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Artificial Intelligence's Impact on Management

A literature review covering artificial intelligence's
influence on leadership skills and managerial
decision-making processes

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by

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Master of Science Thesis TRITA-ITM-EX 2020:192
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Artificiell intelligens påverkan på ledarskap

- En litteraturstudie om artificiell intelligens påverkan på ledaregenskaper och chefers beslutsprocesser

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Approved 2020-06-11	Examiner Kristina Nyström	Supervisor Johan Nordensvärd
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Abstract

This thesis aims to study how Artificial intelligence (AI) can help enhance leadership skills and managerial decision-making processes. The research will be done through a systematic literature review, reviewing articles that deem relevant and objective. The problem formulation could be described as *'the adaptation of leadership skills and managerial decision-making processes due to the implementation of AI in the workplace'*, as that has been found to be the research gap during the literature review.

The research led to the conclusions that there will occur a shift regarding leadership styles. As the harder elements of leadership will be replaced by AI, managers need to lean toward more uniquely human skills to succeed in the future, for example motivating employees and enhance creativity in the workplace. As for how the process of decision-making will change due to the implementation of AI, the study concludes that it is not fully clear how the process will change. However, the implementation of AI will enhance the speed and the accuracy of decisions being made, if AI has quality assured training data.

Keywords

Artificial intelligence, decision-making, deep learning, leadership, leadership styles, machine learning, management



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Sammanfattning

Detta examensarbete syftar till att studera hur artificiell intelligens (AI) kommer att påverka våra ledarskapsstilar samt de beslutsprocesser som är kopplade till chefskap. Undersökningen har utförts genom en litteraturstudie, där artiklar som författarna funnit objektiva samt relevanta till frågeställningen har granskats. Uppsatsen problemformulering kan förklaras som *'anpassning av ledarskapsstilar och chefers beslutsprocesser på grund av implementering av AI på arbetsplatser'*, eftersom detta har kartlagts som forskningsgapet under litteraturstudien.

Studien har lett till slutsatsen att det kommer ske ett skifte avseende vilka ledarskapsstilar som kan föredras i framtida organisationer. När de hårda elementen av ledarskap ersätts av AI behöver chefer lägga större vikt vid för människor unika färdigheter, såsom att motivera medarbetare och främja kreativitet i organisationerna. Studien drar även slutsatsen att det inte är fullt kartlagt i litteraturen hur chefers beslutsprocesser påverkas av implementeringen av AI på arbetsplatser. Implementeringen av AI kommer dock öka både hastigheten och korrektheten i de beslut som fattas, förutsatt att AI har kvalitetssäkrad träningsdata.

Nyckelord

Artificiell intelligens, beslutsfattande, chefskap, djupinlärning, ledarskap, ledarskapsstilar, maskininlärning

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Camran Djoweini & Malin Eriksson
Stockholm, 2020-05-20

1. Introduction

The introduction chapter is an introductory text that illustrates the topic covered by this thesis. The introduction starts off with a background followed by a problem formulation and purpose including the questions that the study aims to answer in its conclusion. The introductory chapter also covers delimitations and sustainability aspects before it ends with an outline of the thesis and the definitions relevant to the study.

1.1 Background

Artificial intelligence (from here on referred to as AI) is the introduction to making computers and machines think and act as human beings. During the 1800s-1900s, AI became prevalent in science fiction, but the thought of AI has over the last decades gotten closer and closer to an actual reality. It has become clear that AI at some point will replace a lot of tasks that human beings do today, possibly in a wider range than we can even consider at this moment. Although this transition of task performance from human to AI will increase the efficiency of the tasks being handled, it also gives us a new work life situation at a bigger scale to adapt to. Change is happening faster than ever, and this transition could be one of the largest technological transformations that mankind will have to adapt to. Therefore, a need to be clear on which adaptations must be made and how to do so is necessary to be able to minimize the amount of repercussions that will be experienced.

Forms of leadership can be argued to date back as far as the beginning of mankind. It has changed and adapted over time as our societies have progressed, making efficient leadership traits develop with it. It has become clear that AI will play a significant role for all organizations in the future, and it will not leave the management field intact (Brynjolfsson and McAfee, 2016). There is a need to adjust leadership skills and processes and the structure around managerial decision-making due to AI being implemented in the workplace. If used correctly, AI can be an incredibly powerful tool to help increase the efficiency of many roles, management included. This thesis aims to find out how future managers will have to adapt to these technological transitions, and it focuses on the change in the leadership role as the technological development allows AI to be a part of the workforce.

1.2 Problem formulation

With new technological advancements comes new opportunities as well as challenges. The question that remain is how businesses in the best manner can exploit the arising opportunities while dealing with the challenges. As in the case of AI, the major advancements will be made in ways data is analyzed, and it will have to be leveraged and combined with unique human leadership traits such as innovative thinking and creativity, to maximize the potential value that leaders can generate. Leaders who want to stay efficient in their organizations as AI enters the labor markets, need to be educated on how to best exercise their style of leadership and how to integrate AI in their decision-making processes to utilize its full potential.

1.2.1 State of the art

There is, as of today, no immoderate amount of research on the topic, although studies on the subject are increasing at a rapid rate. The authors have however mapped out the following six publications regarding relevant state of the art. The six sources presented in this subchapter do not form the whole basis for the literature review, but they have been found to be most relevant and close to the subject of this thesis.

Publication 1: How artificial intelligence will redefine management, by Kolbjornsrud, Amico and Thomas (2016)

Kolbjornsrud, Amico and Thomas (2016) state that 54 % of a manager's time is consumed with administrative coordination and control. They mean that AI will save them a lot of time by taking on this part of their tasks and performing it faster, better, and at a lower cost. In their article they found five practices that managers will need to master to stay successful, including (1) leaving those administrative tasks to AI, (2) put their focus on decisions and judgement work, (3) treat the software and the intelligent machines as colleagues, (4) enable design thinking and harness creativity, and (5) develop social skills and networks.

Publication 2: As AI makes more decisions, the nature of leadership will change, by Chamorro-Premuzic, Wade and Jordan (2018)

Chamorro-Premuzic, Wade and Jordan (2018) explore the concepts of hard respectively soft leadership elements and how the soft elements will be more important as AI make its way into the corporate structures. Traits such as humility, adaptability, vision and engagement will play key roles in the more agile types of leadership necessary in the future.

Publication 3: Artificial intelligence meets the C-suite, by McAfee, Goldbloom, Brynjolfsson and Howard (2014)

McAfee, Goldbloom, Brynjolfsson and Howard (2014) writes about what impact AI will have on top-management roles. They start off by presenting different past situations where AI could be argued to have outperformed humans at human tasks and continue by emphasize the importance for top managers to strengthen their creative abilities and their strategic thinking. They state that AI will be able to present answers, but top managers will need to know which the right questions are to ask.

Publication 4: 10 ways artificial intelligence is transforming management, by Heukamp and Canals (2018)

Heukamp and Canals (2018) present ten different things managers need to pay attention to regarding the future, such as an understanding of what AI will become and make sure not to become complacent, to not rely on the new technology to drive company growth, to stay educated and to build a data-ready ecosystem.

Publication 5: The essential AI handbook for leaders, by Wallenberg (2018)

Wallenberg (2018, pp.74) writes in his book that making AI and human intelligence work in tandem will be the most powerful intelligence we are able to achieve. He concludes that every current organization needs to have an AI strategy to not fall behind and that it is a business tool like any other, however more powerful. He argues that there are five steps to explore and implement to stay successful, (1) Establish basic knowledge regarding AI and its potential company-wide to excel the business, (2) list what problems as well as opportunities that AI need to address, (3) mapping out data inventory, (4) review the AI tools and platforms, and (5) continuously review the AI competence (Wallenberg 2018, pp.102).

Publication 6: What impact will artificial intelligence have on the future leadership role, by Björkman and Johansson (2018)

Björkman and Johansson (2018) explored in their master's thesis at Lunds University what expectations leaders within the technology field have on the impact of AI on their roles as leaders. They found that the leaders were expecting that their need to be adaptable and open to change would increase as well as a need to perform a higher level of transformatonal leadership. The study showed that AI performing technical tasks would increase the need for the future leader to focus on motivating employees and facilitating teamwork and creativity within the workplace.

1.2.2 Research gap

The authors believe that this Master thesis will contribute to the development of knowledge within the engineering area due to it being an entry point into understanding the effects of AI on the future leadership and management roles. It has been identified that the aspect of successful leadership traits and the managerial compulsory task of decision-making, in interface with AI, is missing from existing publications presented in the state-of-the-art above. This thesis will fill out the gap by introducing said combination to the field of study. For someone looking to gain insight and/or do research on AI's influence on society, and more specifically on how the future management decision-making processes as well as which leadership traits will be successful, this thesis will serve as a solid starting point. It will also give young engineers an insight on how to better prepare for this digital change in their future management careers.

1.3 Purpose and research questions

The purpose of the study is to identify changes related to leadership skills and managerial processes within the business community as AI is implemented in the workplace. This will be done via a literature review study. Adaptation of leadership skills and processes due to this implementation is vital for continuous success in future businesses.

The thesis aims to answer the following questions:

- What shift can we anticipate regarding the most vital skills to succeed as a leader as AI is implemented in the workplace?
- How will the process of managerial decision-making change due to the implementation of AI in the workplace?

1.4 Delimitations

AI and leadership are broad research topics which make it impossible to cover all spectra of the knowledge field. The literature review on AI and leadership provided for this degree project is therefore reduced to fit the thesis framework. It will for example not include theories on all leadership styles but only on the ones relevant for this research. The thesis takes into consideration articles and other literature written and published between 1980- 2020.

The research will lead to information enhancement with a standardized approach regarding leadership and managerial processes. The research will not take into consideration the aspect of AI taking the managerial role, but instead when human beings need to lead and manage companies and workforces with the help of AI.

The thesis is a literature study which will not include any companies or cases, neither will it conduct any interviews. Therefore, the results of this study will not be implemented in any organization by the authors. However, organizations are welcome to adapt the conclusions of this study and implement changes within their management structures themselves. The study will be conducted within the spring semester of 2020 and the limited amount of time will affect the generalizability of the findings.

The general societal effects that the implementation of AI will generate are not within the scope of this thesis. The study will not consider how many (and which) jobs will be lost due to the implementation of AI in workplaces, nor how many (or which) jobs it will create. Aspects related to this will not be analyzed.

1.5 Sustainability aspects

The Brundtland report (World Commission on Environment and Development, 1987) states that “*sustainable development is a development that meets today’s needs without compromising the ability of future generations to meet their needs*” and divides it in three dimensions; (1) social, (2) ecological, and (3) economic. The preparation of this thesis, and the increase in knowledge it will possibly generate, aims to provide the impacts linked to those three sustainability dimensions, most directly the social and the economic aspects. Sustainable leadership involves creating sustainable conditions in an organization, social in the form of a long-term take on fundamental human rights and economical in the form of combating poverty without adversely affecting social or ecological sustainability. McCann and Sweet (2014) argue that an organization can only be sustainable if it is based on an ethical culture, and that culture can only arise when leadership rests on an ethical foundation where participation is important. Organizations need to lead their employees in a sustainable way in order to be successful in their industries, whether the employees are human or AI, which is why this study aims to research the impact AI has on leadership.

1.6 Outline

This thesis consists of five main chapters presented below:

Chapter 2, Theoretical framework and literature review - In this chapter, the thesis presents literature relevant to the research subject with the intent to form a framework for the thesis topic. The chapter consists of three parts; firstly AI, secondly leadership and management, and thirdly technology's impact on leadership and management.

Chapter 3, Methodology - This chapter describes how the thesis is carried out. It contains a presentation of which research strategies have been used and why they were chosen as well as how the data was collected and analyzed. The chapter also evaluates the validity and reliability of the chosen methodology.

Chapter 4, Empirical results and analysis - This chapter presents the results of the literature review. The collected data is divided into themes relevant for answering each of the research questions. The empirical results are also evaluated and analyzed with the help of the theoretical framework.

Chapter 5, Discussion - In this chapter, the authors discuss deviations and limitations in the data collection.

Chapter 6, Conclusion - This chapter presents a conclusion to the findings and answer each research question. The chapter also presents suggestions for further research.

2. Theoretical framework and literature review

This chapter present and define theories relevant to the thesis' research problem. The presented literature has the intent to form a framework for the thesis topic, and to be able to conduct this research the authors have focused the study on theories surrounding the areas of technology and business. The framework includes, more specifically, (1) AI, (2) leadership and management and (3) the influence that the former has on the other two when implemented in the workplace. The theories in this chapter have specifically been chosen by the authors, as they can be determined to be relevant for the authors ability to conduct this thesis, and for the reader to be able to understand it.

The order of the subchapters has also been specifically decided by the authors. To be able to answer the research questions, there first needs to be an understanding of the technology used. This is to grasp its areas of use, its potential, and the opportunities that arise with its introduction. An understanding of leadership styles and traits as well as management tasks is also required. Combining the knowledge gained from these subchapters should be sufficient to give the reader the necessary tools to reflect over the results reached in the thesis and also enable them to draw their own conclusions.

2.1 Artificial intelligence

AI can be defined in many ways. In this thesis the authors have chosen to take into consideration the concepts of the English Oxford Living Dictionaries (n.d.), which defines AI as "*the theory and development of computer systems able to perform tasks normally requiring human intelligence*" as well as Merriam-Websters (2018) definition governed "*the capability of a machine to imitate intelligent human behavior*". Based on these definitions, the concept of AI refers to the introduction to making machines think and act as human beings, making it possible for the machines to perform human tasks and adapt to or interact with its surrounding environment. However, it is important to note that what we call AI changes with time as technology advances. When certain AI technologies become highly accessible to us, it is taken for granted and not called AI anymore. This is because the term AI is perceived as a *future* technology. Some of the goals of AI is learning, reasoning and perception. Using these characteristics enables AI to rationalize and take actions towards the highest probability of achieving its goal (Frankenfield, 2020). The above-mentioned characteristics gives AI enormous potential regarding problem solving. With the ability to think and act as human beings, solving problems that human beings do becomes accessible to AI. Some of the advantages of AI solving problems instead of humans, could be the elimination of human error, but also the incredible speed at which it can operate. While our biological neurons operate at about 200 Hz, modern microprocessors can operate at an absurd speed of 2,000,000,000 Hz, or to put in other words, 10 million times faster than our biological neurons (Paasschen, 2017).

To understand the power and potential in problem solving by AI compared to human beings, a comparison between AI's abilities to human beings' abilities regarding complex board games is interesting to do. A good example is the Chinese board game 'Go'. Go is believed to be more than 2500 years old and starts off with two players who take turn placing stones on a board, one player has white stones while the other has black stones and the objective of the game is to cover larger areas with your stones to collect points.

Although the rules of the game are basic, it's a quite complex game due to the number of potential moves that can be performed. In chess for instance, the player making the opening move has the possibility of making 20 different opening moves. In Go, the corresponding number of moves is 361 (Britgo.org, 2019). Google have developed an AI program able to play the game Go, called AlphaGo. AlphaGo studied the playbook of Go and taught itself how to play the game. In the fall of 2015, AlphaGo faced the current European champion of Go in a series of five games. This resulted in AlphaGo winning all five out of five games. About a year later, a revised edition of AlphaGo, called AlphaGo Master, played 60 games against different professional Go players. This resulted in a remarkable 60 out of 60 wins. This illustrates very clearly the immense potential of AI compared to human beings when it comes to solving complex problems, leading to the argument that the implementation of AI can be used to not only perform human tasks, but also doing them much better (DeepMind, 2019).

To completely grasp how AI enables computers and machines to think like human beings and perform different types of tasks, there are two terms that we need to familiarize ourselves with. Those are machine learning and deep learning, which are subsets of AI, as illustrated by figure 1 below. The two concepts are presented in the upcoming subchapter.

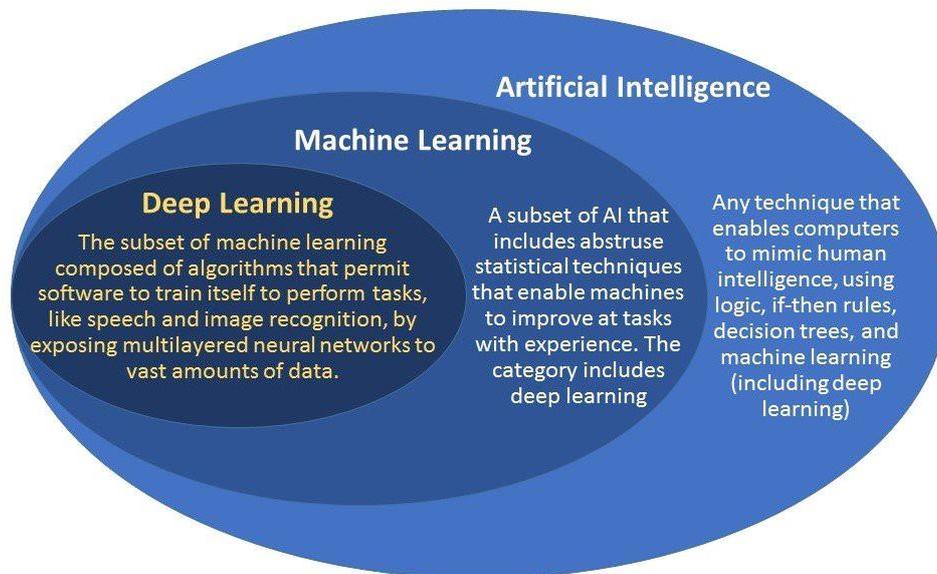


Figure 1: Venn diagram representing the relation between AI, machine learning and deep learning (Mateis, 2018, pp.1).

2.1.1 Machine Learning and deep learning

Machine learning is a study of how algorithms improve by experience. Types of issues that machine learning deal with could be for instance to collect data, analyze data, train algorithms, or use algorithms for future predictions. A common example of this could be image recognition, where algorithms analyze a subset of pictures, to decide which of the images fulfill the criteria. As the algorithms improve by experience, the more images the algorithms analyze, the more accurate it will be. Basically, with machine learning, the machine teaches/improves itself through experience. This is the same method that was used for the 'AlphaGo' program, where 'AlphaGo' taught itself to play the game of Go by basically playing a certain amount of games and learning through trial and error which moves in particular scenarios were good, and which were bad.

In general, there are two main criteria that are required for machine learning to be successful. The first is to have a lot of training data for the algorithm to learn from. Second, to have good training data. If your data is faulty, your algorithm will obviously learn off of that faulty data, and the algorithm will not be as useful or successful as desired. Most machine learning algorithms fail, and one of the main reasons is due to bad or faulty training data (Redman, 2018).

Deep learning, on the other hand, uses layers of neural networks. These layers of neural networks are inspired by the human brain. Each neuron in these networks, just like in human brains, can transmit a signal to any of the connected neurons, which in turn can transmit a signal to the other connected neurons.

One of the main differences between traditional machine learning and deep learning would be that in traditional machine learning, the algorithm is given a series of specific features to be evaluated. In deep learning however, the algorithm is given raw data and gets to decide the important features for itself. For instance, if a deep learning algorithm is made for image recognition, the algorithm will learn to identify pictures of dogs, not by specific criteria such as the dogs having fur, four legs etc. But simply from seeing the result of the image, having been tagged as either 'dog' or 'not dog'. From these tags the algorithm would decide for itself the important features that would decide if the image shows a dog or not. The amount of data given to the algorithm is highly relevant for the improvement of the deep learning network (Casey, 2019).

2.1.2 Tasks performed by artificial intelligence

AI has already made a significant impact in many companies across different industries with its implementation. Below are a few examples presented.

The Chinese giant Alibaba and American reseller Amazon use AI to display product recommendations. Important to note is that Alibaba sells more than Amazon and eBay combined, a lot thanks to its product recommendation tool. Apple is another example, who has implemented AI in many of their different products to support the smart assistant Siri. Apple Music also bases its recommendations from AI. Facebook has implemented AI in their text understanding engine, DeepText, which uses deep learning to understand the content as well as emotional sentiment of posts made on Facebook. DeepFace, which is another one of their AI projects based on deep learning, can identify yourself on photos posted on their platform. Its facial recognition abilities are said to be better than human beings'.

Baidu, which has been described as the Chinese equivalent to Google, has also implemented AI in many ways. For instance, one of their tools called Deep Voice uses deep learning for cloning voices, and only needs 3.7 seconds of audio to do so. This technology has been used in a tool that authors use when creating audio versions of their books, so you can hear the books with the author's voice (Marr, 2019).

Certain tasks that are already to an extent performed by AI today, will become even more prevalent and dominated by AI in the future. These tasks could be anything from customer service chatbots, to warehousing, to manufacturing and shopping (Cogito Tech LLC, 2019). However, there are also areas where AI aren't yet fully implemented, where it has huge potential to perform tasks much better than by their human counterparts, that we will see implemented in the future.

An example of this could be self-driving cars. The start of implementation is already seen, but not nearly as widely implemented as it will be in the future. This is an area where the implementation of AI is obvious, as the benefits of AI in the automotive industry are huge. The benefits range anywhere from increased safety due to less human errors in traffic, to cost efficiency, to reduction of traffic. A study has shown that human error is the result of 94-96% of all motor vehicle crashes (Brown, 2017). AI can drastically reduce these numbers, as computers leave no room for human errors. There will be no crashes due to drivers not being focused, drivers playing with their phones or being tired etc. All these risks will be either completely removed or majorly reduced. It would, however, be unfair to make it seem as AI is the perfect solution for all of this, as the implementation of AI in the automotive industry sets its own challenges and problems. Some of these challenges consist of ethical dilemmas, such as certain situations/accidents demanding AI to choose between the safety of its passengers or others. Questions will arise regarding whose safety should be firstly prioritized and what factors should be considered when ranking the importance of the people involved in the situation.

The above presented theories regarding AI, its subsets, areas of use, potential and challenges, are considered sufficient to give the reader the necessary level of understanding of this field to understand this thesis, and to draw their own conclusions on this matter.

2.2 Leadership and management

In this part of the theoretical review, the authors will present literature containing the leadership and management view connected to traits and tasks.

If the definition of AI is broad, the term leadership can be argued to be even broader. It can be stated to not have a universal definition, but it has instead emerged largely throughout history into endless varieties of what can be described as leadership. To find an unambiguous definition of the term leadership is therefore not easy. A commonly used one is however “*a process where a person intentionally exerts influence on other people in order to achieve a goal*” (Forslund 2016). Cohen (1990) describes the concept as “*the art of influencing others to their maximum performance to accomplish any task, objective or project*”. Theoretically, leadership can be distinguished as an informal authority exercise with personal content (Brytting 2013). Leadership is a complex social relationship whose interpretations and meanings of what is said and done are crucial. It is rarely (if not never) a leader who acts and employees who respond but rather a constant ongoing dialogue. To be a leader often means to be able to motivate and coach personnel through processes so that organizational goals are reached (Jansson and Ljung 2011). One definition of motivation is the *reason to act* which means a leader's challenge to make coworkers feel like they have a reason to act a certain way (Forslund 2016).

Whatever the purpose, a leader must always aspire to motivate her employees in an organization. This includes concepts such as anchoring, processing, and creating participation, all three of which are essential goals of leadership communication (Brytting 2013). The leadership you carry out affects the communication as well as the other way around, thus the two concepts go hand in hand. The next subchapter will discuss leadership styles and traits.

2.2.1 Leadership styles and traits

After going through leadership literature, the authors have identified eight different established leadership styles. Those are the authoritarian, the charismatic, the coaching, the delegating, the democratic, the situational, the transformative and the transactional style. The authors have selected the four leadership styles that occur most relevant to this study and will present them in this subchapter; the coaching, the situational, the transformative and the transactional style. The authoritarian style is also briefly mentioned before moving on to the traits connected to effective leadership. The leadership styles presented can be argued most relevant due to the traits they possess.

The authors will first present the coaching leadership style. Coaching has its origins in sports but interest for it has grown tremendously in the corporate sector over the past decade. Most who have studied the coaching leadership style agree that coaching is a method used to help people reach a goal (Forsslund 2013) and many believe that it aims to positively support and guide employee's development and assist them in reaching their full capacity. Instead of focusing on what is being done, the focus should be on how it is performed. Gjerde (2012) argues that the relationship between a coach and his focus person consists of an adapted and solution-focused communication process.

Different leadership styles can have different levels of effectiveness depending on the situation. Exercising a situational leadership takes this under consideration. In situational leadership, the leader adjusts her leadership to the employee level of knowledge and personal conditions. There are two different models regarding this; Hersey and Blanchard's theory suggests that the leadership should be adapted to the maturity of the group members while Fiedler's model chooses to take into account and adapt the leadership according to the situation. Hersey and Blanchard mean that at a low group maturity, an instructive and clear leadership style should be used and as group maturity increases, the leader can reduce control and switch to a more participative style with high relational orientation (Forsslund 2013). Fiedler's theory judges each situation on three criteria: (1) the relationship between the leader and the employees, (2) how structured the tasks are, and (3) the power of the leader. These three factors are weighed together and place the leader situation on a scale from advantageous to disadvantageous. A task-oriented leadership style is recommended when the leader's situation is very favorable and very disadvantageous, and between these extremes, a more relationship-oriented leadership style is recommended (Forsslund 2013). Regardless of these two models, the situational leadership style includes being aware of how you are perceived by others and utilizing that in your communication, simply adapting to the recipients. Situational leadership often means that you are coaching and good at delegating responsibilities to your employees (Jansson and Ljung 2011).

Another leadership style is the transformative one, which includes concepts such as inspirational and motivational leadership and which is characterized by personal care for the employees. This leadership style aims to satisfy higher needs and create employee commitment. Some researchers believe that the transformative leader is a role model who communicates visions and encourages creativity among employees and acts coaching based on employees' needs (Forsslund 2013). A transformative leadership is considered sustainable in the way that it requires dialogue and good listening and empathy from both the leader and the employee (Jansson and Ljung 2011).

A different type of leadership style is the transaction-based one. The transaction-based style is about acting with reward or punishment depending on how the employees perform, based on set goals and requirements. It can be related to motivating employees through positive reinforcement, giving them recognition and praise as a kind of reward when they perform at or above expectations. People who are proud of their work want to be recognized for it (DuBrin 2015). Jansson and Ljung (2011) sees it as based on a kind of transaction between the leader and employee, where one exchanges performance for reward or lack of punishment.

The leader viewed as a commander under the ideology that praises individualistic, strong and masculine characters has previously been a popular leadership style, called the authoritarian style. In recent years have, however, a demasculinization of leadership occurred, and today teamwork, networking and knowledge are perceived as more important elements (Alvesson 2015). Group cohesion is part of organizational culture and the leader can be seen as someone who exerts an influence on the culture, whether is more or less far-reaching (Alvesson 2015). Research has shown that emotions are of great importance for how individuals think and behave and that emotions transmit themselves to one another. Jansson & Ljung (2011) therefore believes that a leader can spread his feelings to his employees and thereby influence them.

Since the mid-nineteenth century research has been published regarding leadership trait perspectives. This includes three main characteristics associated with effective leadership; (1) personality traits, (2) motives, and (3) cognitive factors. DuBrin (2015) states that personality traits among effective leaders generally consist of self-confidence, humility, authenticity, trustworthiness, assertiveness, sense of humor, warmth and emotional intelligence among others. Motives also distinguish effective leaders, such as tenacity and a strong work ethic. The third characteristic contains the cognitive factors. They are more analytical and withholds conceptual thinking, knowledge of the business, insight into people and situations as well as creativity (DuBrin 2015).

In some cases, a certain type of leadership may fail precisely because it does not match the expectations and assumptions of the employees, and Alvesson (2015) means that this would lead to negative reactions. Important to remember is that the personality traits may differ depending on level of management, industry or culture. A manager might for example perform very effectively as a leader for a group of linear production workers but would be a poor fit in leading a highly educated team in a high-technology company, and vice versa. The leadership style and the personality traits of the leader should always fit the situation fairly well to be able to be effective (DuBrin 2015).

2.2.2 Management tasks and decision-making processes

Management differs from leadership since it includes activities carried out by executives, such as planning, budgeting, organizing, staffing, controlling and problem-solving (Kotter, 1990). Theoretically, management can be distinguished as a formal authority exercise and is thus defined more formally (Brytting 2013). Therefore, leadership can be defined as a person's characteristics while management is the authorities given to that person.

The primary task of a manager is to identify solutions and then act and delegate tasks to carry out those solutions. With this comes a responsibility to review the employee's collaboration with each other and the group dynamics, to find suitable working interaction and group collaboration to achieve desired results. Forslund (2013) presents that it is the employee's perception to assess if the manager is doing a good job or not. Based on this, it can be noted that there is a psychological background to management. An example of this could be whether a manager "sees" the group and its daily behavior and well-being. Traditional management is said to get things done by others through the activities of planning, organizing, monitoring and controlling (Forslund 2013).

A survey consisting of more than 1770 managers across 14 countries showed that more than half of managers' time is spent on administrative coordination and control. Kolbjornsrud, Amico and Thomas (2016) present in their article that frontline, mid-level and executive-level managers from across the globe spend 54 % of their time with those administrative tasks, they also spend around 30 % on solving problems and collaborating with coworkers. 10 % is spent on strategizing and innovations and the last piece of the pie is spent developing people and engaging with company stakeholders.

The managers in above mentioned survey also highlighted which skills they thought they would need the most to succeed as a manager in the upcoming years. The result of this survey can be seen in figure 2 below. There are three skills highlighted that are clear 'people skills', meaning things that AI cannot replace.

PERCENTAGE OF RESPONDENTS WHO SELECTED THE GIVEN SKILL AMONG THEIR TOP THREE

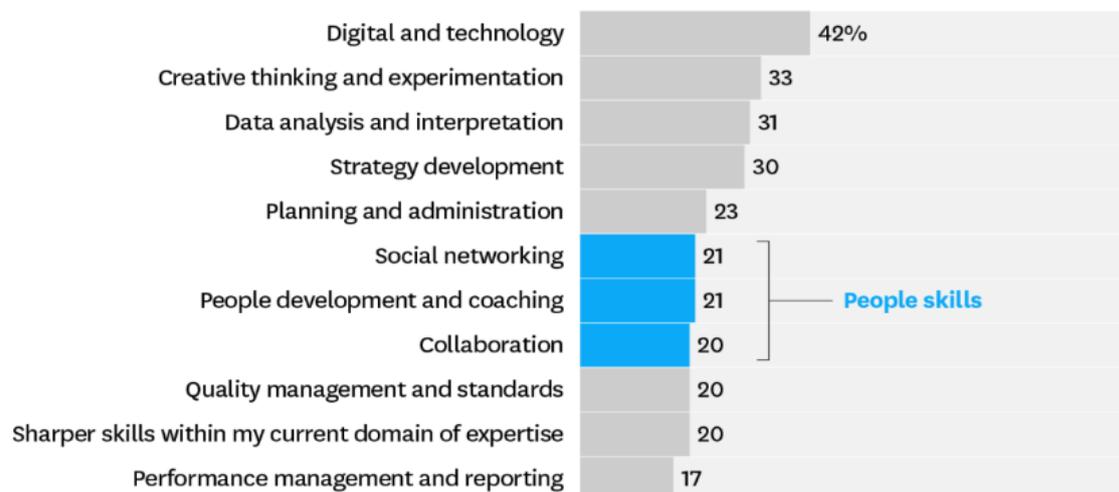


Figure 2: Skill sets that managers say they will need in the upcoming years, to succeed as leaders, in a survey of 1770 managers from 14 different countries (Kolbjornsrud, Amico, Thomas, 2016). The article presents social networking, people development and coaching and collaboration as people skills.

Many managerial tasks today are predictive, for instance hiring. AI will be better than humans regarding predictions in a foreseeable future, which make it important for managers to adapt to a new set of skills. When AI take over the prediction-based tasks, managers predictions skills will be less valuable in organizations. Agrawal, Gans and Goldfarb (2017) state that managers will instead need to develop expertise in judgement to become more valuable to the company. This include for example the ability to provide emotional support and mentor employees. Agrawal, Gans and Goldfarb (2017) argues that judgement skills will be an asset to managers in the future. By this they mean that when AI increase the rate and quality of predictions, the demand for an ability to make judgement calls will rise. In their report they present three types of skills that will be inevitable in organizations; (1) managers with ethical judgement who can make responsible decisions, (2) managers with emotional intelligence who can engage employees and customers, and (3) managers who are creative and thus can identify new opportunities for the company.

One of the managerial tasks is decision-making in the organization. Simon (1987) says this includes making them (or participating in making them), communicating them to the organization and monitor and follow up on it being carried out. The technique has advanced over the last decade because of the development of business operational tools used when making decisions.

Grafström et.al (2017) argues that decision-making in organizations can be compared to what is described as suitability logic, which means a form of situation adaption based on the company's given norms. Employees should act based on what is considered appropriate based on prevailing norms and the company's shared values. This creates legitimacy for both the company and the individuals in it. Little (2013) argues in his study that human's social competence and interaction with IT processes are two factors that highly impact the knowledge creation within a company. Abubakar et al. (2017) make the conclusion that well integrated software expedites exchange of information and thus stimulate creativity and learning within the company. This would evidently result in higher organizational performance.

Abubakar et al. (2017) talks about two different decision-making styles; the intuitive style and the rational style. The intuitive decision-making style being a sense of patterns grounded in the managers previous experience. Zander et al. (2016) describes it as unconscious and disorganized thoughts that become more organized until it reaches a threshold and conclusions can be transformed into consciousness and the article argues that this would result in higher performance for both the manager and the organization. In contrast to the intuitive style, the rational decision-making style encompass cautious and methodical thoughtfulness when considering all the alternative scenarios and probabilities before making a decision (Busari 2015).

Research has shown that many decisions within management cannot be decided by AI analyzing raw data alone. Such decisions require a deeper insight into factors such as culture and history, as well as reflection of empathy and ethics.

2.3 Technology's impact on leadership and management

In this section of the literature review, the influence that technology has had on organizational leadership throughout history is presented. This will serve as the basis in the analysis surrounding future scenarios on how AI may influence future management processes and successful leadership styles and traits.

2.3.1 Historical impact

The change related to AI that can be predicted is not the first wave of technological development that affects business and organizations. There have been significant technological innovations prior, that have shaped organizational leadership to what it is today. The industrial revolution during the 18th century is seen as the first one, called the first machine age (Brynjolfsson and McAfee, 2016). This first machine age introduced mass production to the market, and the establishment of factories and the organization and supervision it required, grounded for a new way of leading work and even led the way for management as a discipline (McAfee et al., 2014).

Brynjolfsson and McAfee (2016) describes the current technological change as the second machine age, which is being centered around computers and data. Tapscott (2014) proves that the computer and the internet enhance communication in a previously unprecedented way, which not only influence work environments but life in general. It has become easier to bring people together and share knowledge, and it is also speeding up the work pace and innovation processes. IT has since the 1990's been found as a key element for effectiveness (Abubakar et al., 2017) and has increased the organization's ability to absorb knowledge and spread communication. This improves the organization's capacity to discover and exploit opportunities as well as respond in a faster manner to changed market conditions (Su, Lin & Chen, 2015).

A shift from the harder leadership elements, such as raw processing of information, to the softer ones, such as personality traits and behaviors, have been spotted over the past 50 years. This shift towards softer leadership elements is suggesting that emotional quotient (EQ), often called emotional intelligence, is twice as important than intelligence quotient (IQ) when practicing effective leadership (Chamorro-Premuzic, Wade and Jordan, 2018).

2.3.2 The organizational change to come

The theme of implementation of AI in organizations makes the topics of organizational development and change also relevant to touch upon. The technological transition ahead will trigger organizational changes within many companies, for instance, some people will lose jobs, some roles will be replaced and people with new sets of skills will be hired. Progress within the field of technology has always had a major impact on businesses, in many cases affecting how businesses are run. These transitions always pose a new set of challenges as well as opportunities. It is the companies that make the most of these opportunities that create a bright future for themselves. Sometimes it can be smaller up-and-coming companies who end up replacing industry leading companies, for instance Netflix vs Blockbuster (Saini, 2019).

At this phase of technological development, machines can take on more intellectually demanding tasks. As previously mentioned, 54 % of a manager's time is as of today consumed with administrative coordination and control (Kolbjornsrud, Amico and Thomas, 2016), which is a task that AI will not only take over completely but also master faster, better, and at a lower cost. As technology becomes more integrated with the companies reliant on it, the work becomes more team-based and therefore social skills will be higher valued. The efficiency that technology enhances will allow leaders to put more focus on employee satisfaction (Tapscott, 2014). Kolbjornsrud, Amico and Thomas (2016) seconds that when they advise leaders to develop higher social skills. Leaders are also advised to treat software and intelligent machines as colleagues as well as harness creativity within the workforce.

A company who was an early adopter of AI, and has made major investments in AI projects, is Amazon. Amazon has AI powering three of its popular services: Amazon recommendation engine, Amazon Go Store and Alexa. The combination of these three has made Amazon lead the industry within customer experience. The usage of chatbots within their customer service segment is an example of potential changing organizational structures within companies. Back in 2013, 35 % of purchases off Amazon came from product recommendations, which clearly illustrates the power of AI and the algorithms used to display such personalized ads (Mackenzie, Meyer and Noble, 2013). Their enormous success and economic growth due to the implementation of AI has led to Amazon selling its machine-learning approach through Amazon Web Services, attracting huge customers like the NFL and NASA (Morgan, 2018).

Chamorro-Premuzic, Wade and Jordan (2018) sees no reason to believe that the development of AI will spare the management field when impacting businesses. They see it likely that AI will supplant the harder elements of leadership and also lead to higher emphasis on the softer elements. Kolbjornsrud, Amico, and Thomas (2016) present in their survey that managers recognized innovative thinking, creativity and data analysis as some of the most important skills to succeed as a manger in the future.

Julian Birkinshaw claims that the best managers are those who are good at managing trade-offs, even when facing pressure for their shareholders. This could also be described as being efficient at doing things in the present but also exploring new things for the future. Birkenshaw also claims that this is something that AI is not good at and is unlikely to become better at (Heukamp and Canals, 2018). Professor Tomo Noda explained that while planning, budgeting and organizing are tasks that AI can perform, establishing a vision, motivating people and aligning people, can only be done by humans (Heukamp and Canals, 2018).

The literature review is now described in its entirety and the authors will continue by presenting the methodology for conducting the research.

3. Methodology

The method section of the thesis is presented below. The study has a deductive approach as the authors base the research on a theoretical framework. The deductive approach is a classic scientific method and it means that the authors assume premises that can be argued to be true and based on these draw a logical conclusion about what should apply in a general situation (Burney and Saleem, 2008). The research is presenting a narrow part of literature, as these sources are considered the most relevant regarding the study’s problem formulation and purpose. Based on the theory, the authors can make predictions regarding the outcome of the research questions.

3.1 Data collection

This thesis is a qualitative research literature review study where data will be collected by reading articles and literature within the research subject. The choice of conducting the research via a literature review has been put through in order to collect the proper data and information on the chosen field of research. The aim of such a literature review is to summarize the state of the art within the chosen field of research. Doing so allowed the study to identify a ‘gap’ within this field where further research could be valuable (Rowley and Slack, 2004), thus identifying the research question for this thesis.

Conducting this thesis required us to identify the state-of-the-art literature within the field of research, understanding the terminology and theoretical concepts as well as analyzing, interpreting and drawing conclusions from the result of the literature. All of which the method of a literature review is appropriate (Rowley and Slack, 2004).

There are two main kinds of literature reviews, systematic reviews and scholastic reviews. For this thesis a systematic review is chosen. The reason for this is that a systematic review is a research report undertaken with the goal of providing evidence in support of how to make something better or more efficient. A systematic review does not result in a definite answer, but rather gives encouraging evidence for translating the result of the research into practice (Hart 2018, pp.93-99). As the research question is about the future impact of a certain technology within the organizational structure, providing a definite answer is very difficult. The result can rather be perceived as an analysis based on the state-of-the-art research to make the readers better prepared to draw conclusions as to what changes can be expected within the organizational structure due to the impact of the technological advancements. Therefore, a systematic review is considered appropriate for this thesis.

Figure 3 below illustrates the different stages of a systematic literature review. A detailed explanation will follow on how each stage of the review has been carried out.

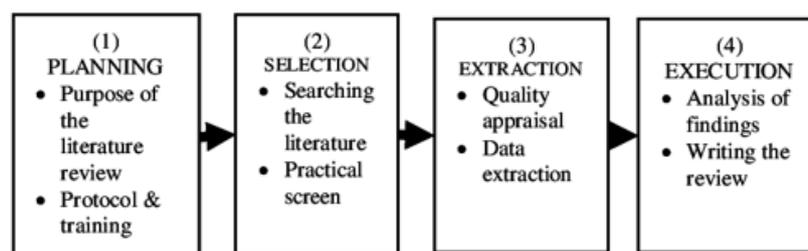


Figure 3: Stages of a systematic review according to Narayana Samy, Rahim and Ismail (2014).

During the research phase of the thesis, a large amount of academic articles, journals and literature have been scanned through to collect the proper data to conduct this research and help find the ‘gap’ within the state of the art research in this field, to define this thesis’ research question. The collected data will, through the systematic review, be weighed against certain criteria (see chapter 3.2 Data analysis) to verify the validity, reliability as well as relevance to the research question that this thesis is trying to answer.

In the research process of collecting sources to base this thesis on, Google Scholar and ResearchGate have been used to find these sources. In order to find as relevant sources as possible, searches have been made for certain keywords along with conjunctions connecting these keywords. The keywords that have been used in order to find relevant sources, are a combination of the following terms:

- Artificial intelligence
- Deep learning
- Machine learning
- Leadership
- Management
- Decision-making
- Shifting skills

The thesis relies on data from both course literature, academic journals and articles as well as online sources of information. The study has sampled 49 sources of literature within the areas of AI, leadership and management as well as combinations of the three. Out of those 49 sources, 28 have been articles found on Google Scholar or ResearchGate, which have been reviewed and analyzed in this study. To broaden the reading, course literature and suitable scientific publications from different university libraries have been supplemented with eleven non-peer reviewed articles in order to take note of the latest trends within the subject. Those articles have been deemed from reputable sources. As AI development is still in its infancy, it is relatively new in the academic genre and thus there are gaps in the range of peer reviewed research. This makes it further important to verify the claims of the sources due to the risk of presenting false information in this thesis. This risk is important to keep in mind since the field of AI is still in its early development stage. The other ten sources are course literature covering the three areas separately. The course literature was sampled to create a solid base for the research and give ponderosity in the reasoning drawn by the article review. There have been some publications suggesting which leadership styles will be preferred in the future but there have however not yet been thoroughly examined how AI will affect managerial decision-making processes. Articles surrounding that area have therefore been harder to come by during this literature review.

The conducted level of research for the theoretical concepts of AI, leadership and management has been kept on an intermediate level and explained relatively simple, to not require the reader to have an advanced background in either of those three areas.

All the steps described above, to find the right data and information, to verify its validity as well as identifying the most important literature, are appropriate methods to do a review of the literature according to Cooper and Hedges (Hart 2018).

3.2 Data analysis

The data analysis was carried out based on the research issues. To properly analyze the vast number of sources that have been collected, considering the timeframe of this thesis process, the introductions and abstracts of each source have been analyzed first. This with the purpose of narrowing down the quantity of sources to those most fitting for this study, containing the most relevant data for our research question. After the sources have been narrowed down to a smaller quantity, each source is read through thoroughly. Each source has gone through two rounds of reviews, firstly weighed against the data analysis criteria's, presented below, and then either removed or used in this thesis, based on the content's relevance to our research question.

A useful method that the authors have chosen to apply to evaluate the sources used in the thesis, is by asking a series of questions regarding every source (Research Guides, n.d.). The following questions are quite useful as per previous experience:

- Who is the author, and what are his/her previous credentials within our chosen field?
- When was the article posted? Sources must be relatively new to be considered reliable in our chosen field.
- Has the source been referenced or cited by any other credible people?
- Who is the publisher? Do they take full credibility for the published information? Do they have any sponsors?
- Are there any reasons to suspect bias in this published information? Do the publisher gain anything by favoring certain outcomes with their articles? Is there a hidden agenda?
- Are there any other reliable sources confirming the data/information presented in your source?

These questions have all been asked when reviewing each of the articles and the literature presented in the theoretical framework. In the process of analyzing the data collection, the authors have chosen to break out certain concepts which was found more interesting. These concepts are presented under the thesis chapter 4 empirical results and analysis as well as chapter 5 Discussion, in the form of the three tables introduced below. The tables generate an accessible way of finding patterns in the theoretical framework gathered and have made the analysis process easier to grasp. Finding patterns in the collected data is of the utmost importance as the report is not limited to only one organization or industry but intends to study AI's effect on leadership and management in a more general way. The authors have chosen to categorize the first table based on the four most suitable leadership styles found in the literature in correlation with its characteristics and the impact that AI implemented in the workplace will have on it. The second table visualize AI's effect on the two different decision-making styles. The third table aim to present the key observations made during the literature review in relation to the articles in which they were found. The tables look as follows on the next page.

Table 1

Leadership style	Characteristics	The impact of AI
Coaching		
Situational		
Transformative		
Transactional		

Table 2

The intuitive decisions-making style	The rational decision-making style

Table 3

Observation	Publications

3.3 Validity and reliability

Validity aim to show whether the correct measurements have been made for the study and a qualitative data collection that permeates the pursuit of good validity through all parts of the process (Patel & Davidsson 2011). The method applied is designed to fit the project. The reading of articles and literature has provided a solid basis for the study's execution and content. Data collection areas are carefully weighted to provide answers to what is considered relevant for the nature of the study.

Social science studies, such as this one, cannot be measured with the same accuracy as a problem with yes and no answers or quantitative numerical analysis'. Since reliability shows whether the study's measurements can be converted into a result by being reliable (Patel & Davidsson 2011), this means that the method makes it difficult to say anything concrete about the thesis' reliability. It is also important to point out that subjects such as leadership are highly individual and cannot be determined based on a theoretical reasoning.

However, there are certain precautions the authors have applied to make sure that the data/information analyzed in this thesis is as reliable and relevant as possible, as described in the data analysis chapter. Thus, resulting in the conclusions being reasonable enough to make the thesis qualify as a scientific study.

3.4 Ethical aspects and method discussion

This study and report hold full objectivity. The students are neutral and impartial in relation to the data, the analysis, and the results that emerged during the research.

With this study, the authors have gained a deeper knowledge regarding AI's influence on leadership skills and managerial decision-making.

The collaboration between the authors has consistently worked well and both parties has participated in all the elements during the preparation of the essay.

The data collection itself is carried out in a relevant way, but the authors could during other circumstances have seen benefits in a wider data collection, for example by conducting qualitative, in-depth interviews with both AI developers as well as managers in different organizations. This would have provided greater support for the empirical results and analysis part of the essay.

The delimitations were difficult to establish and have emerged and developed during the research. As the thesis process proceeded, the delimitations grew reasonable. A possible improvement would have been to dive further and compare AI's impact on leadership in various industries. However, these points would have required more time which was not possible at this time.

In preparation of the thesis, the authors have worked to achieve its purpose and answer the research questions. Identifications have been made related to leadership skills and the managerial decision-making process within the business community as AI is implemented in the workplace. The authors have worked in parallel with the two aspects; leadership styles and managerial decision-making, regarding AI. In the collection of data, different positions and theories have emerged regarding AI in the workplace. With that in mind, it has been important to keep the data analysis as objective as possible so as not to let one approach be glorified over another.

The time set for the study has been an important aspect as well. The degree project was to be conducted and result in a draft submission within ten weeks, with two more weeks set aside for changes and additions. Worth mentioning is also that the Covid-19 pandemic was ongoing during the time of this degree project. Since no interviews or field studies were planned for this study, it was not affected in a direct nature. However, the authors were obligated to change their work situation as a result of the pandemic, which has indirectly affected the study's progress.

4. Empirical results and analysis

The results presented in this chapter depict the data collection and the analysis shows the significance of the study's achieved results. The analysis puts theories within the read literature in relation to each other. Since the aim of the project is to identify changes related to leadership styles and management decision-making processes after the implementation of AI in the workplace, this will be a central starting point in the analysis. Two aspects are decisive with the issues presented in the introduction chapter, one aspect is which shift we can anticipate regarding the most important leadership skills and the other is about changes in managerial decision-making processes. These two aspects can be seen as each other's extremes and they have both been given considerable space in the design of both the result and the analysis below.

4.1 Artificial intelligence's impact on leadership skills

McAfee et al. (2014) presented the first machine age as what led the way for management to be its own discipline, since it required us to adapt the way we led people in the new rate of mass production. It is not unreasonable to assume that the current second machine age, centered around computers and data (Brynjolfsson and McAfee, 2016), will also demand that we adjust our way of leading companies. Abubakar et al. (2017) states that IT has increased organization's ability to absorb knowledge and spread communication. The leadership you carry out affects the communication as well as the other way around, the two concepts go hand in hand. Communication always takes place on the recipient's terms, which could lead to a conclusion that leadership must also be carried out on the recipient's terms in order to be considered good or effective. Thus, as a manager, you can use elements of coaching in your leadership. In many cases, being a leader means motivating and coaching your employees through processes so that the employees reach both their own and the organization's set goals (Jansson & Ljung 2011).

As Kolbjornsrud, Amica and Thomas (2016) presented in their study, managers spend more than half their time on administrative tasks. Tasks that consume so much of these managers' time will be able to be performed by AI both faster, cheaper and more accurate. That would let managers spend the time saved on other important tasks. Examples of such things could be to focus more on the employees, making sure that the individual's needs are fulfilled, giving them the right opportunities to grow and motivating them. This could potentially lead to the employees performing better and thus the entire organization runs more efficiently. This implies that there might be a shift in the leadership styles carried out. Managers will spend more time focusing on people management, as it will be the area where, with the implementation of AI, the managers will be able to contribute the most value. In below presented table 1, each leadership style is presented with its characteristics and what impact the implementation of AI will have on them.

Table 1: The four most suitable leadership styles in correlation with its characteristics and the impact that AI implemented in the workplace will have on it

Leadership style	Characteristics	The impact of AI
Coaching	<ul style="list-style-type: none"> - Support and guide employees - Focus on how performance is done - Relationship-based 	<ul style="list-style-type: none"> - EQ - Softer elements - Mentor employees - Develop employees
Situational	<ul style="list-style-type: none"> - Adjustable - Task-oriented or relationship-oriented - Delegating 	<ul style="list-style-type: none"> - Judgement abilities - Collaboration
Transformative	<ul style="list-style-type: none"> - Inspirational and motivational - Create commitment - Role model - Communication - Encourage creativity - Requires dialog 	<ul style="list-style-type: none"> - Need for social skills - EQ - Softer elements - Motivation - Social networking
Transactional	<ul style="list-style-type: none"> - Acting with reward or punishment - Motivating through positive reinforcement and recognition - Transaction-based 	<ul style="list-style-type: none"> - Strong work ethic - Assertiveness - Supplant harder elements

As can be seen in the table presented above, there are several positive implications to the different leadership styles as AI is integrated in the workplaces. There are however fewer negative implications regarding the first three styles; coaching, situational and transformative. Those three leadership styles will be effective to use since the need for higher social skills are seen in Kolbjornsrud, Amico and Thomas (2016) research. Agrawal, Gans and Goldfarb (2017) emphasize the importance of possessing emotional intelligence to engage and mentor employees as well as being creative to identify opportunities for the company. As Heukamp and Canals (2018) talks about the fact that AI won't be able to establish visions and motivate and align employees, these traits will be important for future managers to obtain.

As was presented in the theoretical framework chapter, research has proven that certain characteristics are associated with effective leadership. Most of these traits are based on how a person is, such as showing self-confidence, humility, work ethic and assertiveness among others. These are 'unique human skills' that will not be affected negatively by the implementation of AI, meaning that AI will not make those traits less relevant but rather reinforce their places as characteristics associated with effective leadership.

According to Forslund (2013), the transformative leader aims to create employee commitment by being a role model who communicates visions and encourages creativity among employees. Kolbjornsrud, Amico and Thomas (2016) argue that one of the practices that managers will need to master is the ability to enable design thinking and harness creativity. This relates back to what was described as ‘unique human skills’ in the problem formulation, as this would require a degree of understanding of the employee’s emotional state, as well as what drives them.

It was also presented in the theoretical framework that a certain type of leadership may fail because of that style not necessarily being the right one in a specific context. The leadership style and the personality traits of the leader should always fit the situation well to be able to be effective (DuBrin 2015), which indicates that the situational leadership style would be preferable. Obtaining this style, with the ability to read situations fairly well so that reasonable adaptations to the leadership style can be made, will according to this literature review be the most successful one. It is important that the style of leadership and personality traits of the leader should fit the context for the leadership to be effective. This is an area where the implementation of AI could have beneficial results. Algorithms could analyze the context, taking into consideration everything from the type of project, to the industry and other factors, to decide what style of leadership might be best suited for the specific context.

In the previously presented survey of 1770 managers (chapter 2.2.2), some of the skills highlighted as to which they believed they would need the most to succeed as managers are clear ‘people skills’, meaning that AI cannot replace these skills (Kolbjornsrud, Amico, Thomas, 2016). The fact that AI cannot replace these leadership skills, should highlight their importance for future managers. If the importance of social skills and networking in the role of the manager was not already clear enough, the implementation of AI will put further emphasis on these skills. Strategic, analytical and creative skills is in the literature also presented as important to require as a leader in the upcoming years. These skills can be perceived as utmost important when doing judgement calls based on the predictions that AI makes. To be able to fully handle and use the data processed and presented by AI, Kolbjornsrud, Amico and Thomas (2016) present that managers will also need some sort of digital capability. This will make the collaboration between leaders and AI more efficient as it unlocks AI true potential. The transactional leadership style is likely not to be as positively affected by AI according to Chamorro-Premuzic, Wade and Jordan (2018) who argues that the harder elements of leadership will supplant while the softer elements will have higher emphasis. DuBrin (2015), on the other hand, talks about effective leaders in terms of strong work ethic, trustworthiness, assertiveness, sense of humor and warmth which indicates an advantage for the transactional leadership style as well.

The adaptations that are needed in order to make the transition of implementing AI as a colleague as smooth as possible, include the lesson on how to best work with the smart machines. Fortunately, not everything can be quantified and although AI will be much better than human beings at making calculations and predictions of different sorts, not all aspects of human intelligence can be replaced by machines. It seems as if the implementation AI in the workplace will force the management role into being more in line with the origins of leadership. It will become of utmost importance to emotionally connect with your employees to get them to believe in you and follow your lead, and work towards the goals you set. Therefore, a mix of the four leadership styles would, according to this study, be the most efficient to use among future leaders.

4.2 Artificial intelligence's impact on the managerial decision-making process

It is still not clear in existing literature how AI will affect the decision-making processes when it is a natural part of the workforce at any average company. The authors have, however, discussed the following possible outcomes, presented in table 2 below.

Table 2: A summarized presentation of AI's effect on the two different decisions-making styles

The intuitive decisions-making style	The rational decision-making style
<ul style="list-style-type: none"> - Not directly affected by AI - Given less space - Grounded on previous experience patterns - Difficult for AI to analyze 	<ul style="list-style-type: none"> - Directly affected by AI - Given more space - Consider probabilities and different scenarios - Enhance speed and accuracy

Simon (1987) states that the technique around decision-making and the following monitoring of it being carried out in the organization have advanced over the last decade, a consequence of the development of business operational tools. Abubakars et al. (2017) two different decision-making styles, the intuitive style and the rational style, can be argued to be differently affected by AI. Since the intuitive style consists of unconscious and disorganized thoughts and feelings within the manager, it could be argued to likely not be highly affected in a direct way by AI, but instead however probably given less space in the organizational context in the future. But, even if it's disorganized, the intuitive style is based on patterns grounded on the managers previous experience, and the implementation of AI could therefore help analyze this pattern. This scenario would help the manager reach better conclusions on the best course of action possible in each scenario. Although considering that the pattern is based on the manager's previous experience, AI would need to analyze the previous experiences of the manager. This might be a bit more difficult, considering that AI would need access to those experiences, even though they might be from the managers previous place of work, or other difficulties that could arise due AI not having access to the proper data. A possible solution to this could be to quiz the manager for AI to get a better sense of who they are as a person and how they would act in certain situations.

The rational decision-making style can be argued to be given more space in organizations, and, since it is based on methodical consideration of alternative scenarios and probabilities (Busari 2015), will probably be more directly affected by the entering of AI in the workplace. The data that AI can provide will enhance both the speed and the accuracy of the decisions being made. As the rational style encompass cautious and methodical thoughtfulness, the implementation of AI will make the decision-making process much easier and more useful. This is because the rational style is based on rationality, which is deemed to be reasonable. The implementation of AI will be successful here because decisions based on rationality analyzes factors involved and considers probabilities as well as alternative scenarios before reaching a conclusion, something that AI excels on compared to humans.

However, here it is important to once again consider what was written in the theoretical framework regarding the different subsets of AI. The importance of good training data, and lots of data, cannot be understated. Without proper data, you will not be able to fully utilize the potential of AI. Relating back to the rational style discussed above, without having the proper training data, AI might not necessarily be able to rationalize and solve the problems at hand better than humans do. This is important to keep in mind considering what Redman (2018) claimed, about how insufficient or faulty training data is one of the main reasons AI projects fail. As AI will accelerate the human learning process required to make good judgement calls, it's heavily important that the data provided are accurate and quality assured.

The authors are also discussing the possibility of AI providing less uncertainty surrounding decision-making, but it could also lead to managers feeling less sense of responsibility regarding their decisions. Let's say that you make a decision based on what the data is recommending with a high probability of success, for example the company going into a new market. If this new market turns out to not be lucrative, you probably won't be fired if you can justify your decision being data-based. Instead, the responsibility can be argued to lie in the algorithm, or the person who built it.

5. Discussion

It is important to note that AI can be used by managers as a tool, and like with any tool, it is important to know where it gives you an edge and where it does not. If managers are not aware of this, they will not be able to use AI to its full potential. Looking back at Professor Tomo Noda's comments, he states that there are certain traits that only humans possess which cannot be replicated with AI. These traits were also essential for managers to succeed. This further highlights what was discussed earlier saying AI is a tool that can enhance your performance as a manager in certain ways, but it cannot replace you as a manager.

It should go without saying, implementing AI into your leadership strategy in the present or near future would mean using the state-of-the-art technologies and methods to maximize the value of your leadership. It is equally important to be adaptable to new changes as technologies develop and new opportunities arise, to make sure that your leadership strategy is still as efficient as possible.

As mentioned previously in subchapter 2.1.4, the implementation of AI raises its own challenges, such as ethical dilemmas. Even though the implementation of AI will make many processes more effective, will it consider all the people involved in that specific process? If the effectivization of the process to a certain degree has a negative effect to the well-being of the employees, how should these two elements be balanced? More importantly, will AI even care about the well-beings of the people involved? This makes it extremely important to have some form of framework that AI is allowed to operate within, so it does not collide with our human rights. Ethical dilemmas are not the only issues that the implementation of AI will face. In other cases, making a decision within an organization cannot be done solely on the base of raw data, but will require to take culture and history into context. This may be because organizations have certain values, and they do not want to lose touch with their history and those values. This poses a new set of challenges for the implementation of AI. If AI shall take the values and history of an organization into context, this would require the training data used to contain the values and the historical context. This means that the training data has to be highly specific for that organization and gathering such specific training data makes the already difficult task of implementing AI even more difficult.

When reviewing the literature, it has been clear to the authors that all sources describe the same scenario regarding which leadership styles will be the most important for the future manager to possess. Some sources emphasize the importance of creativity and coaching, other sources describe EQ and the ability to motivate employees as the most important, while other sources describe adaptability and the capability to ensure employee development as critical for practicing successful leadership in the years to come. It has for the authors become clear that all sources in the theoretical framework, although the descriptions differ slightly, are looking for the same characteristics, highlighting the softer elements of leadership as more fortunate to possess as a manager when AI become an integrated part of organizations.

The main observations and takeaways that have been made through the process of the literature review are presented in table 3 on the next page, in relation to the articles which the observations have been made.

Table 3: A presentation of the key takeaways found during the literature review

Observation	Publications
AI will enhance softer elements of leadership, i.e. coaching, networking, motivating, social skills	Kolbjornsrud, Amico & Thomas (2016) Chamorro-Premuzic, Wade & Jordan (2018) Björkman and Johansson (2018)
AI will outperform humans regarding harder elements of leadership, i.e. raw processing of information	Busari (2015) Abubakar, et.al (2017) Kolbjornsrud, Amico & Thomas (2016) Chamorro-Premuzic, Wade & Jordan (2018) McAfee, et.al (2014)
Managers spend a lot of time on administrative tasks	Kolbjornsrud, Amico & Thomas (2016) Brytting (2013)
Certain tasks can only be performed by human beings, i.e. AI won't be able to establish visions and motivate people	Heukamp & Canals (2018) Cogito Tech LLC (2019)
AI will enhance speed and accuracy of managerial decision-making	Little (2013) Abubakar, et.al (2017) Tapscott (2014) Su, Lin & Chen (2015)
Proper training data is essential for AI projects to succeed	Wallenberg (2018) Redman (2018)
Managers will need to implement AI strategies to utilize its full potential	Kolbjornsrud, Amico & Thomas (2016) Wallenberg (2018)

It is also worth noticing that the conclusions reached in this thesis is based on what the state-of-the-art research say today. The reality of how things will work out might be different, which we will not know until we have reached a stage in the technology development where AI is widely implemented in organizations. As technology advances, this thesis will need to be complemented with further research.

Although AI driven decisions are superior to decisions made by human knowledge, within certain areas and if certain terms are fulfilled, are those, in a larger context, the right decisions?

The authors would also like to point out the fact that in the survey presented by Kolbjornsrud, Amico and Thomas (2016), managers recognized innovative thinking and creativity as some of the most important skills to succeed as a manager in the future. Another question therefore being raised among the authors is what other areas of human intelligence will not be outperformed by AI. For instance, how would AI be able to innovate in comparison to human intelligence? It seems as the innovation processes (at least the disruptive ones) require experimenting and creating hypotheses that does not already exist. It seems unreasonable to believe that AI therefore could come up with new ideas as long as it is based on existing data.

6. Conclusion

The study's conclusions and suggestions for further research are presented below. Based on the above presented research and analysis, the following is given as answers to the thesis' two questions regarding the adaptation of leadership skills and decision-making processes due to the AI implementation in the workplace. The thesis meets the purpose of the study, which is to identify changes related to leadership and AI for continuous success in future businesses.

6.1.1 Vital leadership skills

The thesis' first research question goes as follows: "What shift can we anticipate regarding the most vital skills to succeed as a leader as AI is implemented in the workplace?". The study concludes that with the introduction of AI there will occur a shift towards more 'unique human skills' as the most vital leadership skills. Although networking, coaching and collaboration are already vital leadership skills today, their importance will be further enhanced with the implementation of AI.

This shift of the most vital leadership skills will occur because AI can outperform human beings when it comes to most of the harder elements of leadership. However, only human beings can motivate people, establish a vision, be creative and think innovatively.

The study suggests that mix of the coaching, the situational, the transformative and the transactional leadership styles would be the most efficient to use among future leaders.

6.1.2 The process of decision making

The thesis' second research question goes as follows: "How will the process of managerial decision-making change due to the implementation of AI in the workplace?". The study concludes that it is not fully established in existing literature how AI will affect the decision-making processes in companies. The data that AI can provide will however enhance both the speed and the accuracy of the decisions being made and out of the two decision-making styles the rational one can be argued to be more directly affected by the entering of AI in the workplace.

The importance of a lot of quality assured training data cannot be understated. Without proper data, managers and companies will not be able to fully utilize the potential of AI. It is also not clear whether or not the integration of AI in decision-making processes will lead to managers feeling less sense of responsibility in regard to their decisions.

6.1.3 Proposals for further research

The subject of AI in a combination with leadership and management is, with the ongoing rapid development of technology in the workplace, a relevant topic to explore further. There are several interesting aspects that the authors propose for further research. One example could be how AI can handle and take into consideration the harder elements of management as well as the softer elements of leadership or how businesses should divide their focus regarding short-term success versus long-term success, i.e. task focus and decisiveness versus vision communication and employee engagement.

Even though several leadership styles were introduced in the thesis, there were no contradictions found as to the impact which the implementation of AI will have on the different leadership styles. The research is presenting all impacts that have been found during the literature review in table 1. The articles analyzed have described features that will be important when AI enters the labor market and in relation to the four chosen leadership styles, no negative implications were found. The intent of the research was never to collect and analyze articles with only positive aspects presented, but instead to gather all relevant information surrounding the effects AI will have on leadership styles and managerial decision-making processes as it become an integrated part of organizations. However, the literature reviewed did not conclude any negative sides to this relationship. Although no contradictions were found in the data collection, it is important to note that this might be due to the fact the many of the conclusions on this subject are based on the potential of AI and in which areas it can be more productive than human beings, and where human beings have the edge over AI.

It would also be interesting to explore further how decisions made by AI can have moral and/or ethical implications on the organizations and its leadership and management personnel. Lastly, the authors would be interested in further research regarding how employees will accept/receive AI “colleagues” in their workforces.

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