you are not unique”.

Eriksson explains that some AI models do not require very much maintenance at all, which makes it possible to initiate an AI project with the help of an external consultant (or similar) and then maintain it with the existing employees.

Eriksson states that it is possible to create a simple and working AI-solution in just a few weeks, even if it is done internally. You, of course, need to have resources in terms of knowledge and money, but it is theoretically possible to go from zero to having a working AI-model and solution to a problem within a few weeks. This is more likely in the case of smaller companies, since the requirements in terms of amount and quality are a bit lower. In order to improve an easy model and make it more efficient might then take everything from a few months to a couple of years, depending on the desired result and the available data, knowledge and other resources in the company.

4.2.7. Externalities & Future visions

External affecting factors

”Sweden and Swedish companies are fairly open to new technologies and innovations”, Gabrielsson states, and exemplifies with companies such as Klarna, Spotify and Skype, that are experienced and skilled within AI. He says that the situation in and around Silicon Valley and San Francisco can sometimes be close to hysteric and some companies just assume that they need to incorporate AI into every part of their ecosystem without really knowing why or what value it brings. He says that the situation is like an inflation of AI use. However, he adds that the access to workforce with the right type of skills is indeed an advantage of being in the Silicon Valley-area. Eriksson at Uber agrees that it is easier to find the relevant knowledge in areas like San Francisco and the Silicon Valley.

Davis explains that there are definitely people who know how to work with data. However, a competence that may be harder to find is that of being able to move data around and using data to enable things for companies. Some employees at Energica, like Davis, have been hired for their expertise within data and applications system with the purpose of managing and integrating the data in the company. Smith explains this hiring decision as an investment for the future. Currently, they put a lot of time and effort into cleaning the data to the point where they can start to use it properly in the business, and they have not started to use ML yet, but they plan on doing so as soon as they are ready

Andersson states that it was not difficult to introduce their new AI-based product to their customers, the technology behind it was already by then known by customers on a private level. The company’s competitors were already using similar technologies as well, which made the implementation easier.

At Energica, they are not very focused on what their competitors are doing or not doing. Smith does, however, think that having a team in the San Francisco area matters. “The expectation and appetite to be the best, and the belief of being able to change the world is helpful, and there is more of that here than in other areas. But realistically, as long as you have an internet connection, you can find everything that you need to get started”.

Visions and beliefs for the future

Gabrielsson believes that it is important for companies, and for the management in particular, to educate themselves within data and to learn how to make decisions based on data. This, he says, will increase the level of understanding for general data, which in turn will lead to a higher level of understanding of how an AI-model could work and what it could be useful for in the company. He also says that “just starting somewhere” might be good, because it can create an awareness of what could be done in other areas later on.

On the topic of what the future may look like for companies who choose to ignore the hype around AI, Eriksson says that such a strategy might be risky. He also believes that developing and sustaining knowledge internally will be the best option in the long run. Eriksson believes that all companies can benefit from using AI sometime in the future. Even the most local companies and the ones with little ambition to grow can benefit from AI in some way.

"The more we learn about AI, the less data is needed, and that is good because it minimizes the barrier of entry into AI for a variety of users", Gabrielsson says. Gabrielsson believes that AI will be extremely important for decision making in the future. "Companies that collect the right data and are able to use it wisely already has a great advantage in the competitive arena, and the companies that are falling behind today will likely experience problems in the future", he says.

Key takeaways from Section 4.2.

- AI is not enough well-understood and mature today, resulting in a general unwillingness to invest in it. Managers need to see successful use-cases within their own industry in order to dare to invest.
- Almost all companies can benefit from AI in some way. However, an AI-project needs to align with the overall business strategy.
- It is important for companies, and for the management in particular, to educate themselves within data and to learn how to make decisions based on data. It is difficult to evaluate and select the right AI-projects that can deliver value. Even if an AI-project is being outsourced, there is a need of understanding how the technology and the models work. A collaboration with an external developer can limit opportunities and flexibility.
- There is a difficulty in motivating AI-projects to management. One of the reasons is that new technology solutions such as AI can in an unfavorable way cannibalize already existing technology within the company.
- It is important to have a culture of innovation. The management have to be willing to take on risks. Risky projects and failure can give the company valuable learning experiences and insights that can be valuable for future projects.
- There are some challenges connected to data, such as the difficulty in achieving the right level of "cleanliness" in the data, i.e. to sort out irrelevant and non-usable data.
- The data needs vary from industry to industry, and it is common to combine internally gathered data with bought data. Smaller companies are not always in need of a very advanced model, which make the gathering of data less time consuming.
- An AI-transformation require dedicated managers and great leadership. It suggested that an AI-implementation should be managed by a designated "AI-Champion".

5. Analysis

This chapter provides a discussion and analysis of empirical findings from the interviews. It is divided into challenges and recommendations in order to provide a clear description of what the challenges for the aspirants are and how the experts, with support from the literature, may help in mitigating those challenges with their advice.

5.1. Challenges

The purpose of this section is to illustrate obstacles and challenges in terms of implementation of AI, both in regard to more general weaknesses with the technology itself and in regard to the more company specific challenges, taking into account their specific capabilities and environments.

5.1.1. Challenge no. 1: immaturity of the technology

Ansari mentions that AI is not yet developed enough to use in the sense that it is, in his belief, not possible to use soft values in algorithms, which he considers necessary for Brainspot if they are to use AI. This partly highlights the problem of new technologies – that they have not been used enough to know exactly what they can and cannot do, which is also the topic of the DOI framework. If the relative advantage of the technology is not obvious or if the complexity is too high, the adoption will be slower (E. Rogers, 1995).

Ansari's statement is supported by Williams, who talks about the immaturity around the technology and that the disbelief among companies results in an unwillingness to invest. The immaturity of AI is further highlighted in Gartner's hype cycle, showing that speech recognition is the only mature capability, leaving capabilities such as machine learning to be in the phase of disillusionment (2019). This immaturity of several parts of the AI technology creates a problem because companies investing in (and implementing) a technology need to see a success story, as explained by Smith, and for an immature technology, success stories are limited.

One example of the immaturity of the technology and the need for success stories is Ansari's example of another recruiting company that miserably failed in using AI in their recruiting. The algorithm was programmed to pick the candidate most suitable for the assignment but ended up picking only men, as men held higher positions than women in general, which the algorithm interpreted as men being more successful and, thus, better candidates. This story has made Brainspot wary about applying AI in their business model, and it is a good indication of the need for success stories of AI applications. In this case, Brainspot hesitates to implement AI partly because of this negatively associated story. If there were available success stories instead, maybe Brainspot would be more likely to take the step towards implementing AI.

The need of available success stories within industries is also explicitly expressed by experts such as Williams, who says that managers need to see successful use cases within their own industry in

order to dare to invest. Most for-profit companies are profit maximizing, and since AI is a new technology with uncertain use cases, it is difficult to motivate when compared to traditional investments or projects. The lack of use cases is a factor that, according to the DOI-framework, can hinder the development of innovations such as AI. This is partly due to the lack of observability, i.e. the degree to which the result of an innovation such as AI is visible, which needs to be high in order for the innovation to diffuse (E. Rogers, 1995). It is also due to the lack of trialability, which allows for improvements and experimentation and can thus accelerate the diffusion. If companies had easier access to use cases, it would enable them to motivate AI projects, experiment with it and apply it to solve their own company-specific problems. The lack of use cases within AI is discussed by both interviewed aspirants and experts, and they agree that more success stories would influence the development and implementation of AI positively. As long as the observability and trialability, in this case represented by the available use cases and stories, are negatively associated, the diffusion will be hindered.

All aspirants express a willingness to invest in AI. Despite this, the actual AI-investment in Nordic companies are behind that of other areas (Chui & Malhotra, 2018; Kirvelä & Lundmark, 2018; Markusson, 2018). A part of the answer to the divergence between willingness and action might be explained by the experts. Williams states that there is definitely enough hype around AI, and many leaders are intrigued by using it and by what it can achieve. However, they do not have enough belief or concrete evidence in its future success to invest their money into it. This is also mentioned in literature, stating that one fundamental problem hindering the development of AI is that Swedish entrepreneurs fail to see enough benefits with AI, and thus, the expectations on the return of investment in AI-technology are low, making the projects unprioritized (Vinnova, 2018).

In order for AI to be implemented, it needs to be able to compete with existing, more “safe” technologies when it comes to investing decisions. This is difficult as long as the observability is low. AI, or any project, needs to be motivated to the management. However, it also needs to be motivated to other internal stakeholders, to the employees and the ones whose jobs will change with the implementation, and this is where the topic of change management is important.

More or less all interviewees discuss the importance and challenges of change management within the organization, although the subject is given more weight in the interviews with the experts than with the aspirants, which might indicate that the aspirants underestimate the importance of change management when implementing AI. Gabrielsson states that people and companies do not change until something hurts, Williams says that even though many managers want to embrace new technologies, there is often a fear that it will cannibalize existing technologies or investments and Smith talks about the challenge in spending money and time on AI even though other projects are easier to motivate. This, again, creates a need to motivate AI specifically, and to make it more attractive than to continue to use and invest in existing technologies.

This relates to the theory of disrupting innovations. In the beginning of the lifecycle for a disrupting innovation, it is generally considered to have lower return on investment and being riskier, which makes incumbents in an industry less likely to invest in it. However, as the technology develops, it gains more ground and, eventually, it might have come so far in its development that companies that have adopted it early enough gain a strong competitive advantage over the companies who have not adopted it (Christensen et al., 2015). Even though it is important to note that this is not necessarily true for all new and hyped technologies, it is a relevant aspect to investigate. If a company is in an industry that is projected to be an AI compatible industry, it is probably wise to think twice before casting the investment of solely due to its lower ROI.

5.1.2. Challenge no. 2: compatibility with the company

Another problem highlighted by Ansari's statements about the immaturity of AI is the problem that companies may experience when a technology or innovation is not, seemingly, aligned with the core values of the company, which creates difficulties in motivating the implementation. This has to do with the compatibility of the technology, as explained in the DOI-framework (E. Rogers, 1995) as well as in the TOE-framework (Tornatzky et al., 1990): new technologies need to be competence-enhancing if they are to be adopted. In order for a technology to be successfully adopted, a solid use case also has to be defined, and this use case has to be aligned with the strategy of the company (Chui, 2017; Ifinedo, 2005). This is also connected to what Vinnova (2018) states: that business models will have a major impact on the development of AI. If the business model does not allow for AI to prosper – it will be difficult to succeed with it. One important thing to remember is that this might require alteration of the business model, and this can be difficult since, as explained in the literature, some organizational processes might need to be fundamentally changed in order for a new business model to be successful (Chesbrough, 2010).

While there is an importance of alignment between the AI use case and the company strategy, it is interesting to note that Gabrielsson states that using AI does not necessarily have to mean that soft values in particular are ignored, which is Ansari's concern. According to Gabrielsson, AI can even highlight soft values depending on how it is programmed. This shows how important it is that AI aspirants have the knowledge of what AI can and cannot do in order to properly assess the value of it to their specific company. If not, there is a risk that they miss out on valuable capabilities of AI simply because they are unaware of them.

5.1.3. Challenge no. 3: evaluating, developing & maintaining AI

There are indeed difficulties in evaluating AI, especially if there is not enough knowledge within the company. All of the aspirants admit to not have enough knowledge to evaluate whether AI would be a good project for them to invest in or not, which might also be a part of the reason to why AI has not yet been adopted in the aspirant companies. AI projects need to be evaluated in the same way that all investments are evaluated, often mainly financially, in order for them to make sense and be conducted. If there is not enough knowledge within the company to evaluate

and conclude whether AI is a good investment or not, it will most likely be close to impossible to motivate such an investment to the management. This is probably one of the reasons to why AI is something that the aspirants wish to implement but have not yet done – AI projects are simply not naturally prioritized when compared to traditional projects with higher financial returns.

One strategy that can be used to mitigate the challenge of evaluation due to a lack of knowledge is to hire consultants to do the evaluation. The use of consultants or other third-party experts is viewed positively by most of the interviewees, both aspirants and experts, and both Gabrielsson and Davis state that understanding AI is complex, which is why a consultant might be needed. It takes a lot of practice and experience to be good at it, they say. Thus, the use of consultants can be a good strategy since it mitigates the challenge of not having enough knowledge of AI within the company. However, Andersson discusses the risks of relying solely on an external provider. For example, when using a third party to develop and maintain an AI solution, there might be a lack of customization possibilities and of flexibility.

Gabrielsson also highlights a challenge in using a consultant or buying an off-the-shelf solution with no internal knowledge: someone in the company needs to be at least somewhat knowledgeable within AI in order to maintain and leverage the technology once it is implemented, which can be a big challenge in the aspirant companies since none of them has enough knowledge and experience within AI to maintain such a solution. The importance of having the right knowledge internally in the company is highlighted by several of our experts. In fact, Hedman at Volvo says that “even though a company choose to outsource the development of AI, they always need to have employees with a deep understanding of how it actually works in order to instruct and work closely with the developer”.

5.1.4. Challenge no. 4: lack of knowledge

The challenge of having, finding and hiring the right type of knowledge is frequently discussed during the interviews. This is connected to challenge number three, but challenge number three is mainly connected to the purely internal knowledge that would be required when evaluating, developing and maintaining an AI solution. It is concluded that without enough relevant knowledge, it will be very difficult to evaluate, develop and maintain an AI solution. All of the aspirants have very limited knowledge and experience within and around AI, both personally and professionally, which contributes to the intensification of this challenge.

However, another knowledge related challenge is that of finding and hiring people with the right type of knowledge. All of the aspirants mention the lack of knowledge to be a challenge, and the experts also discuss the importance and the challenge of this. This is interesting considering the result in some surveys stating that a vast majority of Nordic companies report having a good understanding of AI (Kirvelä et al., 2017; Kirvelä & Lundmark, 2018). This is contradicting to the findings in the data in this thesis. However, the importance and the lack of access to knowledge is

something that the Swedish Innovation Agency Vinnova confirms. According to Vinnova, one of the main challenges in the pursuit of AI in Swedish companies is the lack of people educated within areas relevant for AI (Vinnova, 2018). Thus, this stands to be a challenge for successful AI implementation.

It is also interesting to mention that, in line with the findings in this thesis, some research state that both the interest, readiness and understanding of the necessity of AI is low in Swedish companies (Svea Ekonomi, 2019; Wernberg, 2019), which speaks for the ambition that we see in the results in this thesis. This is also indicated in literature that states that one of the reasons contributing to Swedish companies' troubles of leaving the pilot stage of AI-projects is a lack of the right type of knowledge and capabilities of data in general (Kirvelä et al., 2017; Kirvelä & Lundmark, 2018; Malhotra & Chui, 2018), i.e. not only within AI but also within areas related to AI.

Several experts highlight the importance of having this type of related since it is useful in that it increases the chance of a successful AI-implementation. For example, Gabrielsson says that being able to understand how data works and what it can be used for is, according to him, vital for the use of AI. The ability to make data-driven decisions is, by the experts, considered to be a solid first step towards being able to use AI in decision making. Examples of areas related to AI include business intelligence, internet of things and big data analytics, and such experience is vast among the American respondents. It is, however, interesting to add that experiences in related fields may positively *or* negatively affect the way that companies view new projects in the future. One negative effect is exemplified by Ansari, where Brainspot refrain from applying for AI-related grants due to the complexity and tediousness they experienced when applying for EU-funding in another, previous project. In this sense, knowledge in related fields may be a disadvantage or a challenge if it has a negative association.

Even though the knowledge and experience within fields related to AI is limited among the aspirants, there are some examples of where it exists. For example, one positive effect of such knowledge is exemplified in Höjer's discussion about collaborating with students. They have done that in other areas before, which makes them believe that it can work again, in AI. Another example of a positive effect is something that Hedman at Volvo explains that Volvo Group has come a long way in areas closely connected to AI, such as Internet of Things, and he believes that this has been a contributing factor to their advancement and engagement within AI.

5.1.5. Challenge no. 5: lack of resources

Lack of time and money are frequently discussed challenges to implementing AI by all aspirants, mainly stating that they are restrained both in terms of time and money and that projects need to be financially well-motivated. Even Höjer, who considers NWP to have financial strength, mention both the time constraint and that of having to motivate projects financially as challenges.

Another resource-related challenge is connected to data. There are a lot of different challenges in terms of data, such as not having enough data, not having the right kind of data, not being able to understand data and not being able to use the data that exists. For example, Ansari discusses the problem of LinkedIn owning most of the data that Brainspot uses in their daily work, which constitutes a problem since Brainspot is unable to use this data the way they need to if they are to develop an AI solution with it. Johansson at Mycorena explains that their biggest challenge is the lack of relevant data altogether and that an implementation of AI would have been of even more interest to Mycorena if the relevant data had been available.

As mentioned in the literature, one study indicated that 20% of Swedish companies state that they lack enough resources to support data analytics internally, and 35% states a lack of access to required data (Gürdür et al., 2019), which is coherent with the findings in this thesis even though the research concerns data analytics rather than AI specifically. It is also interesting to note that this problem may be even worse for small companies than it is for bigger ones, as the resources and the amount of data that can be collected are oftentimes more limited for smaller companies.

Smith also mentions that if a company does not already gather data naturally in their business model, they might be in an industry less suited for AI, which might be worrying for some companies to hear. This is also confirmed by the literature, indicating that without enough data, development of AI is difficult (Aboelmaged, 2014; Salleh et al., 2011). However, it is important to ask: what is enough data? Some AI solutions only require small sets of data, and also, as the development of AI is moving forward, the technology is becoming more and more efficient and requires less and less data. Thus, even though the lack of data might be a problem, it is again important to look at the specific company and evaluate what amount of data is actually needed for the particular desired use case since, in some cases, the data requirements are fairly low.

5.1.6. Challenge no. 6: culture of innovation & management support

In terms of organizational factors and how to structure for an implementation of an innovation, Hedman and Andersson agree with each other that the idea of separating the implementation of AI from the rest of the organization is beneficial. That is, they believe that it is good, or even necessary, to have a separate team or division for the development and implementation of AI. The American experts consider it necessary to have at least some people dedicated to work only on the project. The difference between these two options is mainly about physical locations and how many people that are involved. When the experts say that they do not believe that an entire team or department is necessary, they mean that for some companies, one or a couple of people are enough. It all depends on how advanced and extensive the solution is.

Eriksson says that it is absolutely vital to have someone in the organization who understands the data and is able to spot patterns in the data. Hedman also states this by discussing the importance of having someone with good insight and understanding of the business perspective and change

management simultaneously as having an understanding and knowledge of AI. Andersson, Davis, Smith, Eriksson and Gabrielsson all agree with this and discuss it several times during the interviews. This can be challenging, given the fact that there is a general lack of that kind of knowledge and skill in Sweden and given the picture painted by the aspirants which illustrate an internal lack of such knowledge.

Andersson emphasizes that it is more difficult for AI projects to survive in an isolated part of the company, which makes it important to consider the balance between all teams. This is where literature and knowledge about organizational structures, specifically structures and cultures for innovation, become relevant. For example, as mentioned in the literature, having an ambidextrous organization. It is, however, a challenge for companies to change from one structure or culture to another, and it is also a challenge to pinpoint strengths and weaknesses with the current structure and culture. The aspirants generally paint a picture of a supportive environment in which innovation and thinking outside the box is encouraged. Some companies, like Brainspot, exemplifies this by recently conducted innovative projects that were fully supported from the get-go. However, one thing that all aspirants mention is a gradual increase of the required level of clarity, of compatibility with the company strategy and of economic return for new projects. However, it still remains a challenge to organize a company in a way that allows innovation to prosper, which is shown in the way that the aspirants state the problem of "motivating AI projects" due to its risky nature. It is relevant to add that the perceived complexity of AI also makes the diffusion more difficult, not least in the sense that it, too, makes it more difficult to motivate such a project to the management.

5.1.7. Challenge no. 7: external environment

It is important to keep in mind the differences between the Swedish business environment and the one in San Francisco and Silicon Valley. More or less all of the experts in the US mentioned that it is probably easier to find AI relevant knowledge in areas like San Francisco and Silicon Valley. Gabrielsson and Eriksson both argue that the access to experienced workforce indeed is an advantage of being in the Silicon Valley area and something that makes the work with AI easier. Thus, one challenge that the Swedish companies experience without being aware of it is the cultural one. This is partly shown in the difficulties in finding and hiring people with the right type of knowledge (which is a challenge confirmed by Vinnova, as mentioned earlier).

Moreover, Smith states that their location in the competitive San Francisco-area matters in more ways than easy access to skilled workforce. He emphasizes the distinctive business culture and the competitiveness that boost progress and growth in the area. Sweden's business environment might lack the competitiveness that is needed to accelerate AI development in particular. Nilsson argues that, since almost every major technology or AI company, partner and leader is located in San Francisco, there is naturally several advantages of being located there as a company. Although, he explains, that during the last couple of years, he has seen other business centers starting to rise in

cities such as Toronto and Seattle. This indicates that the physical location of a company does not have to be a problem for long and that tech hubs indeed can develop in other places, too.

One external factor that the aspirants have noted affects the perspective of innovation projects like AI is that of trends and beliefs about the future. For example, Höjer at NWP states that the main reason for their interest in AI is that it is a technology considered to become more and more relevant as time goes by. He also stresses the importance of competitors by highlighting a worst-case scenario in which a competitor presents a ready-to-use AI solution, making NWP fall behind. Moreover, he says that NWP is interested in implementing AI "not necessarily because the customers want it today, but because it needs to be implemented for the sake of our future".

Possibly, the way that companies and employees believe that a technology will develop and the role they believe it will have in the future plays a role in the decisions they make about it today. We can also note that the bigger companies are the ones who have expressed an importance of competitors and their actions (for example, NWP and Volvo). This might be because of the (often) slower rate of change that exists in bigger companies in contrast to smaller ones.

The fact that companies are affected by what happens in their external surrounding environments is not surprising, and it is also supported by the TOE-framework. The TOE framework, and specifically the environmental dimension, explains that the environmental readiness affects the technological readiness. In turn, the environmental readiness is affected by, for example, what competitors do and by governmental initiatives such as regulations, grants, funding etc. (Tornatzky et al., 1990). It is important to note that external pressure can be both fostering and hindering to the adoption of technologies (Yeh et al., 2015), which is shown by the hindering in the case of Brainspot and their negative experience in applying for EU funding and by NWP's thought of staying competitive and keeping up with what their competitors might do.

Key takeaways from Section 5.1.

- There is a general immaturity of the technology, resulting in an unwillingness to invest.
- Some aspirants experience that AI is not compatible with their overall values or strategies, which creates difficulties in motivating an implementation.
- The process of evaluating, developing and maintaining AI is often complex and require a lot of resources such as time and knowledge.
- The lack of knowledge within the companies is a big concern
- The lack of resources such as time, money and data are considered to be another barrier to implementation of AI.
- The lack of culture of innovation and support from the management makes it difficult to invest in innovative projects such as AI.
- The aspirants experience a lack of external pressure and competitiveness in Sweden, making the aspirants await competitors before making AI investments.

5.2. Recommendations

This section consists of ideas and advice on how to perform AI and how to implement it in businesses. It consists both of ideas that the aspirants have in regards to what they wish existed on the market, such as a service where one can filter AI-solutions based on their own specific needs, and of advice from the experts regarding what to think about when implementing AI for the first time. Lastly, each section is finished with adopting the recommendations to a Swedish context.

5.2.1. Learn about fields related to AI

The lack of knowledge is considered to be a barrier to the implementation of AI, both by aspirants, experts and literature. However, one way to improve a company's position in terms of knowledge within AI is to evaluate what knowledge the company has in areas that are adjacent to AI, which some of the aspirants and all of the experts do. Moreover, experts recommend AI-aspirants to learn about how data works, in areas such as big data analytics and data management, in order to easier understand possible applications of data and AI algorithms. The ability to make data-driven decisions is highlighted by the experts and is considered to be a solid first step towards being able to use AI in decision making. This advice is also consistent with research which indicates that companies with a high capacity to deal with big data and data analytics are more inclined to successfully work with AI (Narrative Science, 2016).

As mentioned under challenge number one, success stories are imperative for many companies when evaluating investments. Companies can create their own potentially successful use cases based on previous knowledge and experience within other areas. Thus, if companies examine success stories that they already have in areas that are adjacent to AI, the barrier to implementing AI might be lowered due to the realization of what successful use cases they already have achieved and ones that they could achieve in the future.

It is recommended to evaluate what knowledge that already exists within the company in fields that are related to AI. Since Swedes tend to generally have a high digitalization level, the probability may be higher that someone in the company have knowledge and interest within the area. If there is any particular interest in adjacent areas, managers are recommended to take advantage of the employee's interest, for example by including them in an AI-project or to further educate them within the area. However, lack of knowledge within AI is a widespread challenge in Sweden, and there are some things companies can do to solve it. Moreover, it is important not to let the lack of knowledge discourage the company from investing in AI.

5.2.2. Use external forces

One of the recommendations for evaluating, developing and maintaining an AI solution is to hire an external consultant. It can be highly valuable to hire someone as a first step to assess the possibilities for an AI-implementation. The AI development can also be outsourced to an external

party entirely. However, several interviewees emphasize that even if you hire an external consultant, some knowledge should exist within the company first.

The act of evaluating, developing and maintaining an AI solution inevitably requires a certain level of knowledge, which the aspirants state that they lack. Hiring someone that is an expert within data, such as a data scientist, will constitute a cost, but according to Smith at Energica, it should be considered an investment for the future as well. Using external help and relying on an external party can be a solution to it, but it also come with challenges, such as a lack of flexibility and customization. This is something that companies need to be aware of and make an informed decision on how to handle. A prioritization needs to be made that includes the desired level of internal vs. external knowledge, customization, flexibility and other factors that might be affected by relying on an external provider.

Moreover, it might be expensive, which is something that the aspirants might not be able to afford. As a solution to the limitations of using an external consultant, Smith recommend companies to just use a consultant in the beginning of a project or idea, if they are unsure of how to proceed. A consultant can help the company to evaluate if there is a valuable business case. Smith's suggestion enables an evaluation without having to hire a new full-time employee until it is known for sure what the value of AI can be for the specific company.

Eriksson also discusses advantages of using external knowledge and suggests that a company can mitigate the risk by taking time-limited help from a student within AI or ML instead of hiring an expensive consultant. Ansari and Höjer, as well as Eriksson, discuss the possibility to collaborate with universities and hire students that, for example, can conduct their degree projects in order to evaluate opportunities within AI. This would constitute a solution both to the time- and the money problem, as the company will not need to hire a new full-time employee and the cost will be lower. In conclusion, the challenge of evaluating, developing and maintaining AI can at least partially be mitigated by the use of external consultants with relevant knowledge and experience.

Smith at Energica states that for companies that do in fact have a too limited access to data, it is possible to buy general (i.e. not company specific) data and add your own data to make it unique and useful. This approach is used by Translator as well. Translator started by only using an off-the-shelf solution, but they are altering it with their own unique data to best suit their specific needs and customers. This increases the relative advantage of the technology for them as well as increases the compatibility with their company strategy. Thus, buying an off-the-shelf solution and adding just a bit of company-specific data might be a solution to the problem of lack of data. Buying or leasing can also be a solution to the problem of lack of knowledge and money, since some simpler AI-solutions can be both affordable and easy to understand, as stated by Gabrielsson and Eriksson.

5.2.3. Embrace being a smaller company

In general, there are both benefits and obstacles relating to the size of a company. Larger companies often have a slower response rate, which makes it more difficult to implement a new technology. However, they often have a higher capacity in terms of people, knowledge and finances. It is also argued that SMEs tend to be more innovative (Beliaeva et al., 2019), flexible and to have a coherent culture (Bouncken & Barwinski, 2020). These are characteristics and strengths that positively affect organizational changes, which an implementation of AI reasonably can be considered as.

Because of that, a recommendation given to AI aspirants is to utilize the benefits of being a smaller company. It is common that SME's have a higher organizational flexibility and a more coherent culture, which tend to positively affect organizations when implementing new changes. When a company wants to implement a digital change, it is suggested that managers should build a new digital identity; setting up norms, standards and values that enables and supports the new digital change. New norms and standards are easier shared and spread in SME's due to the flexibility of the organization and the smaller number of employees (Bouncken & Barwinski, 2020).

However, one of the main obstacles for a small company is the lack of qualified employees with the right skills when implementing a digital change (Bouncken & Barwinski, 2020). The challenge of insufficient resources is not mentioned by the experts until it is brought up as a question. When asked about the challenge of a lack of resources, the experts state that there are several AI solutions that are affordable and not very time consuming to implement.

Eriksson states that there are very simple AI solutions that are especially suited for small companies due to their low level of complexity. Thus, smaller companies may benefit from their size in terms of the AI model they need to develop to make a difference – Eriksson explains that the smaller the company, the less advanced the model may need to be. Therefore, the size of the company is, arguably, not as relevant as the competences within the company and as the use case and its desired level of complexity.

In terms of the challenge relating to a lack of data, Gabrielsson at AI Research Lab believes that basically any company could start working with AI as long as they do it in the right way and the right scale. He also explains that today, it is possible to develop solutions that bring a lot of value but require very little data, which is consistent with what Eriksson discussed in relation to low complexity solutions for small companies. Williams agrees that there are misconceptions about the amount of data that is needed and says that "some types of models do not need a big amount of data, and a company can easily start collecting data". Gabrielsson states that "the more we learn about AI, the less data is needed, and that is good because it minimizes the barrier into AI for a variety of users" he says. This indicates that as the AI technology develops, it becomes more efficient and requires less data. Again, this can be connected to the discussion about maturity. As

the maturity of the technology strengthens, the complexity is lowered and the relative advantage is strengthened which, in turn, increases the potential speed of diffusion (E. Rogers, 1995).

5.2.4. Promote change – designate an AI champion

According to the aspirants, there seems to be a challenge in motivating and prioritizing AI projects without having any actual proof of that it will pay off financially. As the technology gets more advanced and cutting-edge, it is harder to estimate the outcome of a potential implementation. Companies, or AI-supporters within the companies, needs to find a way to motivate AI projects other than with financial KPIs, Williams argues.

Gabrielsson suggest that an inspiring person can make it happen, and that an AI-project needs least one person that is convinced and that is able to convince others. This recommendation is also given by Chesbrough (2010), arguing that managers need to be appointed to drive the change, and they also need to be responsible for encouraging a cultural change. In relation to what Williams explains about middle managers sometimes being the resistors rather than the top managers, it might be an idea to appoint the middle managers as drivers of the change initiatives. This in order to make sure that they are involved in them. Hedman suggests that a designated "AI-champion" should manage an AI-implementation. It is desirable that the AI-champion can influence the top management in a company. Moreover, the AI-champion should preferably have experience with change management and have a good understanding and knowledge within AI. This is also supported by literature, that suggests that one or several skilled employees are required to successfully implement a digital change, and those employees plays a vital role in building norms, attitudes and ethics that supports the transformation (Bouncken & Barwinski, 2020).

Convincing customers about the effects of products and services is something that Nilsson discusses passionately, too. "If you look at all the companies that have grown prominently, it is all because of sales and marketing. Indeed, the product has to work. But people behind the companies knew how to market it". It is also highlighted in the literature about business models, stating that the same product or service may be a complete success or failure depending on the business model by which it is brought to market (Chesbrough, 2006, 2010). Thus, convincing stakeholders about the product or service by packaging it in a compelling way it of high importance. It is here that AI champions will be needed to spread engagement throughout the company.

This recommendation is about how to manage resistance. As explained in the literature, there are several ways to do this, and given the fact that every company is unique, it is difficult to give specific recommendations on how to manage resistance. However, the literature regarding this topic is vast, so if the resistance is considered to be a problem, the main recommendation is to study change management literature including, but not limited to, Kotter's (1995) model, how to leverage company culture (Chatman & Cha, 2003) and how to identify competing commitments within employees (Kegan & Lahey, 2001). Organizational theories and researchers also puts top

management support as a crucial factor for succeeding with implementation of anything that is new to the organization (Wade & Hulland, 2004; Yang et al., 2015; Zhai, 2010).

One general piece of advice on how to manage resistance is given by one of the experts with experience within the area. Smith explains that it is important to listen to and understand each and every individual in the company. Everyone who will be affected by the change needs to be heard. Oftentimes, the resistance stems from fear of the unknown, which is why information is key. Also, it is important to understand that resistance sometimes is close to irrational, which is why it is of great importance to speak to everyone in order to make sure that their reason for resistance is understood and coped with. Thus, the general recommendation that is given on how to start coping with resistance is to communicate individually with as many people as possible within the organization, and mainly those whose everyday work tasks will be affected by the change.

5.2.5. Motivate with soft factors

All of the aspirants express a willingness to invest in AI, which is one of the requirements for them to be chosen for the interviews. Reasons to why they want to implement AI varies, and many of the interviewees highlighted other than financial benefits of AI, such as environmental friendliness, elimination of repetitive tasks and overall efficiency leading to competitive advantage. Swedish companies and stakeholders generally have a large interest in sustainability (Mansson, 2016; RobecoSAM, 2019), it is therefore appropriate to emphasize the environmental benefits with using AI. Moreover, digitalization efforts are not always best measured with financial KPIs (Kotarba, 2017), which is another reason to focus on softer factors.

Höjer at NWP explains that the management's attitude towards investments has changed from a focus on hard economic factors to softer factors, such as environmental benefits. Höjer discussed the compatibility between AI-use and the ambition of NWP to use as little energy as possible, which shows that implementing AI can be motivated by environmental reasons. Moreover, their willingness is shown by the statement from Höjer about their strategy being compatible with what AI can achieve in terms of efficiency and green investments. This also goes for Mycorena, stating that some of the main stakeholders at the company has a strong sustainability interest, which increases their willingness to invest in AI. Thus, Johansson at Mycorena also express an interest in implementing AI for the sake of the environment. Johansson mentioned potential use areas such as predicting and presenting emissions of their production, and the possibility to calculate and reduce the company's emissions.

On the subject of motivating a project, it is important to remember that there are many different stakeholders that need to be motivated and persuaded. First of all, the management is often in charge of the decisions, making that a highly relevant party to get on board. However, many of the interviews highlight the need to persuade customers and employees as well.

Höjer discusses the problem of the customers potentially opposing collection of data from their water plants. Ansari also mentions this, saying that it is difficult to package a novel project in a way that makes obvious sense to customers if it is different from what they are used to. Andersson paints a similar picture, stating that customers to Translator were concerned regarding their privacy, wanting to make sure that they understood exactly how the company manages their data.

At the same time, we note that Höjer discusses the positive effects of using AI in their water plants and says that customers should appreciate the effects of it, as it is in full accordance with NWP's strategy of using as little energy as possible (and being as efficient as possible). This shows that the customers are resisting not because they disagree with what AI can do but because they are unaware of how it will work and what it will mean for them. This confirms Williams's statement regarding that AI is immature and that people do not have enough belief in the technology yet.

Next, Andersson discusses the importance of experimentation and research within a company, and she emphasizes the cultural benefits of taking on a project without knowing if the outcome will benefit the company cost-effectively. She explains that there can be valuable learning experiences and cultural outcomes of taking on unsecure projects. The statements from both Smith and Andersson indicate that profit-maximizing companies are willing to invest in projects not only for the sake of return on investment; they also view projects as a long-term investment in learning and development that can be used for future projects. This indicates that not only financial KPI's lead investment decisions, but non-financial too, just as suggested by literature.

5.2.6. Develop a culture of innovation

Andersson recommends companies to develop an innovative culture that support an implementation of AI. While this can be done by structuring the organization in an innovation-friendly structure such as the ambidextrous one, the experts put more focus on the general spirit in the company than on the formal structure. Andersson discusses the importance of taking risks within an organization. She suggests that companies should take on projects without any clear economic benefits, in order to spur the culture of innovation. Every failure and risk that is taken will give the company valuable learning experiences and insights that can be used for future projects, she says. The importance of having a culture of innovation is also discussed in the literature, suggesting that managers should build a new "digital identity", with values, norms and principles that support a digital change (Eller et al., 2020).

At Energica, Smith explains, the management sometimes support projects even if there is no proper business case, as long as it can be seen as a good opportunity to learn something new. This is a strategy that Andersson also agree on. Smith says that rather than having a management that asks, "why should we do this?" they ask, "why are we not *already* doing this?". This creates a new default, as explained in the literature, by going from developing an idea and having to motivate it to, instead, investigating as many new innovations as possible and assume that they can be done.

This way of thinking could lead to more innovations being implemented in the company since the default is to implement rather than not to implement, as indicated by earlier research.

Although Smith does not recommend this strategy to small companies due to its risk of being resource intensive, it is interesting to note its potential to increase the innovation adoption at companies. The way that these types of defaults can make companies think differently and challenge biases may lead to a greater chance that new innovations are adopted and eliminate the risk of not investing just because it is an unknown area. Even if Smith does not recommend small companies to experiment with all new innovations, it might be useful to remember that the science of defaults can nudge companies in the "right" direction.

Williams recommends all companies to review their company processes as potentially including problems that can be solved with AI. Hansson also discusses the idea of evaluating problems on the basis that AI can be a potential solution to it. He recommends companies to make a list with all problems, even the ones they believe AI cannot solve, and then list possible solutions to it. Gabrielsson explains that this type of mind set is probably more common in companies in and around the Silicon Valley-area, "some companies almost assume that they need to incorporate AI into every part of their ecosystem without really knowing why or what value it brings." As Gabrielsson suggest, this type of mentality can come with disadvantages too, but it will reasonably result in more ideas and AI-projects being implemented.

This recommendation asks companies to develop a culture of innovation by challenging dominant logics that may exist, especially in companies stuck in a success trap or in companies that suffer from strong cognitive biases in the decision-making processes. Developing a culture of innovating that allows for experimentation and that assumes a need to constantly change and adapt to the ever-changing external context is important since it creates flexibility, and a flexible organization is more likely to survive in the long run (Grant, 2016). For some companies, it may be necessary to formally re-structure while for others it will suffice to promote a spirit of innovation in the culture.

5.2.7. Understand your specific company's context

One of the main messages is that all companies can, and should, invest in AI. It is argued that most companies have something that can be improved, and because of that, it is almost always possible to implement AI somewhere since AI is a very diverse technology. Because of that, several recommendations and suggestions are presented in this report on how to take the first step to the implementation of AI. Since all companies are unique and have very different characteristics and features, the recommendations in this thesis will not be directly applicable to every individual company. It is therefore important to understand each specific company's context and adapt the recommendation to suit the situation and the market that the company is operating in.

The aspirants might need to broaden their perspective and take in inspiration from competitors, even outside of Sweden and across industries and markets in order to find innovative ways of using AI that suits their specific context. Thus, any AI solution has to be adapted to the specific company. This, again, highlights the importance of knowledge and ability to evaluate the technology and its capabilities, as mentioned in previous sections.

One example of a company-specific factor that needs to be taken into account is the business model. As stated, the business model needs to allow for AI to happen and to prosper, and according to Vinnova, the business model will play a big role in the development of AI. However, since every company's business model is unique, it is impossible to give a specific recommendation that will suit several different companies. As explained in the literature, there are many ways to evaluate and improve the current business model, including experimentation and evaluation by deconstruction (Biggart, Lacan, & Giesen, 2018; Osterwalder & Pigneur, 2010). The gist of this is to start by fully understanding the current business model and all its underlying parts and processes in order to, in the next step, be able to optimize it given the company-specific circumstances. How and by whom this evaluation and improvement should be performed lies beyond the scope of this thesis. However, much like the recommendation regarding whether to use external forces for the development of an AI solution or not, each and every company needs to evaluate their situation and resources and make a decision based on that. For example, if the company has limited knowledge within the area, it might be a good idea to get external help from a consultant or a student, depending on the financial resources available (among other factors).

Key takeaways from Section 5.2.

- It is recommended to learn about fields related to AI, such as data analytics, as this creates a general understanding of data and data management, which is a foundational part of AI.
- It is recommended to, when possible, use external forces (such as consultants and/or students within relevant fields) when the internal knowledge and capability is limited.
- Embrace being a smaller company by, for example, using easier and non-complex AI solutions that can be quickly adopted due to the higher level of flexibility that exists in smaller companies.
- Designate an AI champion that can inspire potential resistors and motivate projects
- Motivate and inspire with soft factors, e.g. environmental and social ones. It is important to lift non-financial benefits that can be equally important in the long run.
- Develop a culture of innovation that allows for experimentation and that assumes a need to constantly change and adapt to the ever-changing external context. A flexible and agile organization is more likely to survive in the long run.
- Understand your company's context. All companies have different prerequisites and possibilities, and it is important to examine them in order to fully leverage innovations

6. Conclusions

This section provides a final discussion and summarizes the findings in the empirical section and in the analysis by answering the overarching research questions through the three sub-questions. Finally, suggestion for future research and opportunities is provided.

6.1. Answering the Research Questions

How can Swedish SMEs start their AI-journey by learning from American experts?

By investigating the challenges experienced by the Swedish SMEs, recommendations provided by American experts, and then adapting the recommendations to fit a Swedish context, we created guidelines on how Swedish SMEs can start their AI-journey.

We found that it is fully possible, and maybe even advantageous, to be a small company when implementing AI since smaller companies often are more flexible in terms of change. Also, smaller companies can often use simpler solutions and, thus, succeed with a faster implementation than bigger companies. There are also several country-specific factors that enable AI implementation in Swedish companies, such as governmental support, free education and a focus on environmental value. The recommendations provided by the experts fitted surprisingly well in the Swedish context, resulting in a promising future of AI-development in Sweden.

What are the main challenges experienced by Swedish SMEs (aspirants) in terms of AI implementation?

The challenges expressed by the SMEs are confirmed by the experts. There seems to be an immaturity of AI, which creates a disbelief among companies. This results in an unwillingness to invest even though the aspirants name several reasons why they, ideally, should invest in AI. The immaturity also creates a problem since companies investing in new technologies often want to see success stories and get examples of successful use cases. This, however, is considered difficult for AI. Further, some aspirants experience that the technology is not aligned with the core values of the company, which creates difficulties in motivating the implementation internally.

The lack of knowledge is also considered to be a barrier to the implementation of AI, and this is a problem that, according to literature, many Swedish companies experience. Without knowledge, companies can not properly assess the value of AI and thus, there is a risk to miss out on valuable effects of AI simply because they are unaware. If there is not enough knowledge in the company to conclude whether AI is a good investment or not, it will be difficult to motivate it to the management. A general understanding of data is also missing in the companies. Even if an AI-project is being outsourced, there is a need of understanding how data-driven decisions and algorithms work, even if it is on a very basic level. There are a lot of challenges stated in terms of data, such as not having enough data or the right kind or quality of data. Smaller companies, like the aspirants, should take advantage of the possibility to have simple models and, for example,

start by understanding the data that they have in the company today. For smaller companies, this is often easier due to the smaller amount of data.

Resources, time and money are also frequently discussed as challenges. The aspirants state that projects need to be financially well-motivated in order to be prioritized. The problem of motivating AI projects indicates a lack of action from the management to invest in such projects. This is despite the fact that all aspirants state that there is management support for innovation. Nevertheless, having a culture of innovation and achieving managerial support is a challenge.

Lastly, the aspirants do not seem to experience external pressure such as competitiveness from other SMEs, making the aspirants await competitors before investing in AI themselves. This can be a problem, because companies rarely change unless something in their external environment tells them to do so, and many times, this external factor is competitors' actions.

Table 6 - Summary of challenges

Challenges
1. **Immaturity of the technology**
2. **Compatibility with the company**
3. **Evaluating, developing & maintaining AI**
4. **Lack of knowledge**
5. **Lack of resources**
6. **Culture of innovation & management support**
7. **External environment**

What recommendations can American experts give SMEs in terms of AI implementation?

The recommendations given by the experts are fairly broad, which is suiting for the purpose of this thesis. The recommendations include solutions to more or less all challenges experienced by the aspirants. First of all, the experts recommend the aspirants to educate themselves about areas related to AI, such as data management, since this can build foundational knowledge for the future implementation of AI. In order to learn more about AI and data management, Swedish companies can leverage the free education system that is accessible in Sweden by educating their employees without it being a matter of cost. Being able to understand data and data-related decisions is important in order to successfully implement AI.

Moreover, the experts recommend using external knowledge and competence where the internal knowledge or competence is not enough. For example, they state that it is fully possible to buy an AI solution from a third party and to add external data to that solution as long as you have some

specific data to add, too. Moreover, they state that the use of an external consultant (or student) can be beneficial when evaluating a potential AI-opportunity.

One recommendation that was more implicitly than explicitly stated is that of embracing being a small company. A few of the experts discussed the fact that it can be easier for smaller companies to develop, use and maintain an AI solution because it is often the case that smaller companies are not in need of very advanced AI solutions. The smaller the company, the less complex the AI model or solution has to be. Furthermore, small companies are often characterized with more flexibility than a large company, which can make it easier for them to quickly implement a new project. In addition to the benefits of being a small company, there are positive aspects with having a flat organization structure which is common in Sweden, such as a quicker decision-making processes and simpler coordination and communication among employees.

Many of the recommendations are connected to the culture of the company. The experts discuss the importance of having a designated AI champion that can motivate the employees. The importance of being able to motivate projects to the management is also highlighted, and one suggestion on how to do this is to use non-financial reasons. Investing in innovative projects is not always financially better than traditional projects, which is why alternative reasons have to be highlighted. Examples of one such reason is the environmental factor. AI can be environmentally beneficial in the long run since it can make processes more efficient. The environmental aspect of implementing AI might be easier for Swedish AI-aspirants to motivate projects with, since a high share of Swedish companies are working actively with environmental goals.

In general, it is considered important to have a culture of innovation, i.e. a company that allows experimenting, testing and failing. This can be done by, for example, presupposing that innovative projects should be conducted and establishing that there needs to be a good reason to why they should not be conducted. This is in contrary to companies that assume that innovative projects should not be conducted and there needs to be a reason to why they should.

Lastly, it is found that it is important to understand the specific companies' context. Some companies have more financial resources than others, some are naturally more innovative than others and some have more employees than others. All company-specific factors need to be taken into account when developing a strategy for how to implement and use AI. Even though the recommendations are fairly general, it is important to remember that they do not directly fit every single company. All in all, the recommendations should be discussed in the company and they should all be adopted to best suit the company's needs and resources.

Table 7 - Summary of recommendations

Recommendations
1. Learn about fields related to AI
2. Use external forces
3. Embrace being a smaller company
4. Designate an AI champion
5. Motivate and inspire with soft factors
6. Develop a culture of innovation
7. Understand your specific company's context

How can the recommendations be adopted in Swedish SMEs?

In terms of knowledge, the aspirants should learn about fields related to AI. Swedish companies should take advantage of the fact that most universities are public, and courses are therefore free for Swedish citizens to attend. Swedish SMEs should leverage this by letting employees educate themselves within areas connected to AI, such as data management (Vinnova, 2018). There are also free web-based courses for professionals who want to learn the basics of AI (AI Competence for Sweden, 2018)

The Swedish companies seem to have adopted an emergent and reactive strategy in which they are hesitant to act if it is not absolutely needed and clear what to do. Meanwhile, the experts have adopted an intended and proactive approach in which the question is not *why* to adopt new technologies, but rather *why not*. It seems, however, that the lack of proactive behavior towards AI in the Swedish companies is not a result of misunderstanding its potential, but rather a conflict between existing priorities and new ones – an effect of letting dominant logic decide. In order to overcome this, the Swedish companies might need to reevaluate their company culture. The company culture is considered highly important in order to succeed with an AI initiative. In order to create a culture of innovation that allows for the implementation of new technologies, companies are recommended to designate an AI champion and motivate and inspire with soft factors.

In Sweden, people are innovation- and technology friendly (Vinnova, 2018), which might make it easier to find someone willing to take the position as an AI-champion due to personal interest. Moreover, since Swedish organizations are known to be flat (Isaksson, 2008; Tuvhag, 2014; Wästberg, 2009), it might be easier to find more people willing to take on leadership roles regardless of their previous leadership experience because they are less concerned about hierarchies and traditional roles. Having an AI-champion can also be considered especially important in Swedish companies since one of the AI-related challenges stated for Swedish companies is the lack of ownership and control of AI-initiatives (Vinnova, 2018). Having a designated AI-champion with a team that is responsible for the implementation of AI-initiatives would solve this challenge.

As found, companies need to see beyond the short-term financial incentives to invest in AI-projects. When new technologies appear, they are often associated with uncertainty and a lower margin and return than existing ones (Christensen et al., 2015). This makes companies refrain from investing in them. It simply does not always make financial business sense from the start. That is why companies should focus on non-financial effects of AI, such as environmental ones. This could be especially favorable in Sweden since many Swedish companies, SMEs in particular, work actively with environmental goals (Tillväxtverket, 2016). Thus, motivating AI-projects with environmental benefits might make it easier to convince the people in the organization, as it could contribute to a higher level of goal reaching. Also, considering the future prospects of AI, companies should start evaluating the potential of AI for their companies before it is too late. This aspect is also highlighted in literature arguing that an organization is more likely to survive it if is able to quickly respond to changes in its environment (Hannan & Freeman, 1984).

As for creating a culture of innovation, which is strongly associated with experimentation and risk taking, this is something that could be easier for Swedish employees to engage in due to the strong level of societal safety-nets in the country. Arguably, safety nets can increase the willingness for individuals (and therefore for employees) to take risks. This, in turn, can lead to a higher tendency to adopt new, potentially risky, innovations (Alem & Broussard, 2013). In order for employees to dare to be fully creative and experimental, it is important that the company clearly communicates that are no bad ideas and that opportunities where idea sharing is encouraged are created, such as brainstorming sessions (Goffin & Mitchell, 2016).

The lack of resources in terms of time, money and data was considered a big challenge by the aspirants. However, while the aspirants were more worried about the technical aspects, such as data access, the experts had a stronger focus on the soft aspects of AI implementation, such as change management, leadership and organizational readiness. The aspirants' worries are justified, since data-related problems are more apparent in Sweden than in Silicon Valley. This focus is, however, not recommended since literature argue that some organizations experience difficulties starting to use AI because they focus too much on the technology factors and too little on the skills and methods needed for the actual implementation (Andrews, 2017).

According to the experts, the data issues are fairly easy to solve, even in Sweden. They argue that the real challenge lies within knowledge and infrastructure surrounding AI and its implementation. Just as found in the interviews, the literature mentions factors such as talent acquisition, in-house technology access and clear business use-cases to be both highly necessary and highly challenging (Kirvelä & Lundmark, 2018). Again, this is particularly a problem in Sweden where the lack of relevant competence is a nationwide issue. What the aspirants can do to mitigate this is to learn about fields related to AI, to use the available governmental education opportunities (which are free) and to, possibly, hire an intern within data management.

Moreover, the aspirants should change their perspective and instead see the benefits of being a smaller company. These benefits should then be combined with the advantages of the traditional Swedish business culture, which is often characterized by a flat organization structure (Isaksson, 2008; Tuvhag, 2014; Wästberg, 2009). A flat organization structure reduces the authority of high management, which tend to allow for more ideas and innovations to grow and to be shared within the company (Burns & Stalker, 1962; Daft & Becker, 1978) – a so-called bottom-up approach. Less hierarchy and shorter decision-making processes can lead to the creation of more ideas and projects and companies can act more agile. This agility is also something that is commonly found in smaller organizations, and something that should be leveraged. Moreover, as stated, smaller companies can benefit from using a simpler solution than large companies, and this is also something that should be considered. By implementing a simple solution, small companies can get several of the benefits connected to AI while avoiding some of the hassles associated with implementing an advanced solution.

It is also important that companies are aware of the environment in which they are active. In Sweden, there are several governmental resources that can be utilized by Swedish SMEs and aspirants, such as applying for funding for an ongoing AI-project or taking a free of charge course within AI (as earlier state). On the topic of external help and adopting a simpler AI solution, there are also several affordable and easy-to-apply AI-solutions that Swedish SMEs can buy and implement as a start. These plug-and-play solutions might be easier to implement in Swedish SMEs, both considering their size and flexibility, but also since Swedish companies tend to have a higher level of digitalization (Vinnova, 2018). As have been emphasized throughout this analysis, companies should both be aware of the challenges that they face due to being Swedish as well as take advantage of the strengths and benefits of being Swedish. Thoroughly understanding and examining the country-specific factors together with the company-specific factors will increase the likelihood of success in the companies' journey towards AI-implementation.

The experts have a positive attitude towards smaller companies' opportunities and potential to successfully implement AI. A message that shines through in several of the interviews is that companies who ignore it today will fall behind and probably be outrun in the near future. Markusson (2018) also state that overlooking this opportunity could pose a serious threat to any company's future competitiveness. So, Swedish SMEs may be challenged in their journey towards taking full advantage of the power of AI, but it is not an impossible mission. By examining their current capabilities within and around the field of data, using available external resources, embracing their size and their origin and developing a culture of innovation, it is possible and maybe even necessary to continue to fight for the implementation of AI in order to be competitive now and in the future.

To clarify the conclusions of this thesis, the identified recommendations have been paired with the challenges that are experienced by the Swedish SMEs in figure 7 below. The challenges and recommendations are grouped into four themes to make it easier for the aspirants to determine which specific recommendations and actions to take depending on their perceived area of challenges.

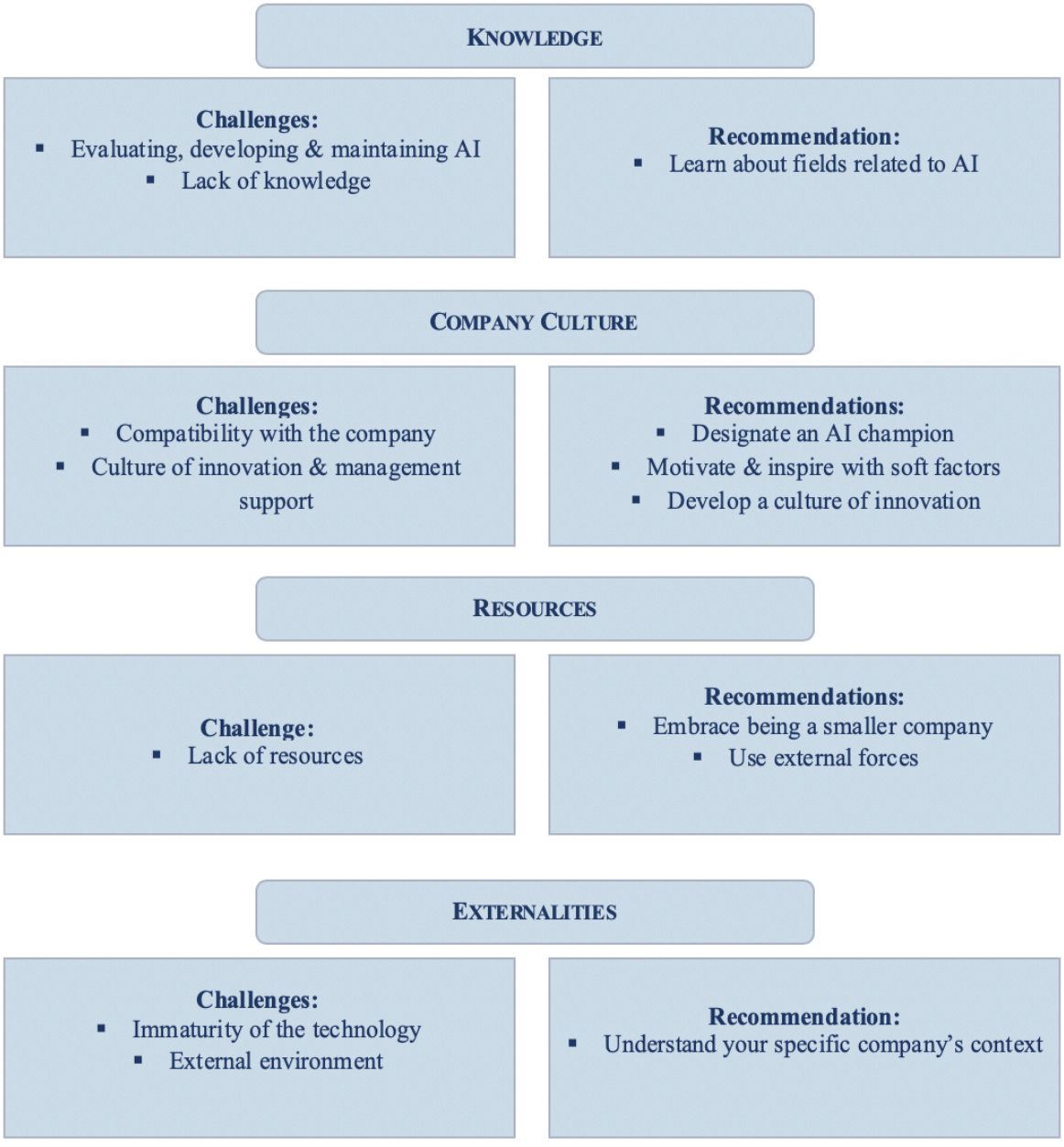

Figure 7 - The four categories of challenges and recommendations

6.2. Suggestions for future research

Our contribution to the field of organizational research and digitalization is, overall, that AI seems to be much like other innovations in that is needs to be mature in order to spread to organizations and that the more difficult it is to understand and the more "newness" it brings, the more challenging it is to implement. Implementation of innovations is a challenging task and just like all organizational change it needs to be carefully managed in order to be successful.

As for the findings, it was interesting to note that the experts were able to discuss AI and AI strategies in such a general manner considering the complexity of the topic. We found that soft organizational factors such as company culture and management support were given a lot of weight by the experts, indicating that change indeed needs to come from within the company and that more concrete factors such as access to data might not be as big problems as expected. We could conclude that the management plays a big role in implementation of new technologies. This is also generally the case for change management, which was found both during the interviews and in the literature. We also found that being a small company does not make it impossible to implement and use AI. In fact, many of the characteristics of a small company even seem to be beneficial for such implementation. Meanwhile, we do realize that more research needs to be conducted in order to fully understand the underlying factors to AI implementation and on how Sweden can reach its vision.

The utilization of AI in Swedish businesses is, as has been stated throughout this thesis, a relatively unexplored research area and there are several interesting subjects within this topic to explore. The main focus of this thesis lies on key challenges and recommendations on how to successfully implement AI. However, a suggestion for future research is to analyse different methods of conducting the actual AI-transformation in Swedish companies. It would also be interesting to investigate what challenges Swedish companies face when they go beyond the pilot stage of an AI-project and aim to scale up as well as how an AI strategy should look in order to be successful.

Moreover, this thesis has focused solely on Swedish SME's with little or any application of AI today. Additional studies might investigate how an AI-strategy should look like for companies that are bigger or to target a specific industry in order to get a more detailed result that is utilizable for a certain type of company and industry. Lastly, further studies could narrow the scope by choosing only one subfield of AI, such as ML, in order to start developing a more detailed knowledge about how to implement all different kinds of AI. Doing so might ultimately lead Sweden, and other countries, closer to utilizing everything that AI has to offer.

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Appendices

Appendix 1: Interview Guide for Aspirants

THEMES	QUESTIONS
About the company	1. Tell us about the company and what you do
AI experience & knowledge	1. Tell us about your personal and professional experience with AI-projects 2. What do you think about when you hear "AI"? 3. Do you work with AI in any way today?
AI applications	1. In what areas or activities are you interested in starting to use AI? 2. What areas or activities seems to be the most vs. the least interesting to use AI for? 3. How important do you believe that it is to have a specific problem to solve with AI before implementing it? 4. What do you think about implementing AI "just to learn a bit about it"? 5. Do you believe that AI is superior to other technologies? Why/why not?
Challenges with AI-implementation	1. What do you believe that the biggest challenges would be in implementing AI in your business?
Resources needed	1. What do you think is most important when implementing AI? Resource-wise. 2. How well equipped would you say that your company is to implement AI?
AI & company compatibility	1. In what ways is or is AI not compatible with your overall business strategy? 2. How much would the daily work change for the employees if AI was implemented? In what ways? 3. Where would the project be developed and executed? Separately or by current teams? 4. How does the integration or cooperation between employees or functions work today for projects?
General view of innovation projects	1. What is the general view of new projects and innovation within your company? 2. What is the view of the management on innovation and implementing projects? 3. Have you conducted any other innovative project that can be compared to AI-implementation? 4. If yes to Q3: what were the greatest challenges in that project? 5. If yes to Q3: how did the management show or fail to show their support? 6. Do you believe that previously conducted projects have impacted the way you think about AI-projects?
External relations (competitors & institutions)	1. How does the AI-use look in your industry? 2. Does the technology use and development in your industry affect your efforts in the area? 3. How much do you know about different institutions' initiatives (e.g. Vinnova) and regulations? 4. Does external institutions initiatives affect your work with potential AI-projects and investments?
Other topics	1. Is there anything else you would like to add that you think that we have missed?

Appendix 2: Interview Guide for Experts

THEMES	QUESTIONS
About the company	1. Tell us about the company and what you do
AI experience & knowledge	1. Tell us about your personal and professional experience with AI 2. Do you have any experience of implementing AI in companies with little to no experience of it? 3. What do you think that the greatest advantage is of AI, versus other similar technologies or human capabilities? 4. Do you believe that AI is superior to other technologies? Why?
AI applications	1. How do you work with AI today? 2. In what areas or activities/functions are you using AI? 3. What type of AI are you using today? 4. Did you develop the AI internally or are you using a 3rd party? 5. What use cases do you believe to be most vs. least suited for AI? 6. How important do you believe that it is to have a specific problem to solve with AI before implementing it? 7. What do you think are the pros and cons of implementing AI just to learn?
Challenges with AI-implementation	1. What do you believe that the biggest challenges are in terms of implementing AI? 2. How do you think that those challenges depend on company-specific factors? *(e.g. size of the company, country in which the company operates and industry in which it is active)*
Resources needed	1. What do you think is most important when implementing AI in terms of resources (*both soft and hard factors)*? 2. Should a company preferably develop AI internally or use a 3rd party? What are the main factors to consider and what are the pros and cons of each option?
AI & company compatibility	1. Do you believe that the compatibility between the company's business strategy and the AI-strategy matters? How? 2. Is it important to have a specific AI-strategy? *3.* How do you believe that AI should be developed in terms of organizational structure? *E.g. by a separate team vs. in IT?* 4. What role do you believe that integration and open communication play in conducting innovative projects in a company? 5. Do you believe that a certain company culture is needed to succeed with innovative projects? Explain.

General view of innovation projects	1. What is the general view of new projects and innovation within your company and how does it show in the daily work? 2. What is the role and importance of the management in regard to innovation and implementation of innovative projects? Motivate. 3. Do you believe that previously conducted projects have impacted the way you think about AI-projects?
External relations (competitors & institutions)	1. How does the AI-use look in your industry (and what industry would you say you are operating in)? 2. Does the technology use and development in your industry, by competitors, affect your efforts in the area? 3. How much do you believe that the external environmental aspect (i.e. being in/around Silicon Valley/SFB area) affects the technology interest and knowledge of your company? 4. Do you think that there are industries, companies and markets that are more or less suited to use AI? Which and why?
Other topics	1. When would you say that smaller companies should start to evaluate the potential of AI? Are there any "signs" to look for in the internal or external environment? 2. What general recommendations would you give to a small or medium-sized Swedish company with limited knowledge and financial resources, that is interested in implementing AI somewhere in their company? 3. Is there anything else you would like to add that you think that we have missed?