HEC MONTRÉAL

Leadership competencies in the presence of artificial intelligence

par

Bénédicte Sagnières

Sciences de la gestion

(Développement organisationnel)

Mémoire présenté en vue de l'obtention

du grade de maîtrise ès sciences en gestion

(M. Sc.)

Août, 2022

HEC MONTRÉAL

Comité d'éthique de la recherche

CERTIFICAT D'APPROBATION ÉTHIQUE

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Projet # : 2019-3385

Titre du projet de recherche : Leadership competencies in the context of artificial intelligence

Chercheur principal :
Benedicte Sagnieres, étudiante M. Sc.
HEC Montréal

Directeur/codirecteurs :
Mélanie Robinson; Nicolas Le Dévédec
Professeurs - HEC Montréal

Date d'approbation du projet : January 25, 2019

Date d'entrée en vigueur du certificat : January 25, 2019

Date d'échéance du certificat : January 01, 2020

Maurice Lemelin
Président
CER de HEC Montréal

Abstract

Artificial intelligence (AI) is gaining popularity as organizations across the globe are implementing AI-based technologies to capitalize on their accumulated data. Nonetheless, welcoming an AI system not only requires that organizations improve their technical capabilities, but also demands them to focus on upskilling their leaders to reach the true potential that can be achieved with such a technology. Past research identified the importance of leadership for a successful organizational change, and other papers recognized that new technologies create significant disturbances within the leadership role. Further studies also researched specific beneficial leadership competencies in an AI context, but more investigation is required to offer a consolidated outlook on the topics of leadership competencies and AI.

Leaders hold a crucial part in achieving success during an organizational change, and it is recommended they upskill to properly welcome an AI system. As such, the thesis explores the essential competencies leaders should acquire to aid in the success of, and thrive in the presence of, an AI technology. The literature review investigates the theme of leadership, change management and artificial intelligence, and concludes with an integrative framework summarizing the literature on AI leadership competencies. Mumford *et al*.'s (2000) skill-based model is used to structure the uncovered competencies into four categories: *problem-solving*, *social judgement*, *technical* and an *ethical dimension to leadership*.

As research is still growing on the leadership competencies required to facilitate an AI implementation, the methodology is primarily exploratory in nature. Qualitative data was collected through 12 semi-structured interviews, to seek in-depth knowledge from the participants. The participations chosen were those who, through their work, gained sufficient knowledge to discuss how the manager's function is required to shift to prosper in the presence of an AI technology.

The findings suggest the need to upskill leaders to help achieve AI adoption and demonstrate that AI introduces five new managerial challenges which require the development of specific skillsets. Each of these unique challenges requires managers to develop critical skills, abilities, and knowledge to navigate them effectively. Several key skills, identified in the findings,

are advocating for transparency, shifting from a skill-based to a trust-based leadership style, becoming cross-functional and embracing collaboration. The findings also contribute to a deepening of knowledge on the importance of ethics in an AI context and present several managerial skills associated with that dimension.

Key Words: leadership competencies, artificial intelligence, management, managers, qualitative data, semi-structured interviews, AI adoption, AI challenges

Résumé

L'intelligence artificielle (IA) gagne en popularité, les organisations du monde entier mettant en œuvre des technologies basées sur l'IA pour tirer parti de leurs données accumulées. Néanmoins, l'accueil d'un système d'IA exige non seulement que les organisations améliorent leurs capacités techniques, mais aussi qu'elles se concentrent sur la formation de leurs gestionnaires afin d'atteindre le véritable potentiel qui peut être réalisé avec une telle technologie. Des recherches antérieures ont mis en évidence l'importance du leadership pour la réussite d'un changement organisationnel, et d'autres articles ont reconnu que les nouvelles technologies créent des perturbations importantes dans le rôle du leadership. D'autres études ont également porté sur des compétences spécifiques de leadership qui sont bénéfiques dans un contexte d'IA, mais des recherches supplémentaires sont nécessaires pour offrir une perspective consolidée sur les sujets des compétences de leadership et de l'IA.

Les dirigeants jouent un rôle crucial dans la réussite d'un changement organisationnel, et il est recommandé qu'ils se perfectionnent pour accueillir correctement un système d'IA. Ainsi, la thèse explore les compétences essentielles que les gestionnaires devraient acquérir pour contribuer au succès et à l'épanouissement d'une technologie d'IA. La revue de la littérature étudie le thème du leadership, de la gestion du changement et de l'intelligence artificielle, et se termine par un cadre intégratif résumant la littérature sur les compétences de leadership en IA. Le modèle basé sur les compétences de Mumford et al. (2000) est utilisé pour structurer les compétences identifiées en quatre catégories : résolution de problèmes, jugement social, technique et dimension éthique du leadership.

Étant donné que la recherche sur les compétences de leadership requises pour faciliter la mise en œuvre de l'IA est toujours en cours, la méthodologie est principalement de nature exploratoire. Les données qualitatives ont été recueillies par le biais de 12 entretiens semi-structurés, afin d'obtenir des connaissances approfondies de la part des participants. Les participants choisis sont ceux qui, par leur travail, ont acquis suffisamment de connaissances pour discuter de la façon dont les gestionnaires doivent évoluer pour prospérer en présence d'une technologie d'IA.

Les résultats suggèrent la nécessité de renforcer les compétences des dirigeants pour favoriser l'adoption de l'IA et démontrent que l'IA introduit cinq nouveaux défis managériaux qui nécessitent le développement de compétences spécifiques. Chacun de ces défis uniques exige des gestionnaires qu'ils développent des compétences, des capacités et des connaissances essentielles pour les relever efficacement. Plusieurs compétences clés, identifiées lors des résultats, sont de promouvoir la transparence, d'adopter le passage d'un style de leadership basé sur les compétences à un style basé sur la confiance, de devenir pluridisciplinaire et d'encourager la collaboration. Les résultats contribuent également à l'approfondissement des connaissances sur l'importance de l'éthique dans un contexte d'IA et présentent plusieurs compétences managériales associées à cette dimension.

Mots clés : compétences de leadership, intelligence artificielle, gestion, gestionnaires, données qualitatives, entretiens semi-structurés, adoption de l'IA, défis de l'IA.

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List of Abbreviations and Acronyms

AI: Artificial Intelligence

IA: Intelligence Artificielle

OECD: Organisation for Economic Co-operation and Development

OD: Organizational Development

ML: Machine-Learning

VUCA: Volatile, Uncertain, Complex, and Ambiguous

Acknowledgements

Three years. It has taken me three years to complete my biggest challenge to date: writing my thesis. From the beginning, I was aware of the effort and the time it would take me to complete it, and despite that, I could never have guessed what this challenge would bring. For the past three years, I questioned my worth, my intelligence, and whether I would be able to finish it. I could have easily given up many times if it was not for all those who followed me on this adventure and offered me their unconditional support. For that, I am deeply grateful.

I want to start by giving a special thanks to my two co-directors: Melanie Robinson and Nicolas Le Dévédec. Without their patience, kindness and, of course, their advice and encouragement throughout this journey, I would not have been able to accomplish this thesis. Above all, you offered me time - the time I needed to learn how to overcome this obstacle, and I am very grateful for that.

I would also like to thank the participants of this thesis with whom I spoke and to all those who helped me recruit them. Without them, this thesis could not have been written.

To my husband, Damien. You had a front-row seat to notice how this thesis affected me. You saw my moments of pride when handing in a completed chapter, but these were fleeting moments and, unfortunately did not reflect the reality of our last three years. No words could do justice to the support and love you offered me to see me through those difficult times.

To my parents, I thank you for trusting me and encouraging me until the end. I would like to tell you: "*Comme le Bac, celui-là aussi je l'ai réussi! ;)*"

To my brothers and sisters-in-law. You have all helped me in your own ways. Whether it was through the delicious food you cooked for me, the discussions and advice you shared or the walks at Otterpoint to refresh my spirit. I owe you a big thanks.

I now close this chapter of my life with a sense of serenity. This thesis has made me go through a lot, but thanks to it, I have been able to confront my greatest fears.

"*These mountains that you are carrying, you were only supposed to climb.*" - Najwa Zebian

Chapter 1

Introduction

Artificial intelligence (AI), first coined in 1956 at a historic Dartmouth College conference in the United States, has recently seen substantial progress, leading to its newfound success (Manyika & Bughin, 2018). A paper by the McKinsey Global Institute explains that organizations are hoping to capitalize on all their accumulated data, since an exponentially larger computing capacity is now available to train AI algorithms (Manyika & Bughin, 2018). A survey completed by 451 Research (2021) also found that 95% of businesses surveyed consider prioritizing AI technology in their digital transformation efforts.

Montreal, specifically, has become one of the most important global AI hubs (Montreal International, 2022). The city is home to the largest AI academic community in the world and to world-renowned experts, such as Yoshua Bengio, a professor in the Department of Computer Science and Operational Research at the Université de Montréal and co-winner of the Turing Award 2018 – the highest honour for computing research, and Joëlle Pineau, Associate Professor with the School of Computer Science at McGill University and Head of the new Facebook AI Research lab in Montreal. In addition to having the highest concentration of researchers and students of AI in the world, Montreal International (2022) notes that more than $2 billion in AI investments have been announced in Greater Montreal since 2016, and more than 1$ billion was raised in funding dedicated to university research. The Canadian government also chose Montreal as the headquarter for SCALE AI, Canada's AI global innovation cluster which helps accelerate the integration of AI across business sectors.

Montreal is at the forefront of AI research and development and the organizations established in the city must certainly benefit from these scientific advancements. Nonetheless, as Manyika and Bughin (2018) explain, few businesses are safe from disruption and many across the globe are facing similar practical issues when implementing an AI technology. As the authors describe, introducing an AI not only shifts organizational processes but also directly impacts the

workforce by, for example, requiring extensive human effort to supervise it (Manyika & Bughin, 2018). Additionally, Brown *et al*. (2019) share that while organizations should improve their technical capabilities to welcome an AI system, they should also recognize the importance of upskilling leaders and other employees to reach the true potential that can be achieved with an AI. Indeed, a survey by Infosys (2018, p. 18) found that an AI transformation is *"as much about people, processes and leadership as it is about technology."*. AI is becoming more prominent and is, by its very nature, disruptive. It not only disrupts the technical side of an organization but the workforce as well. As such, leaders are key figures to reach a successful AI implementation. This thesis, therefore, aims to research further into the role of leaders and identify the competencies and knowledge they should acquire to participate and thrive in a successful AI implementation.

The Deloitte AI Institute launched a survey in 2021 and found that organizations are 1.5 times more likely to achieve the desired goals of their AI implementation if they invest in change management (Deloitte AI Institute, 2021). Nonetheless, they establish that *"only 37% of survey respondents reported significant investment in change management, incentives, or training activities to help their people integrate new technology into their work"* (Deloitte AI Institute, 2021, p. 17). This survey acknowledges that a lack of interest in change management often results in a slower, less successful transformation. There is a clear need to upskill employees to not only help them embrace the technology but also participate in the success of the implementation. In particular, past studies have demonstrated the importance of leadership for a successful organizational change (e.g., Denning, 2005; Gill, 2002; Hornung & Rousseau, 2007; Sims, 2002). Additionally, recent literature uncovered that new technologies create significant disturbances within the leadership role (Sousa & Rocha, 2019; Weiner *et al*., 2015). Clearly, leaders are critical players in guaranteeing a smooth organizational change, and an AI technology will shift their roles and responsibilities. This thesis identifies the different ways in which the leadership role changes in an AI context and explores the competencies that leaders should acquire to prosper in an AI context.

Artificial intelligence offers several solutions to organizations with extensive datasets. Such technology, for example, is used to improve traditional analytics tools by analyzing large amounts of data to effectively detect anomalies (Manyika & Bughin, 2018). The authors also

identify several other uses for AI, such as: *"In logistics, AI can optimize routing of delivery traffic, improving fuel efficiency and reducing delivery times. In customer service management, AI has become a valuable tool in call centers, thanks to improved speech recognition. In sales, combining customer demographic and past transaction data with social media monitoring can help generate individualized "next product to buy" recommendations, which many retailers now use routinely"* (Manyika & Bughin, 2018, p.3). Hence, this technology can transform a wide range of industries and branches of organizations.

The prominence of AI and other technological advances in the past years also brought up a new term: "Industrial Revolution 4.0" or "The Fourth Industrial Revolution" (Floridi, 2014; Hirschi, 2018; Schwab, 2017). Even though there is a lack of an agreed-upon definition, a report prepared by the Organisation for Economic Co-operation and Development (OECD) refers to it as a *"confluence of technologies ranging from a variety of digital technologies (e.g., 3D printing, IoT, advanced robotics) and new materials (e.g., bio or nano-based) to new processes (e.g., data-driven production, Artificial Intelligence, synthetic biology)"* (OECD, 2016, p.1). According to Piccarozzi *et al.* (2018, p. 2 – citing Schwab, 2016), the fourth industrial revolution is evolving at a much more rapid pace than previous industrial revolutions. It is bringing significant changes to the global economy on topics such as investment, consumption, growth, employment, and trade. Not only that, but the authors also acknowledge that the fourth industrial revolution is improving individual tools and methods of management, as well as contributing to a radical transformation of management functions and ways of organizing work in modern companies. To demonstrate, the 2018 Infosys survey found that AI technologies will impact the leadership role in several ways, such as by decreasing transparency of the business, requiring the ability to be more agile and responsive and fostering a culture of lifelong learning as the AI evolves (Infosys, 2018). In that regard, Bonekamp and Sure (2015) also note that technological solutions, including AI, require whole organizations to shift and embrace a cross-functional work organization. The study also identified that employees must upskill to interact efficiently with such technologies since it demands increasingly higher skill activities such as planning and the need for cross-functional perspectives.

In sum, leaders hold a crucial part in achieving success during an organizational change, and their roles and responsibilities need to shift to achieve a successful AI implementation. While research suggests that specific leadership competencies are beneficial in this context, such as the studies by Di Fiore (2018), Brock and von Wangenheim (2019), Huang and Rust (2018), and Piccarozzi *et al.* (2018), to name a few, more studies are needed to consolidate the topics of AI and leadership and offer a wider perspective on the subject. Notably, Brock and von Wangenheim (2019, p.1) wrote: *"managers are left with little empirical advice on how to prepare and use AI in their firm's operations."* Other studies exist on related topics, such as: identifying organization-wide barriers to an AI implementation (Cubric, 2020; Fountaine *et al*., 2019; Singh *et al.,* 2020), questioning the challenges modern society will be confronted with amidst the arrival of AI-based technologies (Brynjolfsson & McAfee, 2014; Floridi, 2014; Loebbecke & Picot, 2015), or examining how the difficulty of implementation is due to the complexity of the technology itself (Azodi *et al*., 2020; Janssen *et al*. 2017; Sivarajah *et al*., 2017). Nonetheless, further research is needed to offer a consolidated outlook on leadership competencies in an AI context.

Therefore, the focus of the thesis is to determine the competencies leaders need to develop to tackle the difficulties brought on by an AI implementation and assist in its success. The following research question is put forward:

In the context of an artificial intelligence system implementation, which key competencies should managers acquire to thrive in the presence of the technology and lead a successful employee adoption?

1.1 Organization of the thesis

First, the literature review explores the themes of leadership, change management, and technology adoption. It further examines how the leadership role shifts in an AI context and identifies the competencies leaders should develop for a successful AI adoption. The literature review concludes with an integrative framework summarizing the literature on AI leadership competencies.

Next the methodology chapter discusses the data collection method and describes the data collection process. It includes detailing that twelve semi-structured interviews were conducted with a wide range of participants who, through their work, gained sufficient knowledge in AI technologies to share how the manager's function needs to shift to properly welcome an AI. This chapter also presents the description of the final sample and presents the coding procedure used to analyze the data.

The findings chapter highlights how participants consider the hurdles from an AI implementation to be much bigger than a traditional IT software integration and that it creates a set of challenges unique to this new technology. This section confirms the relevance of this thesis by demonstrating that AI introduces five new managerial challenges which require the development of specific skillsets to overcome them. Each sub-sections of the chapter is a specific challenge and includes the appropriate skills and knowledge leaders should develop to help address them.

Finally, the thesis ends with the discussion chapter, it summarizes the key takeaways and discusses perplexing or confusing observations. The strength and limitations of the thesis are shared, as well as the thesis's contributions to the fields of artificial intelligence, change management and leadership.

Chapter 2

Literature Review

To shed light on the issues brought on by introducing an AI in an organizational context and more particularly its impact on the role of leaders, it is essential to review the existing literature on the subject. The literature review is structured into three main sections.

The first focuses on a brief overview of the challenges facing organizations today and explains the need for artificial intelligence (AI). Although AI can have a disruptive effect on firms, diverging viewpoints that question the type of impact it can have are presented. Then, the different risks linked to an AI implementation are identified, which demonstrate the need for knowledgeable leaders to address these challenges. The section ends by suggesting requirements for a whole new dimension of leadership development since the presence of an AI creates a shift in the leadership role.

The second section further investigates essential leadership competencies. It introduces Mumford *et al.*'s (2000) skill-based model of organizational leadership, which acts as the structure for the integrative framework presented in the conclusion of the chapter. The importance of the leaders' role in achieving a successful organizational change is then presented; and the corresponding skills for accomplishing such a change are shared, including the preferred leadership styles and the usefulness for leaders to have an ethical foundation. Finally, the focus is given to technological changes and their impact on leadership competencies. This section will serve as a basis for understanding how the specificities of an AI implementation might impact the leadership role and its skills.

While the first sections of the literature review describe a more global approach to leadership, change management and technology adoption, the third section examines how artificial intelligence, more specifically, impacts the leadership role. Thus, building upon the skills identified in the first sections, the third section delves further into research on leadership and artificial intelligence.

Finally, the literature review concludes with an integrative table by synthesizing the literature on AI leadership competencies overviewed in the chapter. It is based on Mumford *et al.*'s (2000) skill-based model for effective leadership and extended to incorporate the additional leadership skills associated with change management and AI adoption identified in the third section.

2.1 Big Data & Artificial Intelligence – A Brief Overview of the Context

We are currently living in a time where the current amount of data in an organization *"exceeds the processing capacity of conventional database systems"* (Dumbill, 2013, p.1). This situation is also called *data deluge,* in which the volume of data being generated is too large for that organization to properly manage it (Marburger *et al.*, 2007). However, the problem facing organizations today is not only the volume but also the speed at which datasets are being generated and the large variety of data types that exist in an organization. These three concepts jointly refer to the notion of *"Big Data"* (Dumbill, 2013, p.1). Given this difficulty, organizations are trying to find ways to make sense of all their data by relying on big data and business analytics. These new processes, such as the use of AI, use a multitude of information gathered by these big data sources to identify patterns and rules. These data analytic methods can be used in a myriad of ways – such as to predict consumer choices, anticipate the probability of a medical condition, identify political extremism in social networks, and to better oversee traffic networks (Vidgen *et al*., 2017).

Organizations are increasingly aware of the impact big data analytics, including AI, can have on their firms. Ergo, there is some excitement, and anxiety, as organizations in various sectors explore how they can utilize their data to create value (Manyika, 2011; Vidgen *et al.*, 2017; Yiu, 2012). Several authors argue that big data and AI can have a significant impact on organizations. For example, Niebel *et al*. (2019) note that the ongoing changes in how data are being generated and made relevant for firms can help to increase business value through the profitable use of data, which had formerly been seen as a 'waste' product before the surge of big data technologies. The combination of big data and AI has created a whole new playing field for firms, given that AI systems can provide cost-effective and scalable capabilities to mine data, ask

new or different inquiries, as well as offer new insights to firms (Migliore & Chinta, 2017). Kaplan and Haenlein (2019) believe that AI will impact most firms, both internally and externally. Internally, AI allows a large number of tasks to be conducted faster, better, and at a lower cost. In the longer term, this won't just influence simple and repetitive tasks, but also more complex ones. They further argue that knowledge-heavy industries like consulting, financial services, and law will also see significant changes. Relatedly, Brock and von Wangenheim (2019) foresee that AI will automate operations and manufacturing, support decision-making and knowledge management, as well as automate customer interfaces. Kaplan and Haenlein (2019) also believe that, externally, AI will impact the relationship between firms and their clients, other firms, and with society at large. Weill and Woerner (2015) concur as they believe that big data analytics will have a disruptive effect on business strategies and business models for mostly all industries and sectors. There even exists a large amount of anecdotal evidence on how insights, drawn from big data, have profoundly affected and improved core business functions – such as marketing, HR, and operations – through the change of companies' strategies and business models (Carillo, 2017; Chen *et al.*, 2015).

However, although it has been argued that AI will have a disruptive effect on firms, there is certainly no consensus as to the type of impact it will have on corporations and society as a whole. For instance, Shirky (2009, p.107) mentions that *"either one perceives digitization and big data analytics (BDA) as yet another 'revolution' or one considers technological developments such as digitization and big data analytics as incremental innovations"*.

On one end of the spectrum, some authors are adamant that AI will not be as transformative as it is being praised to be. For example, Brock and von Wangenheim (2019, p.129) note: *"AI certainly holds a lot of promise but it is not a panacea"* and Tian (2017, p.114) mentions: *"the addition of big data to the portfolio of potential responses is to be welcomed, but guardedly, as experience has shown that the latest 'big thing' usually turns out to be much less of a transformative force than envisaged on its introduction to the market."* Brock and von Wangenheim (2019) actually identified AI to be akin to other technologies that companies end up adopting and implementing. It is deployed as and associated with digital transformation projects and by definition shares many similarities with other digital projects.

Yet, on the other end of the spectrum, there is a belief that AI has created a radical technological change, whether it is viewed in an optimistic (Boyd & Holton, 2017; Brynjolfsson & McAfee, 2014; Susskind & Susskind, 2015) or pessimistic light (Ford, 2015; Huws, 2014; Spencer, 2017). The automation of work, which is in part due to AI, is considered by many to be the most important societal and economic trend in the world (Hirschi, 2018) — one that will essentially change the nature of work, business, and society in the coming decades (Arntz *et al.*, 2016; Brynjolfsson & McAfee, 2014; Ford, 2015; Frey & Osborne, 2017). Carillo (2017, p. 605) goes as far as to say that the *"change seems to be of a greater scope: the advent of a new business paradigm"*. The term "business paradigm shift" is used to describe the overall change that is occurring in the business world: the shift from a business to a data-driven perspective (LaValle *et al*., 2011). The new perspective is found to strongly impact most companies' strategies, business models, and processes (Chen *et al.*, 2015), while creating new ways of working, communicating, and interacting (Loebbecke & Picot, 2015). Whereas AI was originally perceived as a technological disruption and firms viewed the implementation project as solely an IT departmental issue, Vidgen *et al.* (2017) believe that AI extends far beyond that. According to the authors *"organizations need to 'strategically align' all resources to tackle this issue systemically and in a joined-up way"* (Vidgen *et al.*, 2017, p. 634).

Thus, different viewpoints emerged in the literature, with some authors believing AI to be an ordinary digital transformation (Brock & von Wangenheim, 2019; Tian, 2017), while others are convinced it will have a radical and transformative effect on firms (Hirschi, 2018; Schwab, 2016; Vidgen *et al*., 2017). Despite this difference in perspective, it is clear AI systems plays a major role within firms. Using AI, organizations are able to *"process different types of data, analyze massive information, learn, and develop insights that are not possible with human intelligence"* (Naqvi, 2017, p. 247-248). Be that as it may, it does not come without risks. Notably, the introduction of AI is often accompanied by many challenges, whether it be related to the destruction of jobs caused by automation, the invasion of privacy resulting from digital surveillance (Jones, 2016), or the reinforcement of biases in policymaking caused by algorithmic governance (Janssen & Kuk, 2016).

As such, organizations and leaders must be made aware of the challenges that come with introducing an AI system to lead a successful change. What follows are some of the main challenges that have been identified, listed in no particular order, to help determine the various areas in which leaders may have to gain knowledge and develop key competencies to ensure they thrive in an AI context.

2.1.2 AI Challenges

Accountability. When AI systems make decisions on behalf of humans, there is an accountability factor to take into consideration. Indeed, Dignum (2018) questioned whether an AI system should be held accountable for its actions.

When human-machine interactions lead to costly mistakes, grave injuries, or fatalities, it is important to assign accountability for the erroneous or conflicting data, as well as for the limited human control that existed over the autonomous system (Howard, 2019). Yet, as Winfield and Jirotka (2018) question: how can the logic by which the decision was made be examined and who should be responsible? The authors explain that the AI itself cannot be responsible, but others such as Elish (2019) and Howard (2019) also believe that assigning blame on an employee when a misfortune occurs is a potentially unfair way of assigning accountability. This is a challenge that has moral, societal, and legal consequences (Dignum, 2018) and firms and managers need to take the time to discuss this point in great length to set up proper guidelines – about the role an AI system should play in decision-making procedures, as well as the governing rules to be put in place regarding the repercussions if a mistake does occur.

Privacy. The abundance of data accumulated by organizations can help, for example, to customize their clients online experience with relevant content based on their needs or interests. Still, Migliore and Chinta (2017) wonder about the cost to customer privacy. Leaders need to think about, and guarantee, that they are complying with the privacy laws, as well as following the ethical data-governance practices put in place to protect all stakeholders' privacy – including customers, suppliers, and employees, among others (Migliore & Chinta, 2017).

Interpretations of Results. Another challenge that AI and big data present relates to flawed interpretations occurring accidentally or due to a lack of technological competencies.

Authors such as Davenport (2013) and McAfee and Brynjolfsson (2012) have mentioned how the algorithms within an AI system usually involve correlations, not causation. The misinterpretations that can then be made from a lack of knowledge could have a significant impact on the firm. Davenport (2013) also acknowledges that results may be simply due to mere chance, while Lazer *et al.* (2014) suggest that even misleading patterns can be found in data. Along with flawed interpretations, Luca *et al.* (2016) mention that algorithms can suffer from myopia. Since the data used tend to focus on short-term outcomes, there is often a misalignment between short-term success and longer-term profits and corporative goals (Carillo, 2017). In this case, the problem does not come from the algorithms themselves, but rather from the leaders' interactions with them (Carillo, 2017). Hence, it is essential for leaders involved to become technologically competent for them to understand what questions AI systems actually answer, which ones they don't and can't solve, as well as knowing most of the risk and the flaws involved in partnering up with such a system.

Deskilling. Concerns have also emerged related to an overreliance on machine learning and AI systems by the workforce. Some say being too reliant on this technology can lead to the "deskilling" of domain experts later on. For example, educational programs that teach new safety and health practitioners to rely entirely on AI-enabled risk management strategies can lead to aggregate skill loss for the safety and health profession (Cabitza *et al*., 2017; Howard, 2019). Consequently, it is up to organizations to determine how much they are willing to let their employees rely on such a technology, taking into consideration a possible deskilling of their workforce.

Perception. As stated above, AI algorithms can enhance and make data-driven decision-making more efficient – in fact, it is one of the main drivers of adoption for managerial and organizational decisions. Regardless, Lee (2018) found that employees who learn that a decision or result was made by an AI algorithm can have their perception of that decision be influenced, despite the outcome being correct. Their perceptions of the technology may thus influence individuals' trust in, and attitudes toward, algorithmic decisions (Lee, 2018). Trust in the decision quality and its accuracy has been identified as a significant determinant for effective adoption of

automation technology (Lee & See, 2004), so it is crucial for leaders to build trust in the machine and the decisions it makes.

Lack of Transparency. There have also been concerns over the lack of transparency linked to AI as it is being introduced across industry sectors through machine learning (ML) models (Howard, 2019; Lahav *et al*., 2018). The lack of methodological transparency inherent in AI is called the "black box problem". Azodi *et al.* (2020, p. 1) remark: *"While the complexity of ML models is what makes them powerful, it also makes them difficult to interpret, as their internal logic cannot be easily understood by a human."* This technology, ergo, raises serious questions over trust and transparency (Winfield & Jirotka, 2018). A study conducted in 2019 by Miller (as cited in Azodi *et al.*, 2020) points out that humans are unlikely to trust a prediction if they don't understand why and how it was made. The study mentions the example of a doctor that may not trust an ML-based diagnosis if it gives no explanation, by fear the model may include unknown biases or limitations (Miller 2019, as cited in Azodi *et al.*, 2020). While Azodi *et al.* (2020) state there have been efforts to make the inner workings of AI models more understandable to humans, the authors explain that care should still be taken when choosing the data and features to be included in an AI, as the insights resulting from the interpretation of an AI model are *"constrained by the content, quality and quantity of the data used to generate that model"* (Azodi *et al*., 2020, p. 13) Thus, having technologically competent leaders who are aware of this technology's shortcoming and trying to help alleviate the issue by focusing on the quality and quantity of the datasets being introduced in the AI algorithms is key to building trust.

In sum, from a risk point of view, AI is linked, amongst other issues, to accountability problems, algorithms biases, ethical issues, deskilling, in addition to a lack of transparency and trust. These difficulties will have to be addressed for an AI adoption to be successful. In addition to needing the tools and knowledge to solve these problems, leaders will also need to have the appropriate technological competencies when working alongside an AI system to be able to "*uncover patterns, insights, and ask appropriate questions to discover new opportunities for value creation*" (Migliore & Chinta, 2017, p. 8). Bratasanu (2018) suggests a whole new dimension for leadership development is needed. Although this is not exhaustive research, it seems clear there

is a consensus among authors that AI will not only impact organizations as a whole, but it will also shift the leadership role to require new competencies. Integrating this technology will certainly provide numerous occasions for leaders to develop new skills and abilities to ensure this change goes smoothly, as well as making sure the technology is properly used.

2.2 Leadership, Change Management, and Technology

As it has been shown, introducing AI systems is linked to several challenges and will require the help of organizational leaders to ensure its successful adoption. This section, therefore, investigates further into the competencies associated with a leadership role by presenting the skill-based model for organizational leadership by Mumford *et al.* (2000). This model identifies effective leadership competencies and will act as the structure for the integrative framework presented in the conclusion of this chapter. Furthermore, several studies are reviewed which acknowledge the importance of the leaders' role during organizational change, as well as identify the preferred leadership styles when facing such a change. In addition, the usefulness of leaders having an ethical foundation to achieve a successful outcome during a change is addressed. Finally, literature on the impact of technological changes in organizations is shared to identify its consequences on the leaders' role. This section will serve as evidence to understand how a specific technological change, such as the introduction of an AI system, may impact a leader's role.

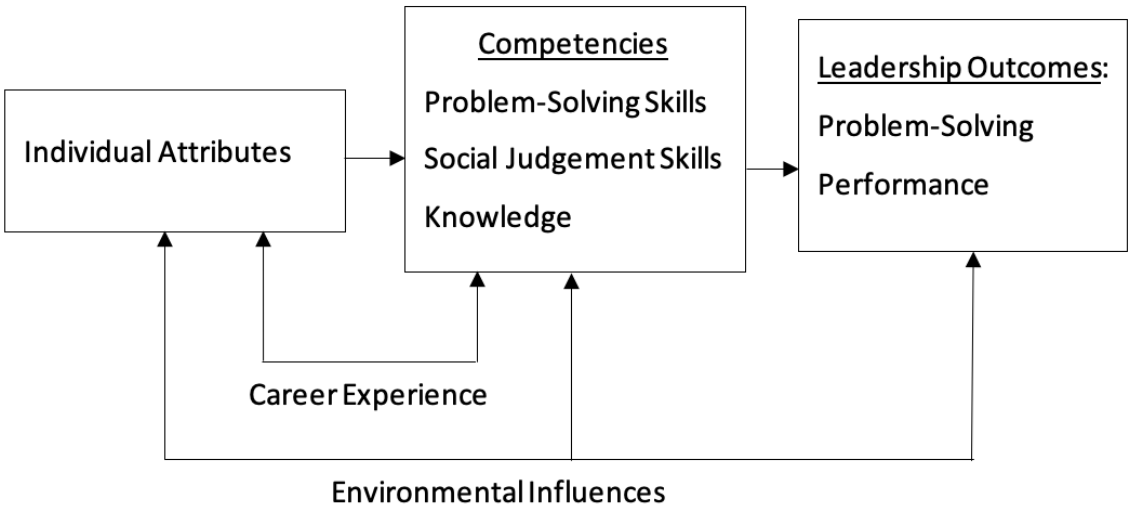
2.2.1 Skill-based leadership model. Studies have focused on conceptualizing leadership from a skills perspective since the 1950s. As Northouse (2007) discusses, the work of Katz (1955) is at the forefront of the discussions, alongside the more recent work of Mumford *et al.* (2000). This thesis focuses on the developable skills, as it is believed that a skill-based approach to leadership makes it more accessible to organizations wishing to upskill their leaders when implementing AI systems.

While the works of Katz (1955) initiated the dialogues around leadership skills, it was the more recent work of Mumford *et al.* (2000) that set the stage for a more comprehensive skill-based model of leadership. The authors argued that three dimensions are positively related to

effective leadership performance: *problem-solving skills*, *social judgement skills*, and *knowledge*. According to the authors, *problem-solving skills* encompass being able to identify and understand organizational problems, as well as having the creative ability to generate new and unusual solutions to these problems*. Social judgement skills* include having the capacity to understand people and social systems while being able to motivate, direct, and gain the support of the workforce to solve problems and implement changes. Lastly, while these first two categories reflect specific skills, the third aspect is *knowledge*. As the authors explain, *knowledge* is inextricably linked to leadership and problem-solving, as it directly influences a leader's ability to solve an organizational problem and implement a solution. Mumford *et al*. (2000) describe *knowledge* as not only an accumulation of information, but also in terms of complex mental models for learning and organizing data. The skill-based model Mumford *et al.* (2000) created also includes three other components: *individual attributes* (such as cognitive ability, personality traits, and motivation – which help leaders develop and apply their competencies), *career experiences* (which shape the characteristics and competencies of a leader), and *environmental influences* (such as natural disasters, economic issues, the expertise of subordinates – which all can affect a leader's performance). While the three main competencies are directly affected by these additional components, the focus will be given solely to the three main competencies since these are developable dimensions that were proven to be most effective in achieving a positive outcome for overall leader performance (Northouse, 2007).

Figure 1

Skills Model of Leadership



SOURCE: Northouse, 2007 adapted from "Leadership Skills for a Changing World: Solving Complex Social Problems," by Mumford, Zaccaro, Harding, Jacobs, and Fleishman, 2000, *Leadership Quarterly, 11*(1), 23.

Thus, the skill-approach model by Mumford *et al.* (2000) provides a framework for understanding key categories of skills for effective leadership. It will be used to structure the integrative framework presented at the conclusion of this chapter, by incorporating the following research on leadership skills into several categories.

2.2.2 Leaders as change agents. Change has often been associated with leadership (Hechanova & Cementina-Olpoc, 2012). According to Kotter (1996, p. 25), *''leadership defines what the future should look like, aligns people with that vision, and inspires them to make it happen despite the obstacles.''* Some research suggests that the leader's role as a change agent is critical to achieving a successful change (Halkias *et al.*, 2017; Mehta *et al.*, 2014). To illustrate, leaders can encourage experimentation and risk-taking among their staff, receive and share up-to-date information of the external and internal environment, and help employees stay focused on what must be accomplished (Mehta *et al*., 2014). Choromides (2018) also notes that a leader's

inability to fully grasp what is required to guide their organization through successful change can be a reason for failure.

Organizational leaders are often faced with a workforce that is resistant and reluctant towards change (Hechanova *et al*., 2018; Mehta *et al*., 2014). In fact, shifting the mindsets and attitudes of employees is described as being a greater challenge for those managing the change than other issues, such as cost overruns and project complexity (Jørgensen *et al*., 2009). Relatedly, research by LaClair and Rao (2002) demonstrates a direct correlation between attaining the business objectives of a transformation and effectively managing the people side of that change. Hence, leaders need to be aware of their important role during an organizational change and understand how they can become proper change agents, to effectively manage it and the people surrounding it. Similarly, a study by Wren and Dulewicz (2005) suggests that a successful organizational transformation is positively correlated with the leaders' competencies and behaviours. Research by Higgs and Rowland (2005) also emphasizes that the success of a change hinges on the behaviours of the leader during that change process. Thus, there is evidence that the leaders' competencies and behaviours have a significant impact on the success or failure of organizational change initiatives (Eisenbach *et al*., 1999; Higgs & Rowland, 2005; Mehta *et al.*, 2014). In that sense, organizations need to modify their thinking and practices around change management to do more to address the skills, attitudes, and capabilities of the people involved - particularly change leaders (Kilkelly, 2014).

2.2.3 Leadership styles for successful change management. Gilley and Gilley (2012) found that prior papers (citing Denning, 2005; Gill, 2002; Hornung & Rousseau, 2007; and Sims, 2002) suggest that many factors lessen resistance to change, including effective leadership, employee involvement, autonomy, appropriate communications, and motivation by management, to name a few. Since leaders play such a central role in ensuring a successful organizational change, what follows explores the impact of different leadership styles on change. This section demonstrates that certain leadership styles are found to be more beneficial than others during an organizational change. Like competencies, leadership styles are trainable

strategies and should be prioritized by the leaders to reach a successful organizational transformation.

First, there is evidence of a relationship between transformational leadership and positive attitudes toward change (Hechanova & Cementina-Olpoc, 2012). Transformational leadership is a process in which a leader inspires, motivates, and encourages their followers through different mechanisms, to help them seek greater capabilities beyond their own expectation (Bass, 1985). A study on transformational leadership revealed that behaviours such as developing a vision, modelling and motivating a group toward change, coaching, and creating a culture that embraces change are important in enabling transformation (Eisenbach *et al*., 1999). It is important to note, however, that Hechanova and Cementina-Olpoc (2012) acknowledge there are mixed findings on whether this relationship is direct or indirect.

Furthermore, Mehta *et al.* (2014) believe that there is not only one type of style that works. As such, they explain that the leadership approach to change should be situational, as it is the situation that determines what style of leadership one must adopt. Rather than a one-size-fits-all approach, *Hechanova et al. (2018)*'s study also suggests that change leaders need to determine the best way to lead their particular organization depending on the circumstances. To do so, leaders must be versed in engaging with their employees to better discern their position and points of view on the matter of the change. As Edvinsson (2002) opined, leading an organization in a volatile, uncertain, complex, and ambiguous (VUCA) environment is very different from leading a formal hierarchical organization in which everyone is familiar with their roles and responsibilities. Hechanova *et al.* (2018)'s study suggests that leaders who are decisive, persuasive, strong-willed and action-oriented during times of change are perceived as more effective. These execution competencies are beneficial because they help bring about the planned results and outcomes in an efficient and timely manner.

As Mehta *et al.* (2014) describe, managing change in an organization is a challenging undertaking for leaders. A leader needs to understand all the forces that exist in the environment and influence all these factors to bring about successful outcomes. Mehta *et al.* (2014) and Jørgensen *et al.* (2009) mention the single biggest difficulty in a transformational change is changing people's behaviour and mindsets. Similarly, a study conducted by Wren and Dulewicz

(2005) found that leadership behaviours such as developing followers, managing resources, engaging communication, and empowering and motivating followers were significantly related to a successful change. In other words, the leaders' role should not only encompass task-oriented behaviors such as analysis and thinking but also people-oriented behaviours, for instance seeing and feeling (Mehta *et al.*, 2014). This signifies that effective change leaders need to not only focus on the technical aspect of the change but also on the people/softer side. In reality, change initiatives do not fail because there is a lack of vision, but because the people who institute the change do not see the realities faced by the employees affected by that change (Kotter, 1996). Transformational leadership can be helpful in this regard to ensure a profound shift in attitude and motivation within the workforce. Nevertheless, leaders need to be mindful of the importance of adapting to situations, as suggested by the situational approach. Thus, it is important for them to understand the needs and concerns of their employees as well as have the tools be able to guide them through the change, depending on the circumstances, without adhering to one set of methods.

2.2.4 Ethical considerations. As By *et al.* (2012) noted, the importance of an ethical foundation in leadership and change has been discussed since the 1930s, as arguments are found in the works of Barnard (1938) on leadership, and Lewin on change in the 1940s (Burnes, 2004). An earlier study by the same authors also expresses that *"the fundamental flaw in some approaches to change is that not only are they not explicit about values, but they give the impression that it is somehow unworldly or naïve even to mention ethical considerations"* (Burnes & By, 2011, p. 248). To ensure a successful change, the two studies (Burnes & By, 2011; By *et al.,* 2012) suggest that leadership and change should be underpinned by a clear-cut system of ethics and accountability. Namely, leaders must be imbued with a moral compass fitting the organization of which they are in charge. Another study by Burnes and Jackson (2011) also found that an alignment between the values needed for the change and those participating in the change is an important factor in the success of an organizational change.

However, as Thiel *et al*. (2012) and Stiglitz (2010) point out, ethical leadership may be a necessity, but it is not sufficient enough to deter unethical behaviour. Despite having a moral

compass, leaders may in fact make poor decisions, especially in VUCA situations. Thiel *et al.* (2012) believe that putting in place ethical guidelines or hiring leaders with strong moral character is not enough to ensure ethical behaviours. According to Thiel *et al.* (2012, p. 49) *"ethical awareness is grossly misunderstood and under simplified […]. Current leaders may be more prone to unethical behaviour because they face ethical dilemmas that are simply more difficult to navigate".* In other words, leaders, in the face of change, may wind up making debatable and misguided decisions, since they have trouble making sense of their dynamic business environment in the first place. For ethical decision-making to be made in the course of a transition, several authors have argued that a sensemaking perspective is an essential skill for leaders to develop (Sonenshein, 2007; Thiel *et al*., 2012). Thiel *et al*. (2012, p. 50-59), citing Drazin e*t al.* (1999) and Weick *et al.* (2005), define sensemaking as: "*the complex cognitive process engaged in when one is faced with complex and high-risk situations [...] It requires careful scanning, interpreting and analyzing of complex ethical dilemmas."* Individual, environmental, and social pressures often restrict the veracity of a leader's sensemaking, which is why instead of relying entirely on a leader's values or moral codes, firms should take a more proactive approach in developing their leaders' sensemaking skills, which in turn will help them make more ethical decisions (Thiel *et al*., 2012).

In short, as Burnes and By (2011) explain, leadership and change are inextricably linked. More importantly, when combined with ethical values, they lead to a greater chance for a successful organizational change (Burnes & By, 2011). Promoting the ethical dimension of change is crucial to ensuring leaders act in the interest of their employees and their organization (Thiel *et al.*, 2012). Therefore, leaders, as change agents, must understand the importance of developing their sensemaking perspective to improve their ethical decision-making skills and promote ethical behaviours within the workforce throughout the change.

2.2.5 Leadership during technological changes. After acknowledging the crucial role of leaders as change agents and identifying the corresponding skills and competencies for achieving a successful change, the following section provides an account of the impact a technological change can have on leaders themselves. While the skill-based model by Mumford *et al.* (2000)

introduced general leader-centric competencies, this section serves as a basis for possible scenarios as to how a technological change, more specifically, may impact a leader's role and their skills.

A need for additional technological tools is growing as firms are competing against increased pressure to become more responsive to their competitors, as well as to meet their own customer demands. The introduction of technology in organizations has not only changed business models but has changed work structures and employment arrangements as well (Hechanova *et al*., 2018). As observed by Haddud and McAllen (2018), there are considerably more jobs that require the use of technology, which is forcing employees to exploit the technology at a much faster pace. While leadership, crisis, and uncertainty are not new themes and have been analyzed multiple times in different contexts (Hannah *et al*., 2009), the topics of change management and crisis - specific to leading through a technological change - has been less researched (Naqvi, 2017). Yet, as Cortellazzo *et al.* (2019) identified, there is a consensus among authors that introducing new technologies creates enough disturbances within firms that leadership roles can, in turn, only become impacted by them (Bartol & Liu, 2002; Geoffrion, 2002; Sousa & Rocha, 2019; Weiner *et al*., 2015 – as cited in Cortellazzo *et al.* (2019)). As with any change, an important role attributed to leaders during a technological transformation is their ability to successfully incorporate it into their firm, while simultaneously being able to inspire and motivate their employees to embrace the change, which is frequently seen as a threat to the current status quo (Gardner *et al*., 2010; Kirkland, 2014).

The introduction of technology and digital tools impacts how people work together (Barley, 2015; Schwarzmüller *et al*., 2018). As Tapscott (2014) explains, technology can enhance communication across organizations, and as a result, it can further collaborations between employees. Since teamwork and social skills are becoming more valuable, it has been suggested that leaders should adopt coaching behaviours to assist their followers in improving these skills (Schwarzmüller *et al*., 2018). Moreover, the increased connectivity and sharing of information has the effect of breaking hierarchies, functions, and organizational boundaries within firms (Cortellazzo *et al*., 2019). As such, leaders are expected to embrace a more inclusive style of leading (Schwarzmüller *et al*., 2018), by taking into account the ideas of their employees in their

decision-making. In addition, considering that computers can handle more intricate tasks, Plastino and Purdy (2018) even suggest that leaders should focus on improving the creativity and the collaboration of the workforce rather than creating order and discipline.

Overall, to lead through a technological change, leaders must learn to be both people-centric and technically minded (Diamante & London, 2002), in order for them to be cross-functional. Likewise, Naqvi (2017, p. 3) observed: *"Just as a leader who still functions with the mindset of the twentieth century will likely not go far, a leader who fails to embrace the subtleties of the cognitive revolution will not make much progress. Learning can be both process-centric (i.e., technical and business) and strategic (business strategy and models)"*. Consequently, this passage has demonstrated how the leadership role has changed with the arrival of new technologies and merging being process-centric, people-centric, and technically minded have been identified as skills needed to be developed to properly work alongside technologies.

In sum, numerous studies demonstrate the importance of leadership during an organizational change and how leader competencies and behaviours can have a significant impact on the success or failure of organizational change initiatives (Eisenbach *et al*., 1999; Higgs & Rowland, 2005; Mehta *et al.*, 2014; Van der Voet *et al*., 2016). In addition, the importance of an ethical dimension in leadership was discussed, and several studies were analyzed to identify critical leadership competencies needed during a technological change (Bratasanu, 2018; Naqvi, 2017; Schwarzmüller *et al*., 2018).

These studies are highly relevant to the research question at the core of this thesis, as they serve as a basis for understanding how the specificities of artificial intelligence might impact the leadership role and skills. While the first sections of the literature review described a more global approach to leadership, change management and technology adoption, the section that follows examines how artificial intelligence can impact the leadership role. Thus, building upon the skills identified in this section as well as the general competencies for effective leadership from Mumford *et al.*'s (2000) skill-based model, the following section delves further into research on leadership and artificial intelligence. The intention is to integrate the leadership skills found to be most efficient in an AI context to the Mumford *et al.* (2000) skill-based model.

2.3 Leadership and Artificial Intelligence

By providing managers and employees access to more accurate data and enhanced predictions, AI is seen as changing the decision-making paradigms and traditional power distribution (Di Fiore, 2018). As a result, AI is considered by some as an unparalleled radical technology with the potential to transform humanity (Brock & von Wangenheim, 2019). Nonetheless, managers are currently left with little empirical advice on how to prepare and use AI in their firm's operations (Brock & von Wangenheim, 2019). Indeed, as discussed above, implementing AI within a firm raises several questions with respect to ethical issues, as well as the leaders' role and competencies and organizational decision-making processes. Thus, as Bratasanu (2018) explains, these concerns create a need for a new dimension for leadership development.

Ross *et al.* (2017) found there are three major perspectives when it comes to forecasting how AI-based technologies will support and change work practices. First, they found that some authors, such as Aagaard and Pedersen (2015), believe it might disempower the managers and workers by forcing them to become subordinates to the dictates of data analytics and associated algorithms. They also cite a research paper written by Chen *et al.* (2012) who questioned to what extent human cognitive processes might get replaced by prescriptive data analytics. The second perspective discussed by Ross *et al.* (2017) is the *Big Brother* scenario. In this scenario, the authors mention the works of Braverman (1998) and Jaros (2001) who believe that the ongoing data analysis is present to monitor the workforce, to further increase managerial control. Lastly, the third perspective, which is the most featured and agreed upon in AI literature, suggests that introducing data analytics and AI will *"empower managers and workers by allowing them to use this information to improve workplace efficiencies and replace "gut instinct" or ad hoc decision-making with evidence-based data analytics"* (Ross *et al.*, 2017, p. 121). Referring to the work of Ferguson (2012), the authors explain that AI will enable the workforce to become more productive and efficient.

As argued above, the amount of data being collected by organizations is shifting the workplace, and more specifically altering the roles and tasks associated with leaders. As more decision-making has become data-driven, it is likely that the competencies of leaders will need

to be modified as well. Developing new competencies will allow them to work in this new data-driven environment properly and successfully.

Murawski and Bick (2017) found that rigorous academic investigations of workforce competencies in relation to big data, and as such artificial intelligence, are rare. They point out the work of Debortoli *et al.* (2014) which identified that most of the existing publications on the topic are essentially exploratory, anecdotally described and often regarding specific data-driven occupations such as mobile analysts (Brauer & Wimmer, 2016) or data scientists (Patil & Davenport, 2012; Schumann *et al.,* 2016). Brock and von Wangenheim (2019, p. 1) also explained that *"managers are left with little empirical advice on how to prepare and use AI in their firm's operations."*. It seems that further research is needed to offer a consolidated outlook on leadership competencies in an AI context. The goal of this upcoming section is to consolidate all the works that have identified successful leadership competencies in an AI context, in the hopes of contributing to a larger perspective on the topic by integrating them into the Mumford *et al.* (2000) skill-based model.

The competencies identified in the literature seem to reflect three different categories of skills. As such, they were grouped accordingly to offer a more streamlined approach: *business-related competencies*, *technical competencies*, and *ethical competencies*. The *business category* encompasses the social and managerial skills needed to lead a team in the context of an AI. The *technical category* includes the technological competencies leaders will need to develop to overcome the flaws in AI systems and will showcase, as well, how leaders who possess these technical skills will replace those who do not. Finally, the *ethical category* explains the importance of being an ethical leader in an AI context, by describing how to become an ethical leader and how firms can go about improving the moral characteristics of their leaders.

2.3.1 Business Competencies. This section investigates the business skills managers are required to develop to properly lead a team in the context of an AI. This first category of skills includes acquiring an experimental mindset and accepting failure as part of progress, promoting original thinking and developing intuition, and, finally, identifying how these skills will allow

leaders to develop a comparative advantage over the technology as well as help build trust in the AI systems.

Accepting experimentation and failure. The new business paradigm, in which organizations are now relying more heavily on data, has engendered a cultural shift in organizations (Carillo, 2017). Whereas failure was severely condemned and seen as a fireable offence in such a highly competitive world, Carillo (2017) notes that it has become a positive mechanism in the big data world. Machine learning, as an application of AI, provides the system with the ability to improve through trial and error, and as such, as the author explains, leaders should acquire the same experiential mindset in which one learns from failures and progressively improves through various cycles of experiments and actions. The author, however, does express the difficulties that arise with such a culture shift: *"it contradicts the basic nature of a manager's job: time is money and failing costs even more money"* (Carillo, 2017*,* p. 615). In his paper, he continues by stating: *"it is only through direct experimentation that one can seize that incremental learning allows to reach higher ends*" (Carillo, 2017, p. 615). To understand the benefits of AI, managers should give their own teams the possibility to experiment with the technology and supply them with a reasonable timeline to deliver the results, as well as sufficient funding. This would benefit them by giving them enough support to continuously learn through several loops of fail-and-learn processes and provide them with an understanding that "failure culture" is accepted and seen as an acceptable form of development (Brock & von Wangenheim, 2019; Carillo, 2017). In addition, this trialability strategy will not only help employees better understand the AI systems, by experiencing the true benefits, but it will also result in reducing the perceived risk and resistance surrounding the technology and consequently will develop a workforce that trusts the AI systems (Hengstler *et al*., 2016).

Promoting Original Thinking. For the leader and their team not to be seen as obsolete or not automatable in this day and age, leaders should promote original thinking. As a paper explains: *"originality was the most important job characteristic in relation to its nonsusceptibility to computerization"* (Perkio, 2015 as cited in Ross *et al.*, 2017, p. 132). Thus, when a task or a job

requires creative problem solving, Ross *et al*. (2017) agree it is improbable it will become computerized in the near future. This indicates that leaders who want to keep themselves and their teams relevant in an AI context should promote original thinking and creative problem-solving to ensure they keep a comparative advantage over the technology.

AI-based leadership decision-making. Leaders are often faced with having to make difficult decisions. In decision-making situations, the inputs are either structured or unstructured. As Parry *et al.* (2016) observed, machines are superior to humans in making decisions when the inputs are so structured they can easily be reduced to quantitative algorithmic processes. Nevertheless, they add that this isn't the case when leaders are faced with highly unstructured data. In this circumstance, leaders hold a comparative advantage. This concept is further explored by Jarrahi (2018) who describes it as the *"new human-AI symbiosis".* This new human-AI symbiosis in decision-making is explained in more detail in the following section.

Jarrahi's (2018) research paper highlights the complementarity of humans and AI in decision-making scenarios and draws upon research written by Choo (1991) and Simon (1972) to declare there are three main challenges organizations face when it comes to decision-making: uncertainty, complexity, and equivocality. First, as described by Jarrahi (2018), Choo (1991) defines uncertainty as the lack of information on which leaders need to base their decision. It is virtually impossible to be aware of all the alternative solutions and their consequences, which makes interpreting a situation difficult and making a decision even more difficult. Then, as Jarrahi (2018, p. 581) states, *"complex situations are characterized by an abundance of elements or variables"*, making the process of analyzing them extremely challenging. Lastly, Weick and Roberts' study, conducted in 1993 (as cited in Jarrahi, 2018) defines equivocality as a situation in which there is the presence of several simultaneous, but conflicting interpretations of that same situation. Over the course of this next section, these three challenges will be further analyzed, based on the work of Jarrahi (2018), to discern how leaders should work hand in hand with their AI system to guarantee better decision-making.

The first challenge with decision-making is uncertainty. Even though an AI system makes analytical decision-making and can digest an incredible amount of information, it is less adept at

understanding common-sense circumstances, as compared to humans (Guszcza *et al*., 2017). Since uncertain or unpredictable environments cannot currently be fact-based — particularly outside of a predefined domain of knowledge, an AI system should be less relied upon in these situations (Brynjolfsson & McAfee, 2012). In this case, it is the leaders' intuition, imagination, and creativity that should be leveraged for them to retain their comparative advantage over the machine (Jarrahi, 2018). Brynjolfsson & McAfee (2014) and Dejoux & Léon (2018) have also both stated that humans hold a comparative advantage regarding intuition, imagination, creativity, as well as social interactions and empathy. Intuition not only gives leaders a comparative advantage but, as Ferràs-Hernández (2018, p. 261) explains, *"the key to scientific progress is not only to induce laws from data but to intuit which data could be used to induce laws not discovered yet. The key is to ask the proper questions, not merely to answer them."* The author's premise is that intuition is a key success factor in strategic management and leaders should develop their intuition, as it is a mental process that will be the most difficult to replicate by a machine and will ultimately aid them in making decisions in an uncertain environment and in discovering new ways of applying the data.

The second challenge is complexity. Complex situations are *"characterized by an abundance of elements or variables"* (Jarrahi, 2018, p. 581). They require processing a multitude of data, and, fundamentally, this task can be better fulfilled by an AI which possesses the computational skills to analyze all the data at a much quicker speed than humans. As Jarrahi (2018) discusses:

> *"Coupled with big data, algorithmic decision making has opened up new opportunities for dealing with complexity and presents more effective ways of equipping human decision-makers with comprehensive data analytics. AI has the advantage of brute force, making it a rigorous tool for retrieving and analyzing huge amounts of data, ameliorating the complexity of a problem domain."* (Jarrahi, 2018, p. 581)

In this situation, leaders should be wary of their own limited thinking capacity and learn to recognize they should rely on the machine's objectivity to achieve success. According to Herbert Simon's concept of bounded rationality, humans are restricted by the information

they've gathered, their cognitive abilities, and by the time it takes them to properly make the decision (Simon, 1972, as cited in Migliore & Chinta, 2017). As Migliore and Chinta (2017) explain by quoting Simon (1972), a leader's bounded rationality can, unfortunately, result in less-than-optimal decision-making, since the decision is solely based on what they believe to be true. In an AI context, however, Migliore and Chinta (2017) declare that the machine can help in improving the decision-making by analyzing datasets present outside of the leader's bounded rationality. With AI algorithms being able to assist leaders in decision-making, especially in complex situations, such leaders will need to learn to "*overcome the evolutionary instincts deeply ingrained in human consciousness"* (Naqvi, 2017, p. 248). Specifically, as Naqvi (2017) recommends, leaders should learn how to rely on the machine's objectivity. It has been explained in the previous section that leaders should develop their intuition as it offers them a comparative advantage in uncertain and equivocal situations. Nonetheless, in complex situations, Migliore and Chinta (2017) believe leaders should be comfortable relying on the AI systems' predictions, rather than only on what they think they know. As Naqvi (2017, p. 248) suggests:

> *"Pilots are trained to do that – as Federal Aviation Authority reports that in challenging flight situations, pilots are taught to rely on their primary instruments, rather than their senses when controlling the aircraft (Wiegmann et al., 2005) – and executives would need similar training*".

Overall, in terms of improving decision-making, AI can assist leaders in collecting and analyzing the data from complex situations, while leaders can improve the algorithms by selecting which data streams the AI should analyze. Leaders should know that a human-AI symbiosis can help them in complex situations, but ultimately, they should have the final say in reaching the conclusions and in choosing the appropriate course of action to undertake the decision (Jarrahi, 2018).

The third and final challenge in decision-making is equivocality. Jarrahi (2018) opines equivocality happens often when there are conflicting interests between stakeholders, customers, and policymakers. The author explains that decision-making should be an impartial

and objective process. Nonetheless, when there are conflicting interests present, Jarrahi (2018, p. 581) describes the decision-making process as transformed into "*an inherently subjective and political process that attempts to fulfill the conflicting needs and objectives of multiple parties".* In this case, handling equivocality is largely the role of a leader, rather than an AI system. While the technology could overcome certain equivocal situations, the author further explains that leaders have stronger competencies in interpreting the political landscape both inside and outside a firm, as well as having the skills to successfully negotiate certain decisions into fruition. These are skills leaders should focus on since machines can only determine the optimal decision; they currently cannot, for example, build coalitions or alliances in order to sell it to a diverse set of stakeholders (Jarrahi, 2018). These specific skills include learning to convince others of the indispensability of their decision, being persuasive and excelling in negotiation skills to outperform the machines in the *"social and political dynamics underlying equivocal decision-making situations"* Jarrahi (2018, p. 582).

Overall, in line with Jarrahi's (2018) claim, when it comes to decision-making, this new human-machine symbiosis presents a shift in the division of work between humans and machines. Though AI does have superior qualities in a complex setting, leaders need to clearly understand what their comparative advantages are over the machines and leverage them accordingly (Jarrahi, 2018). In this case, it is their intuition – to make sense of the uncertainty of some situations, and their persuasion and negotiating skills – to fulfill the opposing needs of various parties. This relationship is also supported by Dejoux and Léon (2018) who believe AI can and should augment human decision-making.

Building Trust. Winfield and Jirotka (2018) stated that building trust in AI systems is vital for the benefits of such machines to be realized. Though, as noted earlier in this chapter, while some research did support an optimistic view of AI (Brock & von Wangenheim, 2019; Susskind & Susskind, 2015), managers should still be made aware that employees might fear being displaced or dismissed and should address this fear proactively. It is by addressing such concerns proactively that leaders will more likely achieve employee adoption (Brock & von Wangenheim, 2019). McKnight *et al.* (2002) also revealed the importance of initial trust when it comes to new

technology. According to the authors, the perception of risk needs to be overcome to create enthusiasm for the technologies. As Winfield and Jirotka (2018, p. 2) declared, *"there is also no 'formula' for building trust, but it is known from experience that technology is, in general, trusted if it brings benefits and is safe and well regulated"*. As stated above, offering employees a trial-and-error experience has also been proven to be an effective manner in building trust (Hengstler *et al.,* 2016). Finally, leaders can also help their employees build trust by providing them with an understanding as to how the technology functions, as it's been proven to create a trust which is more stable than trust solely based on the reliability of the performance (Lee & See, 2004). In short, leaders should understand how essential it is for them and their team to build trust in the AI systems, for their own benefit as well as for their employees. It is by having an understanding of such systems that trust can be built and accomplished, and it is through that trust that employee resistance can be diminished, and employee engagement can be achieved. It is, therefore, crucial to identify the specific technical competencies leaders might need to achieve such trust.

In conclusion, this first section of competencies investigated the business skills managers are required to develop to properly lead a team in the context of an AI. The literature suggests that leaders need to acquire the same experiential mindset as an AI system and its machine learning algorithms, in which one learns from failures and progressively improves through various cycles of experiments and actions (Carillo, 2017). Not only should the leader acquire such a mindset, but they should also allow their employees to do the same, as it is through experimentation that they will understand the benefits of the AI and trust the technology (Hengstler *et al.*, 2016). Furthermore, leaders should promote original thinking and creative problem solving within their team, to ensure to keep a comparative advantage over the technology (Perkio, 2015; Ross Peter *et al.*, 2017).

Additionally, when it comes to decision-making situations, leaders should promote a human-AI symbiosis (Jarrahi, 2018). In complex situations, where the AI possesses the computational skills to analyze more data, and at a much quicker speed than humans, leaders should learn to rely on the machine's objectivity (Naqvi, 2017). However, they should also need to clearly understand what their comparative advantages are over the machines and leverage

them accordingly. In this case, the skills that should be developed is their intuition – to make sense of the uncertainty of certain situations, and their persuasion and negotiating skills – to fulfill the opposing needs of various parties in equivocality situations, as AI systems, currently, do not hold superiority over humans in these dimensions (Jarrahi, 2018).

Lastly, it is crucial for leaders to help their employees build trust in the systems, as it is only through building the trust that enthusiasm for the technology is created and employee adoption is achieved. Not only does trusting the AI system help the employees benefit from it, but proactively handling the fear it can create within the workplace can aid leaders in diminishing the appearance of employee resistance (Winfield & Jirotka, 2018; Zuboff, 1988). It has been proven that trusting the AI can be achieved through understanding the technology surrounding it (Lee & See, 2004). It is therefore crucial for leaders to develop technical competencies for them to help build that trust within their team. The following section will further analyze such competencies.

2.3.2 Technical Competencies. As Antonescu (2018, p. 18) declared, *"AI will not replace business leaders but business leaders who are prepared and understand AI will replace those leaders that do not."* As one study notes, big data analytics may not guarantee a sustainable and positive effect on an organization's performance because of its many complications (Niebel *et al.,* 2019). To reach success, it is essential for leaders involved to understand its risks and flaws and to learn to interact with the technology correctly and appropriately. This upcoming section identifies such limitations, as well as the technical competencies needed to adequately address these limits. Furthermore, it also explores other positive consequences to developing AI-specific technical competencies, such as being able to contribute to their staff's innovative work behaviour, as well as allowing the leaders to become cross-functional.

Understanding its limitations. Even though algorithms make quick and accurate predictions, Carillo's (2017) paper, discussing the works of Luca *et al. (*2016*)* and Davenport *(*2013), observes that leaders need to be made aware of the technology's limitations to overcome its flaws and minimize the risk of mistakes and user error. The following section identifies three

main limits to an AI system discussed in Carillo's (2017) research paper and subsequently the competencies needed to adequately address these limits.

First, algorithms can suffer from myopia. As observed from Luca *et al.*'s study, completed in 2016 (as cited by Carillo,2017), since the data inputted into algorithms usually focuses on short-term outcomes, *"there can be a tension between short-term success and long-term profits and broader corporate goals"* (Carillo, 2017, p. 16). This drawback, resulting from a lack of knowledge, can be addressed, as Carillo (2017) suggests, by teaching leaders to identify which questions can be answered by an AI, and which ones cannot. Drawing from Luca *et al.* (2016), Carillo (2017) adds that the key is understanding that myopia isn't caused by the algorithms themselves, but rather by the leaders' interactions with them. As Carillo (2017) explains, AI can suffer from myopia in the hands of a leader who only focuses on short-term outcomes. Long-term profits, on the other hand, can only be achieved, with an AI, if leaders formulate clear long-term objectives which will, in turn, help them identify the relevant data sets needed to build an algorithm with a broader outlook.

Secondly, Carillo (2017) identified another risk: poorly interpreting the data can lead to inaccurate results. Discussing the work of Davenport (2013), Carillo (2017) warns that leaders should be made aware that results delivered from AI systems aren't causal relationships, there are instead correlations. Carillo (2017) further explains that leaders are required to be sufficiently technologically competent enough to avoid being misled by such conclusions and carry out decisions on erroneously interpreted data.

Lastly, managers should know that established AI algorithms, as well as their data and results, cannot easily be transferable from one context to the next. The work of Luca *et al.* (2016) warns managers that predictions made in one circumstance cannot necessarily be applied in the same manner in another situation. To determine whether such an algorithm could be transferable, Luca *et al.* (2016) suggest that managers identify the differences between each context to determine if the algorithm would be of use and adequate in another circumstance.

In sum, leaders will need to understand the risks and flaws of an AI system to learn to interact with the technology correctly and appropriately. Such limits to the technology are its myopia, the ease with which leaders can erroneously interpret its predictions, and how difficult

it is to properly transfer it to another context. Respectively, the technical competencies needed to adequately address these limits are: knowing how to formulate clear long-term objectives in order to determine the relevant data sets needed to build an AI able to aid with broader corporate goals, being able to correctly interpret AI predictions by being cognizant it only identifies correlative patterns in data (rather than implying causation) and knowing how to communicate that distinction to their staff, as well as developing the skills needed to clearly determine whether an established AI system could be transferred in another context.

After having investigated the limits of an AI system and its relevant competencies to address them, the following section will explore how having learned AI-specific technical competencies, in turn, prompts two positive outcomes for the leaders' development.

Encourage employees' learning and innovation. Leaders with technical knowledge can contribute to the motivation and innovation of their employees' (Van Minh *et al.*, 2017). As Van Minh *et al.* (2017) describe, employees will most likely confer with their managers on work-related problems if the leaders themselves have demonstrated enough sufficient current knowledge on the subject, are able to accomplish technical duties and can assist their employees with technical questions they may have. The authors demonstrated that having a leader who is available to guide the employees through technical difficulties, brings about a sense of obligation and commitment. As a result, employees will want to consult their leader more often and exchange knowledge, which culminates in self-learning behavior. This study focused on technical skills in technology-intensive industries, and it could be believed the same results could be found for leaders in an AI context.

Greater cross-functional perspective. It has been acknowledged that being a leader with a stronger understanding of data analytics results in a greater professional advantage over those who do not (Migliore & Hubbard, 2016). It is only by understanding the core principles of such technology that leaders can eventually extract its maximum value (Provost & Fawcett, 2013). Having an understanding of AI systems will also facilitate the leaders' interactions with data science teams, as they will be able to ask the correct questions and oversee the adjustments that

are needed to improve the accuracies of their model's predictions (Migliore & Hubbard, 2016). In addition to improving their collaboration with data sciences teams, such understanding will offer them the ability to enhance their decision-making, it will also allow them to identify potential threats by knowing how to use new or existing data resources for their competitive advantage (Provost & Fawcett, 2013). Overall, technical knowledge of the AI system will allow leaders to develop a greater *cross-functional perspective* by enhancing collaboration and identifying potential threats.

Consequently, it has been examined how and why developing technical competencies pertaining to AI will help leaders achieve a greater professional advantage over those that do not have such knowledge. Understanding the limits of an AI system has been addressed as being a crucial skill. Whether it is its myopia, erroneously interpreting its predictions, or knowing it is not easily transferable to another context, leaders should be made aware of its flaws and know how to overcome them. In addition, by developing technical competencies and being able to address questions and concerns about the technology, leaders will be able to better guide their staff, which will in turn also improve the employees' self-learning behaviour, as well as enhance their motivation and innovative behaviours. Lastly, having a general comprehension of how an AI system operates can offer leaders a greater oversight, by giving them the appropriate tools to effectively collaborate with data science teams and allow them to better identify potential threats.

2.3.3 Ethical Competencies. The two first sections introduced the business and technical skills leaders will need to develop to lead their teams in the context of an AI system. This upcoming section delves into a third category: ethical competencies. It is argued that ethical leaders are essential during organizational changes and especially in the presence of an AI system, as the technology brings about numerous ethical issues and concerns. To this end, this upcoming section emphasizes the importance of developing ethical competencies and identifies what an ethical leader looks like and how firms can go about improving the ethical decision-making of their leaders.

The fourth revolution and, more specifically, the introduction of AI systems in the workplace, has undoubtedly raised ethical issues (Wright & Schultz, 2018); similarly to the Industrial Revolution and the ethical concerns it prompted: labour rights, working conditions and social inequalities, as discussed by Wright and Schultz (2018) citing Habakkuk and Postan (1966). Wright and Schultz (2018) believe that despite the recent advancements in AI, the ethical concerns surrounding such automation have been less studied and are less understood. A study by Manyika *et al.* completed in 2017 (as cited in Wright & Schultz, 2018) described activities that were once believed to be safe from disruption, such as learning, tacit judgment, emotion-sensing and disease detection, and questioned who it will affect and how. Parry *et al*. (2016) also found that introducing an AI system within an organization could be a dangerous path if the firm does not incorporate moral and ethical values and if its leaders aren't given the possibility to develop such ethical competencies.

Ethical leaders can be described as individuals who "*think about long-term consequences, drawbacks and benefits of the decisions they make in the organization. They are humble, concerned for the greater good, strive for fairness, take responsibility and show respect for each individual"* (Mihelic *et al.*, 2010, p. 1). The authors add that leaders' behaviours influence the ethical values of their organizations by showing the behavioural boundaries that exists within the firm. Not only should ethical leadership be present to adequately address the ethical issues surrounding an AI implementation (Parry *et al.,* 2016; Wright & Schultz, 2018), but a research paper also argued that ethical governance is necessary to build trust in an AI system (Winfield & Jirotka, 2018). Similarly, McKnight et al. (2002) identified initial trust as a crucial factor in creating a willingness to use radically new technologies. Thus, it could be argued that leaders should practice ethical governance to incorporate moral and ethical values within their team to build trust and help promote a willingness to use AI systems.

Ethical governance can be defined as *"a set of processes, procedures, cultures and values designed to ensure the highest standards of behaviour"* (Winfield & Jirotka, 2018, p. 2). The authors presented two examples of ethical governance in an AI context: (1) employees should be permitted to raise moral concerns without fear of retaliation or offending the manager and (2) the training data inputted into AI systems should not result in discrimination against minorities,

the underprivileged, or any other individual who does not fit the profile of the training data (Winfield & Jirotka, 2018). The authors also specify that ethical governance should not only rely on effective governance but should also instill ethical behaviours in both individuals and within the organizations. New ethical principles have recently emerged concerning AI, for example, the Montreal Declaration for a Responsible Development of Artificial Intelligence, which proposes 10 fundamental values surrounding the use and development of AI systems. Nonetheless, while it is promising to notice an emergence of such principles, there is little evidence of good practice within firms (Winfield & Jirotka, 2018).

As described earlier, leaders may wind up making debatable and misguided decisions if they have trouble making sense of their dynamic business environment (Thiel *et a*l., 2012). Therefore, the authors reveal that firms should take a more proactive approach in developing their leaders' sensemaking skills since it will help them make better sense of complex and ambiguous ethical dilemmas and improve their ethical decision-making as well as allow them to promote ethical behaviours in the workforce.

Thiel *et al*. (2012) offer four trainable sensemaking strategies that are described as being able to assist leaders when navigating ethical dilemmas in an organization: emotion regulation, self-reflection, forecasting, and information integration. The upcoming definitions and examples all stem from Thiel *et al.* (2012). First, emotion regulation provides leaders with the tools to detect their emotions and regulate them to encourage sound judgement, especially in uncertain and equivocal situations. Second, self-reflection: by drawing information from prior experiences such as causes, consequences, and contingencies, leaders will be better suited to reflect on their motives, which in turn will help them make an informed decision on the current ethical dilemma they are facing. Third, by making future assessments through forecasting, leaders can learn to predict the consequences of their different potential decisions and improve their skills in refining the appropriate courses of action to reach an ethical solution. Finally, information integration is defined as *"a continuous process by which information is interpreted at each step of the sensemaking process and applied or not applied to currently active mental models"* (Thiel *et al.*, 2012, p. 58). The nature of the information and how it is integrated greatly impact the ethical decision-making process. Leaders should be made aware of the techniques that aid or hinder

information integration, as integrating information thoroughly will contribute to improved mental models and subsequently better ethical decisions. These four developable skills are found to improve leaders' sensemaking and as a result help leaders enhance their ethical decision-making and risk assessments (Thiel *et al*., 2012). It could also be believed that such skills will provide leaders with the tools to better examine the unique ethical dilemmas brought by AI systems

As previously stated, organizations introducing AI systems are faced with numerous ethical issues and concerns including privacy, discrimination, and accountability, among other items. Winfield and Jirotka (2018) identified ethical governance as a necessary step to building employee trust in an AI system. Two examples were addressed: employees should be permitted to raise moral concerns without fear of retaliation and training data inputted in AI systems should not result in discrimination. In addition to implementing these two practices in their organization, leaders should also develop their sensemaking abilities as it is proven to help them enhance their ethical decision-making (Thiel *et al.*, 2012)

2.4 Synthesis and Integrative Framework

The previous section identified and consolidated studies on successful leadership competencies in an AI context. As a result, the literature seemed to reflect three main categories of skills: *business-related competencies*, *technical competencies*, and *ethical competencies*. The *business-related competencies* encompassed the social and managerial skills needed to lead a team in the context of an AI. *The technical category* included the skills leaders should develop to overcome the flaws in AI systems and showcased, as well, how leaders who possess these technical skills will replace those who do not. Finally, the *ethical category* demonstrated the importance of becoming an ethical leader and practicing ethical governance to build employee trust in an AI system. Ethical practices were identified and specific sensemaking abilities were addressed as developable skills to help leaders face the numerous ethical issues and concerns surrounding AI technologies.

The goal of this final section is to consolidate all the competencies into an integrative framework, in the hopes of contributing to a larger perspective on the topic of leadership in an

AI context. The integrative framework is based on Mumford *et al.* (2000)'s skill-based leadership model and extended to include the key leadership competencies identified in the previous sections as being essential in an AI context. As such, the following section begins with an overview of the Mumford *et al.* (2000) model and then continues with the modifications that were made to incorporate the AI-based leadership competencies identified in the literature.

To begin, the skill-based model (Mumford *et al.* 2000) is comprised of five components: individual attributes, career experiences, environmental influences, leadership outcomes and competencies. However, the focus is given solely to the competencies category since it is a developable dimension and Northouse (2007) has explained it is the most effective component to achieve a positive overall leader performance. The competencies category includes *problem-solving skills*, *social judgment skills*, and *knowledge*. According to the authors (Mumford *et al*. 2000), *problem-solving skills* encompass being able to identify and understand organizational problems, as well as having the creative ability to generate new and unusual solutions to these problems. *Social judgement skills* include having the capacity to understand people and social systems while being able to motivate, direct and gain the support of the workforce to solve problems and implement changes. Lastly, while these first two categories reflect specific skills, the third aspect is *knowledge*. As the authors explain, knowledge is inextricably linked to leadership and problem-solving, as it directly influences a leader's ability to solve an organizational problem and implement a solution.

With the description of the skill-based model (Mumford *et al.* 2000) completed, the following section shares how the structure of the model was changed to include the AI-based leadership competencies identified in the literature. Firstly, the *business skills* category identified in the literature review was found to include competencies linked to two original categories from the Mumford *et al.* (2000) model: *problem-solving skills* and *social judgment skills*. As a result, the business competencies were separated into these two categories. Secondly, the original *knowledge* component of the Mumford *et al.* (2000) model was altered to become the *technical skills* category. *Knowledge* is defined as *"the accumulation of information and the mental structures used to organize that information. [...] [it] emerges from the facts and the organizational structures we apply to them."* (Northouse, 2007, p. 51). The *technical skills*

identified in the literature review are the competencies acquired through learning about the technical limits of an AI, such as myopia. As such, it was decided that the *technical skills* category represents *"the accumulation of information*" and the *"facts"* dimension of the *knowledge* category expressed by Northouse (2007, p. 51), as it shows the leader as becoming more knowledgeable and better suited to react to the complex technical issues brought on by the presence of an AI system. Thirdly, the third modification was to add an *ethical dimension* to the model, since it was said that introducing an AI system within an organization could be a dangerous path if the firm does not promote ethical leadership to help leaders make better sense of complex and ambiguous ethical dilemmas and improve their ethical decision-making. Finally, in the interest of clarity, each competency is accompanied by a *purpose* section. The goal of the framework is to present a skill-based model for effective leadership in an AI context, as such, the *purpose* section was added to clarify how developing each competency will result in becoming a more effective leader in an AI context.

Table 1

Leadership competencies in an AI context.

PROBLEM-SOLVING	
COMPETENCY	**PURPOSE**
Promote original thinking	To retain a comparative advantage over the AI
Develop intuition for uncertain and equivocal situations	Difficult for an AI to replicate and allows the discovery of potential new ways of doing
Learn to give in to the machine's analytical strength	The goal is to reach a human-AI symbiosis with strong analytical decision-making (in which humans still have a final say)
Learn to rely on the machine's objectivity in complex situations	In complex situations, a leader's bounded rationality can unfortunately result in less-than-optimal decision-making, since the decision is solely based on what they believe to be true
SOCIAL JUDGMENT	
COMPETENCY	**PURPOSE**
Allow for a "failure culture" by acquiring and promoting an experiential mindset	Direct experimentation allows for proper understanding of the AI system and helps build trust
Able to interpret the political landscape, excel in negotiation skills and in being persuasive	To outperform the machines in the social and political dynamics underlying equivocal decision-making situations
Improve and build employee trust in the AI systems by sharing the benefits they'll reap from it and demonstrating how safe and well-regulated it is	To create enthusiasm for the machine and achieve employee engagement
TECHNICAL	
COMPETENCY	**PURPOSE**
Formulating clear long-term objectives to determine the relevant data sets needed to build an AI system for broader corporate goals	Understanding the limits of an AI system allows to minimize user error
Correctly interpreting AI predictions by being cognizant it only identifies correlative patterns in data rather than implying causation + knowing how to communicate that distinction to their staff	

Determining whether an established AI system could be transferred in another context.	Understanding the limits of an AI system allows to minimize user error
Be available and knowledgeable to guide employees through technical difficulties	This allows to contribute to the motivation and innovation of their employees, which culminates in self-learning behavior, as well as enhance their motivation and innovative behaviours
Aspire for multi-departmental collaboration	Understanding AI systems will facilitate the leaders' interactions with other teams and allow to improve the accuracies of their model's predictions and identify potential threats
ETHICAL DIMENSION	
COMPETENCY	**PURPOSE**
Practice ethical governance (1. Employees should be permitted to raise moral concerns without fear of retaliation or offending anyone. 2. Ensure training data inputted into AI systems do not result in discrimination)	Necessary step to building employee trust in an AI system and promote ethical behaviors in the workforce
Emotion regulation: to detect their emotions and regulate them	Encourages sound judgement, especially in uncertain and equivocal situations
Self-reflection: by drawing information from prior experiences such as causes, consequences, and contingencies	Leaders will be better suited to reflect on their motives, which in turn will help them make an informed decision on the current ethical dilemma they are facing
Learn to make future assessments through forecasting	Leaders can learn to predict the consequences of their different potential decisions and improve their skills in refining the appropriate courses of action to reach an ethical solution
Improve information integration	Leaders should be made aware of the techniques that aid or hinder information integration, as integrating information thoroughly in the sensemaking process will contribute to better ethical decisions

Chapter 3

Methodology

Following the literature review and the presentation of the integrative framework summarizing the literature on AI leadership competencies, this chapter presents the methodology used to approach and answer the research question: **In the context of an artificial intelligence system implementation, which key competencies should managers acquire to thrive in the presence of the technology and lead a successful employee adoption?** It starts with an explanation of the data collection method and continues with the description of the data collection process, including the recruitment and interview process. It also shares a description of the final sample and presents the coding procedure used to analyze the data.

3.1 Research Design

As research is still growing on the managerial competencies required to facilitate an AI implementation, this study is primarily exploratory in nature. As such, interviewing participants that have been at the forefront of an AI implementation was deemed essential to collect as much knowledge and depth as possible as to what these changes in competencies might be. In-person interviews are a widely accepted technique to seek insights from those who have experienced or are experiencing the phenomenon in question (Collingridge & Gantt, 2008; Wimpenny & Gass, 2000).

Data were collected through semi-structured interviews. The choice of favouring semi-structured interviews was made to explore specific topics using an interview guide, while also having the flexibility to explore other areas as they emerge in the conversation. Semi-structured interviews allowed for open-ended questions, which could be modified depending on the function or role of the participant being interviewed.

An interview guide (Appendix A) was created to guide the respondents through different topics. Some of the questions included in the interview guide were: *Can you share a brief history of the AI implementation? What kind of training were you offered? How adjusted would you say*

your employees are to this new technology? What did you, as a leader, do to prepare you and your employees for these changes? (Is the participant bringing up trust and ethics?). The interview guide was largely based on a preliminary review of the literature, which identified three main categories of skills: business skills, technical skills, and an ethical dimension to leadership. These categories were then transformed into questions and sub-questions to explore their specificities further. Due to the diversity of the sample, some sections of the interview guide were prioritized over others during an interview, depending on the role of the participants and their connection to an AI or role during the AI implementation.

Once the interview guide was prepared, a pilot interview was completed. According to Kvale (2008), a pilot interview allows to strengthen the interview questions, by helping to identify any flaws or limitations within the interview design that would require adjustment before completing the rest of the interviews. As it was anticipated that candidates would be difficult to recruit due to the novelty of the research topic, the pilot interview took place with a participant outside of the field of study, so as to not lose a high-quality participant to that process. The pilot interview was completed by an individual specialized in human resources, who offered suggestions: to rewrite several questions for added clarity and change the order of some questions to establish a more logical sequence. Once that process was completed, it was time to identify potential participants. As described below, this procedure was more difficult than expected.

3.2 Data Collection – Recruitment, Sample, and Interview Process

Data collection took place between February and September 2019. At the outset, the ideal interviewee was a manager, whose team was comprised of at least three employees, and whose organization had recently introduced an AI within their department. These criteria were chosen given the focus of the thesis on the impact of AI on leadership roles.

Moreover, the choice of which type of AI to include in this project was important, since the approach to – and collaboration with – a specific type of AI can vary widely. Considering that AI can take various forms, it was decided that the thesis would not include robots and only focus on machine learning-based predictive analytics, offering improved decision support, as well as

helping to optimize processes. The AI would need to require human collaboration in order to function, since the aim of this study was to understand the impact it could have on the employees, mostly managers. The participant could also be a non-technical employee, having a limited understanding of AI systems and computer science, and could work within any department in the organization.

During the early stages of the recruitment process, however, it became clear that the original criteria would need to be modified to find participants for the study since very few respondents were found that matched those exact criteria. Three main difficulties arose. First, few companies have actually finished implementing an AI. Second, most organizations that had been identified as having implemented an AI, had either a) implemented an AI within their manufacturing processes in the form of robots or b) implemented an AI within their call center in the form of chatbot – both of which are not the type of AI the thesis focused on. Finally, the few who had been identified as having implemented the type of AI preferred in this study were not interested in being included in the project.

As a result, the sample criteria were simplified and the scope widened to include any and all individuals who, through their work, gained sufficient knowledge in AI to share how the implementation of such a technology would impact the manager's function within an organization and their team. The modifications made of the sample criteria did not impact the interview guide per se. The focus and the questions were slightly adapted to be address all industries, careers, and job positions, since a wider range of individuals would now be identified.

3.2.1 Recruitment. As mentioned previously, identifying candidates, even after having modified the criteria, proved to be difficult. A variety of methods were used to identify potential participants, such as networking, social networking websites, and web searches to locate companies that had implemented an AI. Many AI software companies' websites were examined in the hopes of identifying possible clients, who could then be directly contacted. From this, over 30 individuals were contacted on the social networking website LinkedIn, which in the end only resulted in one interview. The most successful strategy was networking, which led to interviewing seven participants. Networking also created a snowball sample, built as a result of participants

recommending other individuals to contact for this study. This method garnered four additional interviews. Ultimately, networking and the domino effect which it produced, led to 11 interviews being conducted. In the end, it took eight months to complete 12 interviews.

3.2.2 Sample. As shown in Table 2, the final sample includes a wide range of candidates. The variety of industries in which they work, and the diversity of their work functions allowed to gather a large amount of information which, in turn, offered different perspectives on the topic, and complemented each other well. Before presenting the table, note that each participant was given a randomly assigned code to preserve anonymity.

Table 2

Interview Sample

PARTICIPANT CODE	FUNCTION/ROLE	INTERVIEW LANGUAGE *	MEDIUM	ALONE OR GROUP	RELATIONSHIP WITH AI
A	Change Management Consultant	French	In person	Alone	Specialized in Robotic Process Automation
B **	CEO	French	In person	Group	AI Startup
C	Sales Engineer	French	In person	Group	AI Startup
D	Change Management Consultant	French	Phone	Alone	Specialized in AI
E	SVP Operational Excellence	English	In person	Alone	Working on introducing AI within its company
F	Executive Search Consultant	English	Phone	Alone	Specialized in AI profiles
G	VP RH	French	Phone	Alone	Company has introduced AI
H	Director Sales & Marketing	English	In person	Alone	AI Startup
I ***	Advisory Insight	English	Videoconference	Group	AI Startup
J	Managing Editor	English	In person	Group	AI Startup
K	Marketing Technology Manager	English	Email	Alone	Worked with an AI pilot test
L	Director	French	Videoconference	Alone	Helped implement AI within its company
M	Technology Lawyer	French	In person	Alone	Identify technologies to implement
N	Director of Knowledge Management	French	In person	Alone	Helps implement AI technologies

Notes. *Quotes drawn originally in French have been translated in English for the purpose of this study. ** Participants B and C were interviewed at the same time. *** Participants I and J were interviewed at the same time.

3.2.3 Interview Process. The interview process was relatively similar across participants. Each individual first had to agree to take part in the study by signing a consent form. If the interview was done over the phone or through videoconference, the consent form had to be signed and sent over prior to the interview being conducted. In-person interviews were preferred, as it has been suggested as the best method to collect insights (Collingridge & Gantt, 2008; Wimpenny & Gass, 2000).

To capture the interview data more effectively, the interviews were recorded, and candidates were asked to give their permission through the consent form. As Jamshed (2014) notes, handwritten notes taken during an interview are relatively unreliable, since the researcher might miss some key points. The author further explains that recording an interview makes it easier to focus on the interview content and the verbal cues.

The interviews ranged between 35 minutes to 1h36min, those that lasted longer were usually the ones who had two individuals present at the same time. The interviews took place in a variety of places, at the convenience of the participants. Five interviews were done at a participants' office, three in a coffee shop, three by phone, two through videoconference, and one interview was completed over email. After the interviews were completed, transcripts were prepared to better analyze the information gathered.

3.3 Data Analysis – Coding and Analyzing

After completing the transcripts of the twelve interviews, the Gioia methodology (Gioia *et al*., 2013) was used to code data from interviews as *"it is designed to bring qualitative rigor to the conduct and presentation of inductive research"* (Gioia *et al*., 2013, p.15). In that regard, the transcripts would be first analyzed to identify first-order codes. Once that initial step is completed, the first-order codes would be further examined to find commonalities between them and merged to form second-order codes. From these second-order codes, it will be possible to identify the underlying themes brought forth by the participants.

To describe the process more specifically, the coding was conducted from multiple read-throughs of the transcripts. During the first round, every idea, belief or thought shared by the

participants was coded as a first-order code directly on the pdf versions of the transcripts. As the transcripts were being coded, it was clear that commonalities were appearing between transcripts; so, to keep an unbiased approach, each transcript was first coded independently from one another. Once completed, the goal of the second round of read-throughs was to reword certain first-order codes, to match them across the transcripts, when it was clear they were sharing identical thoughts, in order to avoid duplicates. By the end, 121 first-order codes were identified and compiled in an Excel table (i.e., *Be curious* n=2, *AI governance* n=4, *constant process to improve technology* n=7). To clarify, the coding process was done manually without the use of a data coding software.

Merging the first-order codes into second-order codes was done as a two-step process. First, each first-order code, which seemed to be part of a shared category or share a common concept, was assigned a color. Citations related to each category were highlighted in that color in the transcript. By the end of that step, each color represented an emerging second-order code. Color coding allowed to have a visual representation of the underlying categories that were appearing and helped to scan through the pages of transcripts with more clarity to find the commonalities. Then, the second step consisted of using the previously compiled Excel table and grouping the first-order codes by their newly found shared category. This second step acted as a validation phase to ensure all first-order codes were analyzed and all potential second-order codes were detected. Overall, 17 second-order codes were created (i.e., *Current state of AI* n=9*; Develop the ability to work across functions* n=8). The second-order codes were mostly associated with knowledge and leadership skills necessary to succeed in an AI context, which was in line with the objective of the thesis and was similar to what emerged during the preliminary review of the literature (i.e, *AI-based business competencies* and *technical competencies*). It is important to note the wording of the second-order codes might have been influenced by the results found during the preliminary literature review, even if an effort was made to stay impartial.

Once the second-order codes were established, the last step consisted of identifying the overall themes that were appearing. These themes would act as the structure of the findings chapter of the thesis. To begin, several second-order codes were found to be associated with two different themes that were unrelated to specific leadership skills: *the participants' beliefs*

regarding the current state of AI-based technologies and whether they believe *introducing an AI system differs from other change management projects, particularly other IT implementations.* These two themes, while not directly answering the research question, were kept and used as an introduction to the findings chapter, since they demonstrated how relevant the topics of AI and change management are for organizations.

Lastly, the remainder of the second-order codes were found to be related to specific categories of leadership skills or knowledge necessary to succeed in an AI context; so, the original plan was to structure the findings chapter accordingly. Analyzing the second-order codes in more detail and the context in which they were brought up by the participants, however, led to the discovery that the skills deemed important by the participants were being contextualized by specific AI-based managerial challenges they helped to overcome. The analysis found that participants brought up five main challenges that managers would be confronted with (i.e.: *constant process*, *identity shift*, *teams will shift*) and the leadership skills, identified as second-order codes, were the skills that would help managers address and overcome a specific one. The result was a deviation from the synthesis table presented in Chapter 2, which resulted in a framework categorized by skills (*problem-solving*, *social judgment*, *technical*, *ethical*). It was decided that, to portray a more realistic representation of the participants' outlook on the topic, the five challenges identified would become the five main sections of the findings chapter and, each were to be presented alongside the leadership skills and knowledge associated with contributing to resolving the challenge in question.

Chapter 4

Findings

Based on data from twelve interviews, this chapter focuses on the results of the interviews to determine the key managerial skillsets required for a successful AI implementation. The chapter starts by discussing two introductory themes found during the coding: *the participants' beliefs regarding the current state of AI-based technologies* and whether they believe *introducing an AI system differs from other change management projects, particularly other IT implementations*. By analyzing their answers, the section highlights how participants consider the hurdles from an AI implementation to be much bigger and that it creates a set of challenges unique to this new technology. This section confirms the relevance of this thesis by demonstrating that AI introduces new managerial challenges which require the development of specific skillsets.

The second and largest section of this chapter is the presentation of the five unique challenges managers are confronted with in the presence of an AI system. Analyzing the codes highlighted that participants contextualized the skills needed in an AI context by the managerial challenge they help to overcome. It was crucial to identify only the challenges that have been expressed by no less than half of the participants, to bring out the most important ones facing managers today.

4.1 An Overview

4.1.1 AI, a novelty. This section explores what participants believe to be the current state of AI. It addresses some of their concerns surrounding the novelty of the technology, the perceived ease of use, and application of such a technology. The goal is to identify certain hindrances that managers and organizations should be made aware of when starting an AI implementation, as well as ways that leaders could alleviate them. Acknowledging these concerns is a good first step in understanding the feasibility of such a project.

The current state of AI as a technology and within organizations was a theme that emerged across many interviews (n=9). This theme was created based on six first order codes found across these interviews, including: "AI has not yet been mastered" (n=4) and "organizations require a new infrastructure" (n=3). While only two participants explicitly stated the novelty of the technology, a third acknowledged that it is a technology that is neither fully understood nor whose potential has been fully reached, which is something managers should be wary of. Participant E explains how AI is similar to the oil and gas industry 50 years ago, since it is not yet ready to be fully used right away.

> *"I call the data the oil of the 21st century: there is more of it than we know how to use. We're talking about a data cloud, a data lake, we no longer have a data swamp. That is to say, we have a lot of data which is disorganized, which is in gigantic masses, but it is not refined. [...] So, the data, you have to know, like oil exactly once century ago, how to extract it and refine it. Once refined, you must distribute it, monetize it, and give it maximum added value. We are now in the understanding of the data, like exactly a century ago in oil, and it took 50 years for the oil infrastructure to be created, with oil refiners, extractors, distributors, with all the companies who were wondering: do I have to do it myself? Can I give it to other people? Do I have to invest in it? What is the level of investment that I need? If I invest in these assets, will I be able to duplicate them? We have exactly the same questions on the data. Do we have to keep the data to ourselves? Can we give it to third parties to process it? If so, to whom does this data belong? What is the intellectual property right on the results? Will I be able to trust if I give the data, and then keep the result? Should I not trust it? What are the legal barriers to that? These are exactly the same questions that arise, and we are very junior, we do not know."* (Participant E)

In addition to saying the technology is still underdeveloped and many unanswered questions are still remaining, the participant also addresses how understanding its components is crucial to move forward:

> *"Since there is a buzz surrounding AI, we take it for granted that we are proficient in it, but in fact we don't manage any of these elements really well […]. Everyone invests a lot in AI, but no one has yet really understood all of its components, so no one has a robust, replicable, industrializable end result, with proven benefits – because we simply haven't made it there."* (Participant E)

While other participants also mentioned how the infrastructure of most organizations might not be ready to host an AI (*"I still think we are a little way from being well adjusted to AI technologies, mainly because of the fragmentation within our systems and data – this is a huge*

blocker"; Participant K); some explained how starting by institutionalizing the capacity for automation might be a good first step to welcoming an AI in an organization (n=3):

> *"In general, organizations will first build an automation capability into their businesses. In terms of evolution, maturity, and even in terms of industry maturity, we start with automation and then we eventually go more into the cognitive. It's easier and it's a little less scary, because it's just a robot, it will always do the same action."* (Participant A)

Finally, a select few said that organizations who have already implemented AI are either those that have the maturity and financial means to do so (n=2), or simply because the type of AI being implemented is rather straightforward to use (n=2):

> *"We have search engines that integrate AI, but it's transparent, it doesn't change anything. It's like Google. So, people use them and there is no adoption challenge. It works and they don't ask questions. As long as it helps them get good results quickly. This is easy. It's really when there is a change in the way things are done that it becomes an issue." (Participant N)*

> *"It is rather the bigger organizations that will import AI and machine learning. It is those who can really afford it. To start a project, a proof of concept… These are organizations that are very mature." (Participant A)*

This is important to note for leaders whose firms are planning to, or are, introducing an AI system. Acknowledging these concerns can act as a good first step in understanding the feasibility of such a project. This first theme explored AI as a novel technology and it has shown that the technology is still at its beginning stages, with, still, many unanswered questions. Starting to build an automation capability into the business and using straightforward AI tools are good ways to start introducing this technology within an organization for a successful adoption.

4.1.2 Similarities and differences with other technologies. This second section will analyze if participants believe introducing an AI system differs from other change management projects, particularly other IT implementations. If true, this would imply the importance for managers to develop new skillsets, or at the very least gain new knowledge on how to approach these unique challenges.

To start, half of the participants mentioned that some parts of an AI implementation are similar to any other change management project (n=6). First-order codes such as “same difficulties, but the hurdles are bigger”, “same way of approaching the employees”, and “as difficult as any implementation” were combined into one theme to help clarify how certain aspects of introducing an AI in an organization might not be much different to other change management projects.

First, two participants said that the same adopter categories can be found as with other organizational changes:

> *“Like all the introduction of any new tool, we are going to change the ways of doing things, so that may or may not create enthusiasm. Some people might say: “Ah, great a new tool”. There are early adopters who will say: “I want to learn it, use it, I want to be avant-garde”, and there will even people who’ll say: “Oh that's my future in the company, this tool there.” But there are others who resist. And that is the topic at hand.”* (Participant B)

> *“There will necessarily be a learning curve as in any technology ... but it is no different from any other technology. There are always early adopters (15%), resistors (15%), and everyone in the middle (70%), so it's like any change.”* (Participant E)

Relatedly, two others stated that it’s as big of a challenge as any other organizational change (n=2):

> *“There are a lot of other technologies that don't have AI, which are just as difficult to implement, because they change the way things are done. It's a normal change management challenge: to get employees to adopt a change in general. I think that for all organizations, deploying a technology is always an issue when it changes a way of doing things, whether there is AI or not. And it depends a lot on the training and support that is given to the users of the technology.”* (Participant N)

Even though some participants see it as big of a challenge as any organizational change, they all agree that the hurdles for an AI implementation are much bigger.

Going back to Participant E’s analogy with the oil and gas industry to showcase that last point:

> *“The barriers are greater on the other hand because we understand less, we know less, because, as I told you at the beginning, there are many more unknowns, all aspects of what we do is full of*

unknowns. When I used the analogy of oil, well now we would like to be a multinational oil company, but we don't even know how to extract, refine, develop, monetize, or distribute it. The first attempts will be failures, and it's normal and we have to accept it." (Participant E)

As for comparing an AI implementation to another IT transformation more specifically, more than a third of participants expressed how they believe AI will have a deep impact on processes, deeper than any other IT transformations done in the past (n=4). Four participants explicitly stated that organizations and managers alike will need to see it, not as a technological change, but as a cultural change.

"Be careful, do not compare AI with an IT implementation. If you do this you are on the wrong track, because you associate AI with an IT change. And like I told you, if you introduce, for example, a new customer relationship management software, yes people may be asked to change, and if you change the customs, people will resist a bit. But it's almost better to compare AI with a big change in process, a deeper change of process, of way of doing. […] *AI is, and I'm going to exaggerate it with my point, but it's 5% software, of coding, and 95% of re-imagining processes, business models, design and change management. That's what people underestimate."* (Participant D)

"It's really an almost cultural change, it's bigger than just saying "I'm going to robotize my car production line", it's a lot more than that." (Participant M)

"The main roadblock is culture. The culture of the organization. It's not technology, it's not people. It's the culture and it's the culture that you have to work on – that's where people get caught. They think it's just human. No, no, it's everyone together, it's the culture of the organization. If we value this thing, people will get on board. That's the nuance I think." (Participant G)

While it has been said that an AI implementation shares certain similarities with a change management project, and it should be seen as a cultural shift, rather than a technological change; all participants agree that its hurdles are much bigger. Additionally, it was found they all recognize that the technology brings about further underlying complexities and challenges than other change management projects. As Participant F declared:

"I think managers need to be trained so that they are aware of not only the potential (of the technology), but also the pitfalls, the risks, the ethical challenges." (Participant F)

During the analysis of all the interviews, five main challenges were identified and are found to be unique to this technology and its implementation. Since participants contextualized the skills managers need to develop by the challenge it helps to overcome, this following section will be organized by challenge. Accordingly, each of the five challenges will be a separate sub-section of this chapter. Each sub-section will first present the managerial challenge and will then include an analysis of what the participants believe to be the key skills, abilities, and knowledge managers need to develop to confront it.

4.2 Challenge no. 1 - Managers need to become technologically proficient to extract the maximum value from an AI system

This first challenge expresses the importance for managers to become technologically proficient to utilize the AI to its maximum capacity and value. While earlier in the chapter the technology was described as not having reached its full potential, half of the participants acknowledge that having a basic understanding of the technology will allow managers to extract its current maximum value and help move the technology forward (n=6). As such, multiple participants declared that managers not only need good business acumen, but it is essential that they develop technological competencies as well, to bridge the gap between the business and technology silos of an organization. Participant D calls that becoming a *"translator"*:

> *"In terms of skills, when you start to think about AI strategy, AI strategy doesn't really exist. It's a business strategy that uses AI to achieve this goal. But to do that, you still have to be able to understand AI: what does it do? What are the limits? The possibilities? So, you can't be naive about that and say, "yes we're going to do these 12 things here". You have to understand "in my business, with this technology, there's potentially four ideas that I could do". So suddenly the expectation of the manager is that he is a translator, we call it. He must be able to understand enough about the AI to have an intelligent dialogue and to be able to know what it is and how it can add value to his business universe. Versus, what are the pitfalls and things that you shouldn't do with it? This is new. It's a gap right now and people can educate themselves and you can talk about how companies have the responsibility to train their managers. But as a manager, that's the first blind spot: They understand the business, but now they have to understand the technology enough. Not at a level 4/4, but a level 1-2/ 4."* (Participant D)

Acquiring basic knowledge of the technology, not only will help managers better maneuver the AI, but it will also allow them to identify new opportunities. As Participant J points

out, bridging the gap between business and technology will allow managers to find new uses for the AI and, consequently, make the technology flourish.

> *"Artificial intelligence is able to do things that we have not been able to do with software before, and so it unlocks new types of problems that you can solve that have perhaps not been thought of yet, which is why you need both the understanding of the technology and the business context. […] So right now, to identify an AI opportunity, you need somebody who has a deep understanding of the technology and a deep understanding of the business that you're applying it into."* (Participant J)

Additionally, two participants revealed that the value extracted from an AI can increase at a much more exponential rate than any other IT software, providing that the managers understand the technology and its potential. For example:

> *"They need to be able to get a grasp on the AI. They need to be interested in learning about the technology. I think that's crucial. They need to be able to understand the technologies. This is similar to whenever you have new technologies come into place. You have people that have managerial skills to manage things. And then there's the technical gap in terms of them not understanding what the actual technological solutions are. The only difference is when it comes to AI, the value you can get from somebody that has an understanding of the technology and can manage and communicate and have a very strong vision and lead a team; the value can be 20-30-40 times more than a linear way of getting value. That's the biggest differential: in terms of value that plays on managers that understand what the potential is and how you leverage it."* (Participant F)

Developing a basic understanding of the technology will therefore allow managers to bridge the gap between the business and technology silos of an organization by being able to communicate and give feedback on more technical details and share information with their employees. As a result, the opportunities and value of the AI system are expected to increase. The following passage summarizes the technical competencies managers should develop to reach that point.

The most important skills found are: "understand the knowledge engineering" (n=3), "verify accuracy of results" (n=4), and "ensure there's a need for a mechanism if an error arrives" (n=3). These three codes, grouped together, represent the views of eight participants. These first-order codes have been combined into one theme since they all relate to the idea that managers should ensure there is a human oversight surrounding the AI to minimize the risk of errors.

Participant J calls that becoming a *"human in the loop"*. As participant N explains, knowledge engineering is:

> "*The intellectual engineering behind it; how we programmed the machine. The "if such situation applies, such provision of law applies, otherwise it is such other."* (Participant N)

In addition to having a basic understanding of what knowledge engineering is, Participant J explains that managers should be allowed to participate in the development process of the technology to set up the correct red flags in the system, or at the very least be told where they have been implemented.

> *"By implementing these clear systems, you can have kind of the flags be raised, so that managers know where those flags are and are able to adjust."* (Participant J)

By building upon what Participant J shared in the interview, Participant I reveals the importance of setting up these flags: it is to allow for better control and monitoring of the system and therefore minimize the risk of "d*rifting in its judgment over time".* The participant added:

> *"We know that every time we do this task, we can have some level of confidence at the end about how successful we were. And we can surface that information through the software to administrators of the system to say: if it's below a certain threshold, make sure somebody checks it."* (Participant I)

So, not only do managers need to know about the knowledge engineering of the AI in place, but they should also be able to question which mechanisms are in place to check for errors and be able to verify that these mechanisms are at the right thresholds for minimum errors and drifting. Ensuring a human oversight will allow minimizing the risk of errors.

Three participants also pointed out that managers should understand how rigorous the data collection process is and how important it is to collect quality data (n=3). This will allow them to coordinate with the technological teams more efficiently and improve the AI results.

> *"Oftentimes you have technological teams who are able to set up the right infrastructures, but I would tell you that, from the manager's point of view, it still requires someone who understands*

quite well that developing AI solutions requires a certain rigor at the level of data collection, a certain rigor in terms of data governance and that it requires a technical environment that is unique. It's just that you need a manager who is open to that, and when the work teams tell him: it's going to take this from us, he has to understand." (Participant D)

Participant E sums up the last two points quite well:

"We must be very clear on: (1) what the inputs are, (2) what we expect from the output and (3) how we are going to check these data points... that's an aspect that's not necessarily always accepted" (Participant E)

The last competency included in this sub-section is the first-order code "learn to rely on the machine's objectivity" (n=1). While it was only brought up by a single participant, this individual conveyed it multiple times throughout the interview and was therefore deemed worthy to share. Even though Participant H is talking a specific industry, it is believed that the same could be applied to any traditional business context. In this upcoming quote, Participant H describes how employees should adopt an objective approach to the data collection process. By considering only what they know to be true, unfortunately, it might create a bias in the algorithm, as well as contribute to inaccurate results.

"[They] are very zoned in on what they think is super important and what they can see. [They] will say these are the parameters you should be looking at. But that's not what we do. We look at all the data and then we let the algorithm decide what the best parameters are, regardless of what [they] think. We do want to know what he thinks, but that would be a bias approach. […] That's the whole thing about big data: you can't say that's it's not important. So, when we collect the data, they say: you want this parameter? You want to know when [discusses industry]? And we say: yeah! But then they ask us why we need that information? They are bias. You are doing a disservice by excluding information based on assumptions. If it doesn't matter, it doesn't matter. But that's the thing, it might matter for [them], and not for that one, but we never know." (Participant H)

4.2.1 Synthesis – Challenge no. 1. In sum, managers should become technologically proficient to learn how to collaborate with the AI system and aid in its development by coordinating with the technological teams. The main competencies managers should develop to do so are 1) understand at a basic level the knowledge engineering of the AI system, 2) ensure there is a human oversight surrounding the AI to minimize the risk of error and drifting, 3) recognize how

rigorous the data collection is and help collect quality data, and 4) learn to rely on the machine's objectivity to avoid any bias or inaccurate results.

When it came to sharing how managers should learn and educate themselves on the topic, the answers were, globally, very brief. Overall, seven participants gave examples. Five participants mentioned that managers should simply be self-taught, it was suggested they read books (n=1), attend conferences (n=1) and networking events (n=2) and research blogs and other forms of documentation (n=1). Two others did mention how they believed the entire education system should change to equip students and provide businesses with the skills they need to address this new challenge. Lastly, one participant suggested there should be some form of company training.

4.3 Challenge no. 2 - Trust & Ethical concerns: Barriers to AI Adoption

While the participants themselves did not express personal concerns surrounding the use of an AI system in a business environment, nor did they believe their employees were fearful of the technology, at least half of the participants (n=6) did express that employees are concerned about the performance of an AI system, its capabilities, and reliability of its results. A first-order code "skeptic" was attributed to three different interviews, with Participant K saying: *"There is also skepticism about the AI capability that exists",* and three participants conveyed there exists a "mistrust" regarding the validity of its results. For instance, Participant M declared:

> *"It is rather a distrust of the results of the machine. They wonder: when the machine gives me a conclusion, has it really looked at everything? Did it really check everything? Is the information being analyzed correct, valid, and up to date? Does it really consider all the parameters of the question? It is this mistrust that exists which results in a resistance to use it in their daily life."* (Participant M)

Eight participants believe that the uncertainty surrounding its performance requires that managers address and prove its reliability to ensure employees trust and adopts the technology (n=8). As Participant F points out:

"AI is nothing more than statistics being applied to data. If people understand that, then they become more comfortable. I think it's the responsibility of these leaders to help people understand some of these things." (Participant F)

Participant I also explained the importance of trust in the adoption of any new technology:

"So absolutely, we know that if people don't trust something, they will work around it, or if they feel threatened, they feel like their job is threatened, they won't use it. So, I think it's like understanding the levers of trust and then having the ability to act on that far back enough in the chain of development of that system, to make the impact for that employee." (Participant F)

In addition to tackling trust issues regarding the performance and capability of an AI system, ten participants shared that employees have expressed ethical concerns surrounding the use of such a technology. Participant E, for example, shares that their employees are concerned about a violation of privacy with the data being used. "Right to privacy" is a first-order code that was attributed to four participants' interviews.

"The ethical issues are not around applications, but around the confidentiality of company data, and personal data. We have more and more data on people, their behaviors, what they do, etc. And the ethical question is: when do we violate the rights to privacy? Because we observe people on the production lines, are we able to tell each individual what he did? When he did it?" (Participant E)

Other first-order codes identified as being ethical concerns are: "who owns the data?" (n=3), "who is responsible if an error occurs?" (n=2), "reinforcing biases" (n=2), and "can the results be challenged?" (n=1). The following are a few excerpts discussing those issues.

"The data that we are going to feed to the machine, that we are going to send to the machine for analysis: where are they hosted? On local servers in Canada? Because we are bound to high standards in terms of confidentiality, as are our customers. We are legally bound by certain high-security standards and by our professional code." (Participant N)

"Through the AI there is a new level of intelligence which is created, but this knowledge shared with me in a report, well the machine keeps it... so... who is responsible for this "black box" a little?" (Participant M)

"That's one of my fears, frankly, is that the technology is sort of too easy, that you can get something going and really be reinforcing negative bias, amplifying that or kind of running away with trying to automate things without having that bigger picture." (Participant I)

The presence of ethical issues, as well as mistrust in the performance of an AI, are found to be the two biggest barriers to AI adoption. Together, these two themes were present in all twelve of the interviews (n=12). The following section delves into what participants believe to be helpful to managers to simultaneously build trust in the technology and address the ethical concerns surrounding it. Three main categories of competencies were identified and classified as themes during the analysis: “ensure AI governance is well established” (n=7), “be employee centric” (n=8) and “show tangible proof of AI effectiveness” (n=9).

First, participants shared the need for a well-established AI governance (n=7), as it allows for better monitoring of the system, which in turn helps to address several ethical issues. The participants shared suggestions to establish clear governance practices, such as learning to regulate the AI system to flag the system for biases and errors, as well as ensuring there is no privacy violation. In Participant I’s opinion, if a company cannot monitor the system accordingly, the technology shouldn’t be implemented.

> *“AI is driven by learning systems, which is it can learn how to do stuff that we couldn't explain directly how, like how to do it. That's why we're using AI in the first place. That gives it a superpower and also creates risk, because if we don't know exactly how it's working, then we're like giving up some level of being able to audit step by step or whatever. Right? But what if you can't guarantee that you can audit it for bias in an effective manner? That means you probably shouldn't go down that road, go down that path, because if you can't put in place the controls to ensure that you're not systematically disadvantaging a certain social group or something like that, then you've got problems.”* (Participant I)

The second main category of skills to facilitate AI adoption by building trust and addressing ethical concerns is to “be employee centric” (n=8). This theme regroups several first-order codes, such as: “implicate them” (n=5), “identify change agents” (n=4), “peer pressure” (n=2), and “be transparent” (n=4). What follows are further explanations of each of these first-order codes, as singular competencies to develop. To begin, “implicate them” (n=5) reflects:

> *“Involving them in the process as well, by telling them: this is how I train the machine, how I configure it. Is this right? Do you have something else to suggest? Are there other documents that I should use as a basis for training the machine?”* (Participant M)

The participants that identified this competency explained that implicating the staff in the AI development process leads them to a sense of *"ownership of the technology"* (Participant M) and motivates them into wanting to use the technology, and, as Participant I suggest, it can also improve the performance of the technology:

> *"You need somebody who is at that frontline level to be able to explain: these are where I would anticipate it would go wrong, or to just apply their judgment around: here's an ambiguous case, here's how I would interpret it. There's like what are the pitfalls? And then how do we make sure that we're steering it in a direction that it will perform in a way that fits in with how we do things around here?"* (Participant I)

As Participant G explains, having staff involvement also leads to empowerment, and hopefully AI adoption:

> *"We take them to see cases, we involve them with us in the decision-making committees to show them the best practices. […] This means that we have decided that at the employee level, we want to promote empowerment and accountability."* (Participant G)

In addition to implicating the employees, the second most important first-order code was "identify change agents" (n=4). This was seen to be a more generic approach to any change management project in creating momentum and improving the adoption rate, like Participant G declared:

> *"There is a normal demographic curve, maybe 10% of people who are early adopters, 70% of the world who are followers, and 20% who have both feet on the brake. You need to know that not everyone evolves in the same way, at the same pace. It's the same thing as with employees. If you work with your 10%, they will become your change agents, and the others will say to themselves: "ah look that is easy. I see what it does so I will do like them"."* (Participant G)

Not only will using change agents increase the number of employees adopting the technology, but it was said that using peers has the benefit of creating a certain "peer pressure" (n=2).

> *"Your colleague, your office neighbour, they use it, and they were satisfied. By trying to integrate colleagues, it may be saying to them: if my colleague used it, then I should too. I'm trying to build trust like that. If other members are using it, then maybe you should try it too. It's a little peer pressure."* (Participant M)

Finally, "be transparent" (n=4) was also seen as an important competency in building trust in the AI. As both Participants I and J explain, some employees might have concerns about the technology because they haven't received explanations as to why it is being introduced. Sharing additional information can relieve some of these concerns.

> *"And I think it comes to: do people see it as automation, or do they see it as an augmentation of their work? And unfortunately, both of those ideas are still very colored by sci-fi movies. And so, yeah, I think, you know, understanding the nuances of how it's actually going to work because it's such early days, people just fill in with what they've seen on film and television."* (Participant J)

> *"If you can't… if the way that it is kind of rolling out isn't signaling to people like hey, we're including you in this because we want you to be a part of this company in the future versus just trying to get information about how to automate their job. If you don't approach the right way, then you'll get different results*." (Participant I)

Participant M also believes that by being transparent on the knowledge engineering, managers will be able to gain the trust of their employees, and consequently have the employees trust the machine as well:

> *"I explain how I configure the machine. I am very, very transparent in telling them: how I configure it, with what data, how often. Because our laws change, our regulations change, so I have to make sure the machine is constantly updated. So, there is a lot, a lot of transparency, of communication to who's in charge. If people trust me, strangely enough they're going to trust the machine more too. I have a lot of that credibility to seek out, and I do it by being very transparent."* (Participant M)

Overall, the interviewees believe that being employee-centric will lead to employees trusting their manager and the AI. Implicating the employees will help them feel empowered and can improve the performance of the AI. Identifying and using change agents, especially peers, helps build confidence in the technology and increases the number of employees adopting it. Lastly, being transparent about the reason for the implementation, as well as sharing details about the knowledge engineering and governance practices surrounding the AI will benefit

managers by making them seem more credible and knowledgeable, thus trustworthy in the eyes of their employees, and it will also address some ethical concerns, in turn, building trust in the technology.

The last main category of skills found to improve AI adoption is "show tangible proof of AI effectiveness" (n=9). The most important first-order codes associated with this category are: "is the AI coherent in this context?" (n=7) and "show differences of results between two sets" (n=6). These codes are considered skills since they require developing the correct tactics and knowledge to demonstrate and convince employees of the usefulness of the technology.

To start off, three participants found that employees tend to question a new technology's usefulness. To build trust in the AI, managers should focus on sharing how the AI is coherent in the particular context it is being implemented in (n=7). As Participant L points out: *"I think trust will be built with relevance. I think that's mostly it."*. When it comes to relevance, Participant N adds:

> *"Then another step will be to determine what the tool does. Does it meet a need of ours and improve our efficiency in this task? So, we ask ourselves: under what circumstances is it relevant to use this technology. And we must also sell that idea of relevance to our lawyers because they have always done things the same way until now."* (Participant N)

The second approach to showing tangible proof of AI effectiveness is by "showing differences of results between two sets" (n=6). Completing the task manually as well as with an AI is proof to the employees that the results of the AI are reliable. Not only will it show that the results are reliable, but Participant N also says it demonstrates increased efficiency.

> *"One of the things we do to show them the new way of doing is we will continue to do the task in the traditional way, manually. And at the same time, but without billing our customers of course, we do the same task using the AI. And we show them the gains at the end of the line: either in terms of efficiency or even reliability of the result, which we have been able to achieve using the technology. And sometimes we get the same result for a specific case in five times less time, so it's very interesting for people who work like crazy."* (Participant N)

For Participant L's AI project, the participant shared that the project isn't up and running just yet, but a few employees do have access to a test version. That allows them to look at what the results are and notice if there are any issues.

> *"Employees are gradually being able to use the application, as a test run. So, that will allow them to take a look at what's going on. Of course, it is not yet functional, but we asked the artificial intelligence team to share the results of the machine, to share what the machine would give us. This allows us to see that currently, there is no issue. It allows to have confidence in the solution and to prepare for the launch, for which we will be even more confident. And the employees will be too. It starts with us too. We will be able to convey that we have been watching for weeks that there is nothing at stake, that things are going well."* (Participant L)

Lastly, Participant M shared the importance of data and success stories when trying to convince employees to use the AI system. Comparing two data sets, one completed manually and the other with an AI system, gave Participant M sufficient data to share proof of AI effectiveness with the employees.

> "*I realized that one thing was missing, the data. Let me explain. I realized that just talking and trying to convince them to use it was not enough. I needed to provide them with data: that the AI saves 1000 hours of lawyers' work, or that it saves 4x more time. Stats. it speaks a lot more and lawyers trust it a lot more. There are mathematical formulas, proven facts. Giving them numbers is much easier, it speaks to everyone, people easily understand. They'll say: "I don't know what the machine is doing, but I know it saved me X amount of money". Usually, it's a winner so I'll take it there."* (Participant M)

> *"And you also get success stories. Get your stories and then you can promote it, proactively. Don't wait for people to ask for one, knock on the doors. "You know your neighbor he uses this technology there, it saved him 40% of his time, the technology, it worked really well. In any case just thought I would tell you that." It speaks volumes more to say that we have used it*." (Participant M)

Overall, proven facts are believed to be an important way to reach AI adoption (n=9), whether it is by explaining the relevance of the technology or sharing statistics regarding the gain in efficiency (time and money saved) and reliability (low error rate).

4.3.1 Synthesis – Challenge no. 2. With respect to the second challenge, trust and ethical concerns were demonstrated as being the two most important factors hindering AI adoption.

Half of the participants said that employees are skeptical about its capabilities and are questioning the reliability of its results. It was deemed important that managers learn how to convince employees to trust the machine as well as address all the ethical issues surrounding it. To do so, three main themes were identified: “ensure AI governance is well established” (n=7), “be employee centric” (n=8) and “show tangible proof of AI effectiveness” (n=9). Becoming technologically proficient will allow managers to verify that the correct practices are in place to ensure proper AI governance. Helping to establish clear governance practices and proper monitoring will give managers opportunities to flag the system for biases, for errors and ensure there is no privacy violation, which will help alleviate ethical concerns. Managers should also be able to share with their employees the regulations and monitoring processes that were put in place. Becoming employee-centric will allow managers to build trust in the AI system. Implicating the staff in the development of the AI will empower them, as well as improve the performance of the AI. Identifying peers who can become change agents will help build confidence in the technology and will increase the likelihood of AI adoption. Being transparent about the reason for the implementation, as well as openly sharing the knowledge engineering behind the AI will also help build trust in the technology. Finally, showing tangible proof of AI effectiveness is a safe path to reaching adoption. Demonstrating gain in efficiency and reliability through data was said to be great step in addressing concerns and improving AI adoption.

4.4. Challenge no. 3 - An Evolving and Continuous Process

The beginning of this chapter described how AI is neither fully understood, nor has its full potential been reached yet. This section will delve further into how this technology is still in an experimental phase, and how organizations and managers alike should also embrace its evolving nature and show leniency to their staff in the process.

As Participant N states: *“It’s not plug and play”*, compared to a traditional IT implementation, meaning an AI implementation is an evolving and continuous process, which comes with its own set of challenges. The three most important first-order codes that lead to identifying this challenge are: “constant process” (n=7), “requires significant and continuous data” (n=7) and “based on iterative discovery” (n=5). While the first-order code “constant

process" helps to identify the never-ending nature of this technology, the other first-order codes, "requires significant and continuous data" (n=7) and "based on iterative discovery" (n=5), are found the be the reasons why an AI system is considered to be continuously evolving. These first-order codes will be analyzed in greater detail, to identify the challenges facing managers, and establish the skill set needed to address them.

The following quote from Participant H describes how an AI system requires a constant interactive process, as compared to traditional IT software.

> *"Our communication and process are never-ending. Because it's custom and because it's ongoing, we are delivering a prediction every week, we are in constant contact: we need something from them, they need something from us, I think that's a major differentiator. As opposed to: you're getting a new platform, everyone goes through training, and off to the races and you pay for it and everyone is using it."* (Participant H)

The two main reasons found which explain why an AI system is continuously evolving are: a) it works through iterative discovery (n=5) and b) it requires constant data input for effective results (n=7). These two categories are studied as sub-section, separately, as the skills needed to address the difficulties surrounding them are distinct.

a) AI and its iterative discovery

When it comes to the AI having been built around iterative discovery, Participant I declare:

> *"It's something that's very integral to AI as well, which is kind of iterative discovering as you go, not knowing what the outcome will be when you first start. It's important to have to use that sort of design thinking lens as well. And as you give it data to analyze, the technology will learn and get a better understanding of the environment your business is in. And so, it improves over time."* (Participant I)

As Participant D also points out, the evolving process of iterative discovery by an AI system should be embraced by the staff:

> *"When you do AI, you don't know what you don't know. That's just how the technology works. Research shows you can spend a lot of time sitting down saying: "This is our AI solution, and this is what it's going to do: it will predict when the train is going to be late, and after finding that out, it will have to predict how the delay of the train will propagate in the network." To do this, they'll use a random algorithm, and if it doesn't work, they'll try something else, and if it doesn't work, they'll*

add another data source. In this case, you try to define what you are going to do. That takes a long time, it's not productive and you often get it wrong. What is important is to say to yourself: we know enough about what we are going to do, but we are very aware that the situation is going to change. We are very aware that we are going to do business that we did not know and that we'll have problems along the way that will have to be resolved in real-time". (Participant D)

While it is clear AI systems work through iterative discovery, these two quotes are also associated with a topic, the importance for managers to "embrace the unknown" (n=8). Participant E sums up this specific AI difficulty well: *"There are a lot more unknowns, every aspect of what we do is full of unknowns.*". Participant B shares how the path to a well-implemented AI is indeed through exploration:

"We are going to do beautiful things, we are going to do some bullsh%t, and eventually we will normalize all that. We need to test the waters because we haven't discovered the full potential yet." (Participant B)

Since AI technologies go through iterative discovery, managers are required to "embrace the unknown" (n=8). This is also important, as Participant M clarifies, because the iterative discovery process requires employees to work differently:

"The technology is not always there to do exactly what you were doing, but faster, it is also there to offer another operating model, another framework, another workflow." (Participant M)

"Embracing the unknown" (n=8), a main theme and skill brought up by a majority of the participants as an essential approach to working effectively with an AI, due to its evolving nature, was defined in several ways: "embrace experimental culture" (n=3), "accept mistakes" (n=2), "accept ambiguity" (n=4), and "promote agile method" (n=2). As Participant I explains:

"The whole thing that's exciting about these systems is that they can adapt and improve over time. So, there's like this unpredictability in its performance after it goes live as well." (Participant I)

It's been said that there are several unknowns when it comes to an AI system, and Participants G notes how curiosity and experimentation should be embraced by managers:

"Another element is curiosity because we live in a world where you always have to improve things, try, and ask yourself questions, for example: is this the right way to do things?" (Participant G)

"People should be given the tools to learn by doing and do some introspection work on it. What I mean is, they should be able to say: "I tried that, and it didn't work. So, if I try this, what will it do?" It's great to do data analytics, but there is a lot you have to learn and experience. So, you have to be able to experiment and learn while doing that." (Participant G)

Participant E explains the importance of accepting mistakes while trying to build a successful AI:

*"We have to give ourselves the right to make mistakes. What I mean is, we shouldn't say to ourselves: "no, it didn't work, so AI is not applicable here". We must accept that we still have some learning to do, and that we're going to make mistakes, but that should encourage us to try a second time. And if we fail the first three times, then all the more reason to try a fourth time, because each time we gain in understanding, we mature and we get closer to a result. So, we have to have tolerance for that and understand that these are new emerging technologies and that we are not going to win the first time. in terms of business management, it takes a willingness to risk." (*Participant E)

And further in the interview, Participant E also added that accepting mistakes shouldn't just be during the process of building and improving the AI, but also when it comes to the results:

"If we look at a business, around costs and accounting, very quickly we see whether the result that comes out makes sense or not. When we use AI, we have a result that comes out, which is a correlation, a causality, which are numbers, and we are forced to accept it, but we are unable to know if it is true. or not. So, you'll have to learn to accept that there'll be mistakes that'll appear." (Participant E)

In addition to accepting mistakes, another key skill identified was: "accept ambiguity" (n=4). This was in reference to the managers, as well as the employees.

"You have to be persistent in this. The characteristic that encompasses all of this is the ability to live with a certain level of ambiguity. There are a lot of people who are used to very, very, very precise job descriptions or job descriptions. While me in life, the only phrase that is important is: and any other related tasks." (Participant G)

"And I think that's a tough part of this whole thing, it's understanding what those skill sets are. And just the… what kind of personalities do you want? Right. There's I'm sure, like with certain jobs, you

want a personality that is hyper detail oriented and really focused on every single thing and is just like, they can put the blinders up and just drive that function. Well, a computer just does that really well. And that person isn't as flexible with dealing with ambiguity and nuance, which is the more of the kind of work you need to do now with AI." (Participant J)

Overall, it was found that as the AI improves over time through a discovery process, managers will need to be lenient with their staff, allow for experimentations, be comfortable with ambiguity and accept the presence of mistakes.

Another first-order code associated with the theme of AI and its iterative discovery is "promote agile method" (n=2). While not addressed by many participants, it was the main discussion point during Participant D's interview. Due to the importance given to this topic by this participant, it was deemed noteworthy to include and expand on it in this analysis.

While quoting Participant D earlier, it was said that the evolving process of iterative discovery by an AI system should also be embraced by the staff themselves. The way the technology works, by improving as you feed it data, requires teams to be able to adjust constantly and be quick to respond in case of errors. Participant D made it clear in the interview that creating agile teams is the preferred method to go about it. And while putting this in place requires reorganizing teams, and investing time and effort, Participant D explained that managers need to be trained to work with an agile team, as it requires a different approach to management.

"It requires managers to be eyes on hands off. You can't have an agile team if every two days you have a manager who wants reports and papers and every two weeks, he pokes his nose in the thing and says: "ah I wouldn't have done that the same way" and then forces them to change it. You just can't. As a manager, you have to learn to trust your teams, give them autonomy, you have to learn to interact in different ways, you have to know what is going on, you can give them your input, but instead of trying to control your team, you have to learn to create a team and a context where the team can perform. You are no longer a player in this team, you are the architect of a successful team - a coach of sorts. This is very, very, very difficult, because there are a lot of managers who have learned and often become managers because they understand the processes well, understand what is happening and they micro-manage their project, their team and end up putting themselves as the bottleneck of the whole universe and that makes sure that they know what's going on and that they stay relevant in the organisation. I'm exaggerating a bit here, you know, but there are a lot of people, when you start to build agile teams, they suddenly realize that either: 1) they don't know how to add value anymore or 2) it creates anxiety or 3) they realize: ok now that I have created this super-efficient team, what am I useful for, and what do I do? So, you really have to teach managers to work in agile mode, because building high performing agile teams is a huge, huge, huge problem." (Participant D)

In brief, as an AI system adapts over time through a discovery process, managers will be required to adapt as well. Experimentations will be key in improving the technology, and managers should allow their teams to do so and be lenient if mistakes arise. Curiosity and learning to embrace ambiguity will be essential since there are many unknowns surrounding the technology and its results. Organizations and managers alike should promote and create agile teams, as it's been said to be the most efficient method to go about this technology. Lastly, their role as managers will need to shift into more of a coaching role and leader, to embrace the agile process needed in an AI context.

b) It requires constant data input for effective results (n=7)

The beginning of this third challenge declared AI as being continuously evolving. While the first part of this section discussed the challenges that come with an AI improving through iterative discovery, this second section will delve further into how AI systems require constant data input to produce effective results, which stems from the first order code "requires significant and continuous data" (n=7). This topic was briefly mentioned in the first challenge when it was found that managers need to recognize how rigorous the data collection process is and help collect quality data to extract the maximum value from an AI system. However, this upcoming section will analyze the reason behind the "need for consistency" (n=3) and what managers should do to "convince employees to feed data in the machine" (n=4).

As Participant H announced: *"Quality data is made through consistent data input"*. It was found that consistency is key when wanting effective results:

> *"The whole process and the whole way that AI works is important to understand. If they don't give us the data, then the accuracy is a bit skewed. If they give us information late, they don't understand the effect it has on the algorithm and why it's so important for the data to be updated in a timely manner. So, if he [manager] goes on vacation for three weeks and nobody is sending us the information, that's a problem. If on the other hand, they are collecting quality data, and they are constantly in communication with us, the algorithm will notice things like faulty sensors, and will also be able to better predict their yield." (Participant H)*

Participants K and M also brought up the importance of collecting continuous data:

> *“We sometimes struggled to provide performance data back to the A, so it could learn more quickly and improve its effectiveness. To optimize what we produce, we need to ensure data can continuously be used.”* (Participant K)

> *"The machine must understand that for me it's a cat (the animal), but for you this other way of talking about it, it's also a cat. It has to understand all the nuances for each concept, it's almost endless. For it to work, for the AI to learn these different nuances, people need to contribute new materials constantly.”* (Participant M)

These participants all agree that not only is data, in general, essential for the development of AI, but it is the continuous inputs that will yield worthwhile results since AI systems are in constant evolution. This need for continuous data also comes with its own set of difficulties, mainly convincing employees not only to feed data into the machine but also to do it in a continuous manner.

> *“There is a risk. People find it great when you first implement it because they see concrete results, but after that they stop contributing new materials, mainly because they think it has reached its plateau. So, there’s a natural lack of interest that happens eventually*. (Participant M)

A good first step is to share the reason behind the need for continuous data:

> *“If they don't understand why we need that data, it's not important to them. So, helping them understand how important the data is, the quality of the data is the first step and then going from there. Then they understand it and they want to give you more and they are less hesitant because they see results and they are more confident in what we are doing.”* (Participant H)

The problem that occurs, however, as identified by four participants, is the employees saying, “*I don’t have time to input data*” (Participant B). Participant K also shared how some employees have trouble prioritizing that task:

> *“Employees sometimes struggled to provide performance data back to the AI so it could learn more quickly and improve its effectiveness.”* (Participant K)

Yet, as Participant M explains, the speed at which employees could receive worthwhile information would increase tenfold, far outweighing the initial time spent teaching the AI algorithm:

> *"Some lawyers see it as an additional task they didn't have before. If it hadn't been for the machine, they wouldn't have had to do this. There are those who say that it takes longer, but in the end that's not the case because even though you take five minutes to train it, it'll be able to find you what you are looking for way faster than the time it would have taken you without it. It'll analyze plenty of documents and spot the clauses you're looking for much more quickly. It'll only take the AI five to 10 minutes, while if you had to do it, it could take you all day, and you would be tired, and you would probably end up being constantly interrupted by phone calls. The machine doesn't get interrupted. So, sometimes the five, 10, 15 minutes that it takes to train the machine is a good investment. But there are people who are still resisting the change, because they see it as an additional task that they wouldn't have to do if the machine didn't exist."* (Participant M)

Participant H also made a point by saying discipline is key:

> *"I think they have a really easy time accepting it, but a hard time disciplining themselves in terms of consistency. So maybe in the past they didn't put it in until the end of the week, but if they have it available at the beginning of week, we need it at the beginning of the week. They can't wait three days and then put it in, because now you are actively using that information for something and we need it to be consistent… but it's stuff like that that tend to be a bit of a challenge because they are so busy. They aren't on computers, they aren't checking their emails, it's hard to get them on the phone. So, I think having more than one person we can communicate with from the organisation is super important, because somebody needs to reach the others and say: hey you need to give them this."* (Participant H)

As Participant H points out, data input not only requires discipline but collaboration as well. The first order code "collaboration" (n=4) was found in a third of the interviews. The amount of data needed to train the AI system requires employees to collaborate since it must be a group effort. Participants B and C raised this point:

> "*Is it really going to draw value? Because if I want the results to be of value, everyone has to get on board."* (Participant B)

> "*In terms of best practices, the more people collaborate, the better the chances of success – both for the AI system and for the people in place: it allows to have convincing results and to be able to use it."* (Participant C)

Not only does collaboration allow for a larger group of people to input data, but as Participant F points out, it allows the inclusion of important nuances in the data set that some individuals might not be aware of.

> *"Think about if you're in the healthcare and you have a diagnostic solution, which takes MRI images, and comes up with a diagnosis. If you are working in silo and you just kind of, take the data and give the answer, you may miss out on the important nuances. So, you need to be able to work with the medical community within your company, the doctors, the radiologists, the designers of the equipment, how they designed the MRI machines and then the data that's been collected. Bring it all together so you don't miss out on some of these important nuances when you are building and improving your solution."* (Participant F)

4.4.1 Synthesis – Challenge no. 3. Ultimately, to overcome the evolving nature of an AI system and produce effective results, an AI system requires constant data input. This means that managers need to be made aware of the importance of being consistent with the data input and share that notion with their team. They should also encourage collaboration as data collection and input should be a team effort to produce reliable results. Lastly, they should educate their employees on the benefit of investing their time and effort in inputting data – in the long run, this will help them to get results much quicker than before.

Overall, the reasons and challenges behind why an AI system is continuously evolving was shared. Firstly, it is because it adapts over time through a discovery process called iterative discovery. As it adapts, so should managers alike. Allowing for experimentations and showing leniency when errors are made is key to embracing this process and improving the technology. Curiosity and accepting ambiguity are two other skills managers should adopt, since there are still so many unknowns surrounding the technology. In addition, promoting agile teams should be encouraged, since it will allow for adjustments to the technology to be made at a much quicker pace, and in a constant manner, than if individuals were scattered in the organization. It is understood that these skills could all be summed up into a larger role: becoming a leader. The second reason for an AI system to be considered continuously evolving is that it requires constant data input for effective results. Managers should be made aware of the importance of collecting quality data, and so should their employees. Quality data implies data collected in a continuous manner, to avoid skewed results, and in a large capacity, for all types of nuances to be understood

by the system. Managers should encourage their employees to prioritize this task, as it is believed that the speed at which employees would receive information, and the amount of information they would be able to collect from an AI system far outweigh the time spent feeding data to the algorithm. Lastly, collaboration was found to be a main element when wanting to collect quality data, since large amounts of data should be analyzed to produce notable results. This concept can be linked to the creation of agile teams. Managers should promote team effort when implementing such a technology.

4.5. Challenge no. 4 - Teams will shift

The previous section explored the reasons and outcomes of an AI system being a continuously evolving technology. A need for agile teams and encouraging collaboration was identified as essential to be able to react to such a fast-paced technology. This challenge delves further into the consequences of introducing an AI system on team structures. It will establish that implementing an AI system requires hiring "new employee profiles" (n=3), which, more often than not, have never existed before in an organization. Consequently, managers will need to become cross-functional. The first-order codes, "new employee profiles" (n=3), "multidisciplinary teams" (n=4), and "ecosystem partnering" (n=4), will be analyzed. Overall, two main findings were identified as a result of a shift within teams: managers will need to "develop the ability to work across functions" (n=8) and learn to "manage employees whose jobs they don't understand" (n=4).

To begin, Participant D clearly conveys the need for "new employee profiles" (n=3) when implementing an AI system. Compared to traditional IT implementations, upskilling employees is not enough to properly interact with such a technology.

> *"As a manager, you've been doing your job for 20 years. You understand very well what it takes to perform the tasks you do, and when there's an IT project, you are used to dealing with people from IT. When you have a project, and you need a bit of analytics, you talk to someone on your team who is in business intelligence. You have your analyst who you like because she's super technical when she does the analyses. But you have to realize that the way an AI works, the level of talent that you need is completely different. You need to go find new profiles: data engineers, machine learning engineers, and they need to be part of your team, or at the very least you need to be able to interact with them easily."* (Participant D)

Participant A also expresses the importance of bringing in employees who are specialized in AI:

> *"There is also an impact on the teams. They must equip themselves with people who will become more and more educated. By that I'm talking about a data scientist, machine learning engineers… [...] You have to have people who have a different education than the people you traditionally have on your team. You have to have the right people because those that you have don't necessarily have the skills you need."* (Participant A)

Not only will organizations need to hire new employee profiles, but a third of participants also revealed the need for "multidisciplinary teams" (n=4) when working alongside an AI system. The concept of collaboration was already mentioned in the previous challenge, to produce notable results; however, not only should managers encourage collaborations within the organization, but they should also reorganize internally to build multidisciplinary teams and introduce these new hires within existing teams, rather than create a new silo in the organization. For Participant G, creating these new cross-functional teams will allow them to better respond to situations that might arise with an AI system.

> *"What we want is to build multidisciplinary teams. we don't want them to work in silos anymore. We want them to become more proactive, decisive, and encourage risk taking."* (Participant G)

Participant J also identified reorganizing teams as crucial to the success of the technology:

> *"There's a need to sort of organizing properly internally. You know, we always say the best first couple of things that you do is, you have executive alignment, and you should be connecting teams together. So, separate from the concerns of the quality of the output, there's the issue of just not bringing the right people along, but also not creating the right teams, to give it the sort of momentum and sustenance that it needs to get it fully operational."* (Participant J)

After having identified that introducing an AI system will call for a certain internal reorganization, the following section will focus on one particular consequence: managers will now be required to "develop the ability to work across functions" (n=8). This theme was expressed by a majority of the interviewees.

Participant A explored this topic and explained why managers will need to become cross-functional. The explanation, shared by a few others, is that these new employees, specializing in AI, will be joining the business side of an organization, rather than the IT department. With this, managers will not only be required to collaborate with these profiles, but will become their managers, and as such should become knowledgeable enough to interact with them.

> *"This is a big difference. Typically, all tech employees end up working in IT. But now, they are part of the business side of it all, and IT, for once, isn't the lead for that type of software. Typically, you can find developers in IT, but now more and more, these people, like developers, data scientists, machine learning engineers are placed as part of the business, in a line of business, because we're trying to solve a business problem using this new technology. So, one of the differences in my opinion is that IT is no longer the lead in this kind of project, they lose a bit of the decision-making aspect of these projects. There's a need for IT support, but in the end, it's a business solution we're trying to build, it's not an IT problem. The AI implementations that are successful, in my eyes, are when the business side leads it. Because it is a business solution, business managers should act as the leads and IT as support."* (Participant A)

As Participant A illustrates, these new profiles will not only be part of multidisciplinary teams, but they will also be included in the business side of the organizations, as a result of business managers leading projects that are using an AI system.

Consequently, managers need to acquire the necessary skills to be able to act as their leader. It's already been said in a previous section that managers will need to develop certain technological competencies, to utilize the technology to its maximum potential. In this scenario, the need for basic knowledge of the technology is to help managers "develop the ability to work across functions" (n=8) and ensure effective communication with their new employees. The following quote from Participant E shares examples of conversations managers should be able to have with their data scientists, such as understanding the data and knowing if a specific project is able to be completed with the data on hand.

> *"Data scientists is a new skill. It requires managers to be able to speak with to them. Managers must be able to say: I need a forecast and here is the type of data we have, it comes from such and such customers, from such and such market source, these ones we don't really believe in them, these make sense, those are good, but I understand that we don't have enough frequencies. They must understand the granularity of data, horizons, frequencies, etc. Managers must understand concepts like that, be able to speak with a data scientist, who does not necessarily know the industry, and run scenarios. They must be able to have a dialogue, understand a little bit the*

technology, without having the skills to create it, but so that they can interface. The biggest difficulty is that you have to be able to see if the desired solution is feasible for the data scientist, and to readjust it if necessary. So, they need to understand the tech sufficiently to discuss and exchange on it." (Participant E)

In addition, Participant H raised a similar point, emphasizing how crucial that interaction is between managers and AI specialized employees:

"The more we can interact, the more we establish these relationships, the more they start to open these Pandora's boxes of what's possible and what they are collecting and how the growing process works and what they take into consideration." (Participant H)

The first order code "ecosystem partnering" (n=4) was assigned to quotes acknowledging the importance of collaboration in an AI context. The following quote from Participant F shares an additional reason why managers should become cross-functional: AI technology is shifting so quickly that managers need collaboration is key to stay well-informed.

"In AI centric roles, you need people that are going to be more eco system friendly. What I mean by that, is because of the nature of this work today, it's growing, you need to be able to connect with a broader group of people in order to be able to thrive and stay on top of things. If you are the type of person that does its own thing, you will lose out." (Participant F)

Managers aren't expected to excel in this technology, but they should be able to understand enough to be able to have productive conversations. Participant M describes an example of what that level of knowledge should be.

"They don't necessarily need to be able to program from A to Z. Understanding the basics of programming is very, very mathematical. They don't need to take a C ++ language course. What is important is that they understand some of the basics of programming. It is essential to narrow this famous gap which exists between those who will use the machine and what the company is trying to do: either to meet certain needs for efficiency, cost reduction, or perhaps replacement of personnel. I think it is essential. The manager needs to understand the basics, but I don't think you should require a manager to be able to fully program. This linear, mathematical aspect of transposing that into a world that is sometimes not linear and mathematical, that's the challenge. It takes an analysis component and people who understand both sides of the coin." (Participant M)

Business managers will now be leading teams comprised of individuals specialized in AI. In addition, introducing these new employee profiles within their teams will require them to gain a basic understanding of the technology, for them to collaborate effectively. As such, managers will not only be faced with acquiring knowledge of the technology, but it will also require them to learn how to properly manage these new employees. This leads to analyzing the second code: "manage employees whose jobs you don't understand" (n=4):

> *"The reality for managers is that they'll have to employ more and more people whose skills they don't even understand. I mean they understand the basis of it, but they can't grasp the technicalities, since they've never worked with anyone like this before. And this won't stop. The more we advance in technologies, the more it accelerates, the more you, as a manager, will have to be able to manage people whose profession you can't even understand."* (Participant E)

A few participants shared their opinions on that subject. For example, Participant D notes that managers should focus on creating a stimulating environment for their staff members since they aren't necessarily able to challenge their work.

> *"You will have to create an environment which is conducive for these people, which is stimulating, because you will lose them otherwise. Because at the end of the day you're the manager, but you're unable to assess their performance and the quality of their work, so how do you challenge them? And so, all of a sudden you go from a managerial level with businesspeople and people who did Excels - to people creating code that you can't read, with insights that you can't necessarily challenge."* (Participant D)

Furthermore, Participant E sums up this new role quite well, by stating the need for a shift from skill-based managing to trust-based managing, implying the importance of transformational leadership in the context of an AI system.

> *"The relationship between employees and managers in this area is like in any other area, it must be built on trust, based on support. It's a normal relationship. But, the main difference, since you can't quite get what they are actually doing, is that you can't operate on a skill-based management method. Now, it has to be trust-based, focusing on common ambitions, and coaching your employees. What you bring isn't your skills anymore, now your job is to make them understand the business issues you're facing, the data issues. As this new type of manager, I'm not able to judge what they are doing, I can only make sure that they understand the issues, and make it clear what's expected of them, and what the final objective is. The management methods to prioritize is less of*

> *commanding and controlling, but rather coaching and alignment. That's what's essential. Because these new professions will continue to evolve so quickly. Managers shouldn't tell them what to do, but rather make clear what the business is trying to achieve and what they need from them. And they should be able to give your employees everything they need to get there."* (Participant E)

This shift in leadership was also addressed by Participant G, expressing how managers should focus on the overall vision of an organization, by establishing clear goals with their team and learning to rely on the expertise of its members, since managers aren't able to specifically challenge their work.

> *"At the manager level, it'll become necessary to be more transversal. Their technical expertise will be less required because we want the multidisciplinary teams to have the technical expertise. Which means, that the management style will change, so will your managers. You will need less so-called traditional managers, nor will they need to know how the calculations are done in the machine. But rather, you'll need managers who are more strategic and transversal, who have a global and broader vision of the organization, who understand the importance of being consistent with where he wants to go, and what he wants his team to accomplish."* (Participant G)

4.5.1 Synthesis – Challenge no. 4. Overall, introducing an AI system will result in hiring new employee profiles, such as data scientists and machine learning engineers. For the AI implementation to succeed, these new hires should be placed in the business silo of the organizations. Consequently, organizations will undergo internal reorganization, since multidisciplinary teams now become essential when working with an AI system. Two main skills were identified as being crucial in this context of multidisciplinary teams. First, managers should become cross-functional and learn basic knowledge of this new technology, to adequately collaborate with their subordinates and initiate productive conversations. Second, as a consequence of hiring new employee profiles, managers should learn to manage employees whose jobs they don't understand. Since managers might lack the knowledge to adequately challenge the work of these new employee profiles, it was implied that managers should shift towards transformational leadership, by focusing on gaining their employees' trust, acting as their coach rather than their manager, while also making clear what the outcomes are, such as the overall goals and objectives of the team. Ultimately, introducing an AI will not only shift teams, but also the managers' role and management style.

4.6. Challenge no. 5 - Psychological-based challenge: Professional identity gets revisited

The last challenge identified is of a psychological nature: introducing an AI system can lead to employees revisiting their professional identities (n=11). Four first-order codes make up this challenge: “changes how employees define themselves” (n=2), “diminished abilities” (n=3), “loss of control” (n=3), and “performance anxiety” (n=3). Two other first-order codes are suggestions from participants to help managers navigate this specific challenge: “avoid penalizing employees at their performance appraisal” (n=2) and “managers will need to become leaders” (n=3)

The first manner in which employees might find themselves revisiting their professional identity is by realizing that an AI system is becoming more knowledgeable than the employees themselves. Two participants said that some employees may find themselves questioning their value, as a result of a machine being able to do their job. The quotes linked to the first-order code “changes how employees define themselves” (n=2) were used to come to this conclusion.

As Participants D and G share in the following quotes, introducing an AI system has much more of a consequence on the self-worth of employees than implementing an IT solution. The technology not only acts as a support to their tasks but can end up replacing certain tasks employees were used to be defined by.

> *“AI must be seen as a modification of all processes. It fundamentally changes the way in which decisions are made in an organization, and the processes of an organization, versus just a computer tool. Don't think of AI as a chatbot who is just here to talk. Rather think of it as something deeper than that: it recommends which customer to talk to, what we should tell them, what the pricing should be, the products we should push, the city we should prioritize, the sales we should have from such and such person etc. It is much deeper than an IT system that it used more as support."* (Participant D)

> *“Basic computer technologies are going to simplify my work, what I do. Here’s an example: instead of using paper, I have all my applications on the internet. So that’s one thing. But afterwards, I shouldn’t forget to analyze all my data. But now, part of my job, which was more intellectual, is going to be done by AI. So, what does that mean? What's left in my job? You come and attack my skill that I’ve been building on for 20 years, I’m an expert in this area and I know how to do the math. Today, oops, data compilation, data analysis, recommendations, are all done by a software. We fall into the nature of work, which is what AI is changing. Whereas before that, computer tools came to simplify my work. It's not the same level there. People have the concept that a computer*

software is there to make my life easier, since they'll work less hard. But now, with AI, they are going to be realizing, "The AI is doing the thinking for me, so what's left of my job? Do I have the skills to do this? Am I going to be able to learn that? "We fall into this a bit, and now employees are asked to come out of their area of expertise, which they've been developing and improving for the past 10/15 years." (Participant G)

As Participant G explains, an AI system can therefore have a profound impact on employees, since they find themselves questioning their own intellect. Participant D also brought up this point:

"You are having an impact on the core of the person's job. This person is defined by his profession. If tomorrow morning you tell me: "B, you don't need to give recommendations to your clients anymore, because I have a machine that will give a recommendation", I'm not going to be fine. So, it's normal, it's human. AI is literally prediction. So, you begin to enter into processes, where before humans were defined fundamentally as: I am the expert, this is the decision that must be made, I am the expert to evaluate an insurance request, a submission for a claim. But now suddenly I have a machine that is able to offer me a solution, potentially better than mine, 90% of the time, so that comes into play in the very definition of how people present themselves and perceive their values. And so, it brings a psychological element which I think is very new, which sometimes provokes a reaction of fear and rejection, which is very human, and it's necessary not be naive about it and it should be addressed." (Participant D)

The second manner in which an AI system will impact employees on an in-depth level is that it might bring up a fear of performance. This was mentioned by three participants and coded under "performance anxiety" (n=3). This fear of performance was found to be present in employees as well as managers. As Participant B describes in much detail, there are two main fears surrounding performance at work. The first fear is that an AI will show that employees could have been more productive than they were in the past, and the second fear is that an already productive employee might not be able to meet the new expectations requested by their manager when working alongside an AI system.

"The fear comes from two sources. The first is that someone, somewhere, realizes that I am not doing my job well, because it will highlight the fact that I was doing my job poorly before and that I am doing it better now with the new tool. This is the perception they might have. So, it scares me to have a new tool, because my boss is going to say: you're incompetent, it's been 10 years now, you could have changed. That's the first fear that will make employees want to resist the change. The second is: I love my new tool, it's really cool, but now my boss has new expectations that come

with the new tool, but will I be able to fulfill them? I know that I'm able to do it today, but the new tool brings new expectations, and will I be able to meet these new expectations? That too is a fear. A fear of performance. Oftentimes, the manager will have these expectations which have increased with the new tool. But the timeframe for the employee or the group to reach that same level of performance they had before with the new tool is often a little too short. It's like cutting down a tree with an axe and cutting down a tree with a chainsaw. You have to learn how to handle the chainsaw, understand how it works, you have to learn how to handle it safely. It'll take some time, but they'll get there. So those are really the two fears: the fear of exposing a non-performance, and the fear of moving from a situation where I was performing to a situation where I would no longer be performing, or at least that'll I'll be given different expectations to meet, but it'll take me a while to get there." (Participant B)

As mentioned earlier, these same fears are also present at the management level as well. Participant D illustrates the importance of having managers develop the right mindset to face this challenge, by embracing the changes:

"When you start to deploy these tools, you realize that it takes a manager who embraces the changes and who is happy to be given tools or to develop tools that will show that he can be 20% more productive. An example of that is an AI that determines in which region I should allocate my resources. A manager who says: "I find that great, it's been years since I find that I don't have the tools to do this well and I was sure that we could do better." This is a good mindset, the company is going to be successful with that mindset. But another manager might say, "no I don't want to use that tool," because he thinks that once deployed, it's going to show that he was 25% suboptimal. There is one in 2 people who will find it really threatening, and the other really energizing. Managers should be part of that second group. With an AI, if you have managers in that first group, it's not going to work." (Participant D)

To be able to help employees through this fear, two participants described how important it was for managers to "avoid penalizing employees at their performance appraisal" (n=2). Participant G, in particular, brought it up by stating:

"It creates nervousness, it creates fear. You have to support them, you have to be very, very close to them, that's why we have an internal coaching team, they shouldn't think that we're evaluating them and penalizing them during a performance review. At the beginning, it's essential to give everyone a chance. We, personally, are a company that is over 160 years old. You can't ask people overnight to do things that you never asked them to do, by tomorrow morning. We have to make a transition, and we have to support them. There are some that might decide it's time to retire. That's fine. There are those who might say: I prefer to return to a professional role rather than leading this change, because I'm not able or I don't want to do it. So, you really have to be listening. The pace of change is important in this. If your people do marathons, but you tell them tomorrow

morning that they are going to the Olympics... well, if you don't give them training and you don't give them support, you won't have many people going to the Olympics." (Participant G)

Therefore, it's imperative that managers understand the impact an AI system can have on employees. Until now, two consequences were analyzed: firstly, employees might start to question their worth, and secondly, a fear of underperformance might arise. Participant D also brought up how these consequences can also occur to managers themselves. It's important for organizations and managers alike to identify those being confronted with this challenge and give them the resources needed to help them. As Participant G suggested, giving an appropriate time frame to allow employees to embrace the changes is crucial, as well as making sure they aren't being penalized while they are still learning the new technology.

Moreover, two additional consequences of an AI system on an employee's professional identity were examined: the feeling of "loss of control" (n=3) and the risk of "diminished abilities" (n=3). To begin, the first-order code "loss of control" (n=3) is explained by Participant H as employees having initial trouble handing over the control of certain tasks or data they've accumulated.

"*I think at the beginning it's handing over all the control system information and how they are doing. They are so scared, that's their livelihood, and so they are quite hesitant. It's surprising how quickly they come around and want to give you more and ask you more questions and become more involved once they realize all the data they get from it."* (Participant H)

Participant L as well shares how that loss of control is what differentiates an AI system from a traditional IT software:

"The change that's really there is more control, there is less control. When the machine is there and you end giving less control to your staff, well people are not used to it. So, it requires change management, and it's unlike any software we currently have which is controllable by humans." (Participant L)

This consequence not only impacts the employees but the managers as well. As it was said in a previous section of this chapter, while more data and control are given to an AI system, it's essential that managers be able to question the mechanisms in place that are there to check

for errors, since a human oversight is still crucial to minimize the risk of mistakes. So, at the management level, there is also a shift in their control, having to focus more on the AI system and its mechanisms, in addition to their employees.

> *"So, there's like the way that you interface with it, the way that you control it... The way a manager exerts control kind of evolves a little bit. And so then as a manager, even, your job is changing because of that, just because of that."* (Participant I)

Consequently, since an AI system will replace certain employee tasks, it will create a sense of loss of control for the employees. While it might replace some tasks, managers should make it clear it is used to ultimately assist them. Participant H described how managers should address it through education and conversations.

> *"I think the amount of education that we provide in helping them understand that this is not to replace you, it's to assist you. And then opening the door to conversations: what else can AI do for the greenhouse. What other problems are you experiencing that you also have that we can potentially think of the next product for. Then they understand it and they want to give you more and they are less hesitant because they see results and they are more confident in what we are doing." (Participant H)*

Finally, the last consequence of an AI system on employees' professional identity is a risk of "diminished abilities" (n=3). As Participant F conveys, if a system can learn to think for you, eventually, as a result, it will impact your own thinking abilities.

> *"I'll give you an example: your phone now can tell you that you should probably go to the airport because your flight is leaving soon, and it's going to take this long so you should leave. You can either get excited by that or get worried by that. Worried because your phone knows too much, because that is AI. Or you can get excited that you don't have to think and it's thinking for you. And that also has implications. Over time if your phone is doing all your thinking, maybe your own thinking abilities will get diminished."* (Participant F)

In the case of Participant N, the individual also shares how AI led to modifying their training programs in place. The participant explains that the tasks being replaced by their AI system are known to be very formative for their younger staff, and by replacing them with an automated machine, managers have expressed worry when it comes to their training and a loss

of knowledge. Participant N shared how modifying the training programs is crucial to ensure their employees aren't gradually losing knowledge.

Not only should managers be careful of a potential loss of knowledge within their staff in the long term, but Participant J also expresses the danger of giving up too much decision power, willingly or unwillingly.

> *"If people get habituated in trusting what a system is telling them, effectively, even if it's not official or formal or on paper, they will over time give up authority in decision making to that system, whether it's appropriate or not."* (Participant J)

Overall, introducing an AI system can lead to employees revisiting their professional identity, in four different ways. First, having the AI system become more knowledgeable than the employees themselves can result in the employees questioning their worth and their intellect. Second, introducing such a system might bring up a fear of underperformance, either revealed by the AI or caused by a manager wanting employees to become proficient with the technology much quicker than realistically feasible. Third, working with an AI system means giving over control of certain tasks and data to the machine, which employees can have trouble doing, especially if they aren't given the tools or possibility to inspect for errors. Fourth, as the system becomes more knowledgeable, there is a worry that employees will gradually lose knowledge over time, or hand over too much of the decision-making process to the AI system, resulting perhaps in problematic situations.

To address this challenge managers should avoid penalizing employees in their performance appraisals. Knowing they will be given sufficient time to embrace the changes, and they won't be penalized in the process for their mistakes, was said to be crucial to help with the employees' possible nervousness or fear regarding the AI.

One last item, mentioned in previous sections, is that managers will see their own professional identity revisited, as well as their employees. It was shared that as teams will become more agile, managers will need to become "*eyes-on, hands-off"* (Participant D) and focus more on becoming a leader rather than a manager. In addition, since they might lack the knowledge to adequately challenge the work of some of their employees, it was implied that managers should shift towards transformational leadership, by focusing on gaining their

employees' trust, acting as their coach rather than their manager, while also making clear what the outcomes are, such as the overall goals and objectives of the team. This notion of "managers will need to become leaders" (n=3) was addressed explicitly by three participants. Participant D, for example, shares how the time previously spent acting as a manager, should now be transformed into acting as a leader and helping their employees through the psychological challenges brought up by the introduction of an AI system.

> *"There's the notion of not being naive in relation to the psychological and human sides, of having a machine suddenly giving you recommendations and telling you what to do. You know you have to have empathy, an ability to sit with people, to motivate them, to inspire them. The time that you free up from moving away from all the details, because you now have experts and your teams are agile, can you reinvest this time in being a force of positive change for your organization? Talking, communicating, sharing that story of change, explaining to people: "We are going there, and we are the pioneers. I know that it's not easy. Once we're successful, you will see we're going to be the industry leaders." And now you can talk to [names a person] who is a little sad or insecure. " (…), Listen I know it's not easy, you are capable". I think the managers are going to have to become leaders. if ever in one sentence, that's the difference, in my opinion that's it. In change, there's uncertainty, and you can't have people who micro-manage. It takes people who inspire, who lead, who get their heads out of their papers and excels files, who will go out and put their hand on people's shoulders and say:" Listen, it's amazing what we're doing. I know you learn a lot every day and there's a lot of change, but it's really fun to see that you're in it with me." It's a bit of a caricature, but I think it's elementary."* (Participant D)

Participant E as well shares how important it is for managers to shift into a leadership role, to endorse the change and motivate their staff, since AI is not just a technological change, but it's a much larger change, impacting the organization across the board.

> *"As I said earlier, the biggest challenge with AI is not the technology. It's the change management side, the human side. It's sometimes surprising how a beautiful AI project is attacked and you don't understand why. And so a manager, he is not going to react too much to that. A leader, will take the leap and meet people, and say: "ok let's do it, it's important." A leader will find ways to mobilize the organization and his team and even outside of his team. He'll probably takes some hits, but he needs to be able to push a project in which he believes in. It's very inspiring for the team. A manager is going to be there: well no, I don't really want to put my head out, it's too much work, it'll take way too long, it's too big of a process. A leader will say: the process is broken, we'll let's change it. Managers will be called upon to operate outside of their immediate bubbles, so it's critical they become leaders."* (Participant E)

In order to help managers transition into this new role, Participant G expresses the usefulness of offering coaches to their managers:

> *"To bring them more into a transversal role. We try to help them in action. There is a theoretical part, but it's much more in action. You know people today they like to have a solution, if you want them to learn, they must experience it."* (Participant G)

And Participant D shares that the managers' new role will allow them to concentrate on tasks with added value, which they previously did not have time to do.

> *"You have to be able to communicate with them: this is how we're positioning the solution to help you; it will free up time for you, it'll facilitate your work, which means that you could potentially do things of added value and achieve more, which you couldn't previously do."* (Participant D)

Altogether, this necessary shift in the manager's role will provide support to employees navigating these psychological-based challenges conveyed above.

4.6.1 Synthesis – Challenge no. 5. Overall, introducing an AI system can lead to employees and managers alike revisiting their professional identity. First, two main consequences were analyzed: 1) employees might start questioning their worth and 2) a fear of underperformance might arise. To overcome these consequences, managers should give an appropriate time for adjustment, during the transition, to allow employees to embrace the change. Making sure they aren't being penalized during this process was also found to be essential in gaining their trust and helping address the possible nervousness or fear regarding the AI system. In addition, since an AI system will replace certain employee tasks, two other consequences were found: 1) it will create a sense of loss of control and 2) risk of diminished abilities over time. For these, managers should address the purpose of the AI system as ultimately assisting them, rather than replacing them, as well as making sure the training programs are being modified to guarantee employees aren't gradually losing knowledge over time. Managers should also ensure employees are given the possibility to inspect the AI system for errors, as it was shown to help employees give over control of certain tasks. Lastly, it was implied that managers should shift towards transformational

leadership, by acting as a coach and leader rather than a manager. This new role will allow the managers to focus on gaining their employees' trust and helping them through the psychological challenges brought forth by the presence of an AI system.

Chapter 5

Discussion

The previous chapter highlighted five main managerial challenges in an AI context which require the development of specific skillsets. To portray a more realistic representation of the participants' outlook on the topic, the key skills, abilities, and knowledge that managers need to acquire to navigate in an AI context were presented through the lens of the challenge it helps to overcome.

This upcoming chapter starts by exploring how the findings relate to the literature review. The main takeaways are discussed, and the key skills are identified. The practical implications of the thesis are then addressed and the section includes a summary of all the leadership skills managers should acquire to thrive in an AI context. Lastly, the chapter then concludes with the strengths and limits of the thesis, as well as avenues for future research.

5.1 Interpretations of Results

The literature review concluded with the presentation of four categories of leadership skills: *problem-solving*, *social judgment*, *technical*, and an *ethical dimension*. The findings of the qualitative study indicated that participants were more inclined to discuss the competencies needed in an AI context when they were contextualizing them by the challenge they help to overcome. The participants agreed that implementing an AI system brings several new managerial challenges and upskilling managers is a necessary step to help address them. The importance for managers to develop new competencies in the presence of an AI system was illustrated throughout the literature review and during each of the interviews. Indeed, the role of a leader as a key figure in a successful organizational change is not new (Hornung & Rousseau, 2007; Mehta *et al.,* 2014). It was found, however, that new technologies create significant disturbances within the leadership role (Sousa & Rocha, 2019) and that they are being implemented within firms at such an exponential rate that it imposes on their executives the ability to continuously unlearn and relearn (Naqvi, 2017).

Since it is a new technology, some might believe the implementation should be done in a similar way to a technological implementation; however, all participants acknowledged that it brings about further underlying complexities and challenges, with some going as far as stating it should instead be recognized as a cultural shift, with much bigger hurdles to overcome than any other technological programs. Hearing the participants first discuss the challenges an AI implementation creates and then share the competencies that are needed to overcome them, is a reminder of Kotter's (1996) work, who shared that change initiatives do not fail because of a lack of vision, but because the people who institute the change do not see the realities faced by the employees affected by that change. This suggests that identifying the challenges an AI implementation brings to the workforce is a crucial first step for managers to determine which skills they should develop. Once key challenges are identified, this allows for a better analysis of the skills needed to overcome them. This upcoming section will now analyze and discuss the results and summarize the key takeaways.

5.1.1 Becoming technologically savvy. One of the key findings of this thesis was the need for managers to gain a basic understanding of the technology used in an AI system. This is consistent with several studies identified in the literature review (e.g., Carillo, 2017; Diamante & London, 2002; Provost & Fawcett, 2013). Not only did the findings demonstrate it will help managers ease their employees through the AI implementation, but it is also beneficial for managers to improve the technology since it is a continuously evolving system. As Antonescu (208) declared: *"AI will not replace business leaders but business leaders who are prepared and understand AI will replace those leaders that do not"* (Antonescu, 2018, p. 18). Understanding AI systems will facilitate the leaders' interactions with data science teams, as they will be able to ask the correct questions and oversee the adjustments that are needed to improve the accuracies of their model's predictions (Migliore & Hubbard, 2016). One participant said managers should become "translators", which will not only help them in having better control of the AI system but also identify new development opportunities.

Having the tools to understand the knowledge engineering of the AI system was also found to make managers seem more credible to their staff, which was seen as a great way to

build trust in the technology. In the literature review, a study by Van Minh *et al*. (2017) demonstrated that having a leader who is available to guide employees through technical questions brings about a sense of obligation and commitment. It was clear in the interviews that managers shouldn't become proficient at a 4/4 level, but *"they should understand the technology enough at a 1-2/4 level"* (Participant D). As stated above, an AI system is continuously evolving, and managers are key figures in helping to improve it. Developing technical skills will help minimize the risk of errors and make managers become a "*human in the loop*" (Participant J), by allowing for better monitoring and control of the system, in addition to knowing how to identify biases and errors in the collection of data. Something which was not discussed by the participants is whether managers should be held responsible for improving the technology or if they should only focus on the implementation. Having identified that managers can extract much more value from the technology if they understand its core principles leads to the question: who is responsible for improving the technology? If leaders are expected to participate in the advancement of the technology, this additional role should be made clear to them.

5.1.2 Transparency is key. Being transparent is noted as an especially crucial skill in an AI context. As evidence, Winfield and Jirotka (2018) highlighted that: *"technology is, in general, trusted if it brings benefits and is safe and well regulated"* (Winfield & Jirotka, 2018, p. 2). This suggests that managers who want to build trust in the AI system need to be transparent about the reasons for the AI implementation and share how it will benefit the workforce. This aspect is particularly important in an AI context as it could be said that the media has described the impact of AI-based technologies as being ominous. Participants I and J did share that managers will need to focus on counteracting that discourse and relieve any concerns employees might have about the technology by being transparent. Not only should managers be transparent about the reason for the implementation, but many participants agreed on the importance of showing tangible proof of the effectiveness of the technology. This is in line with the works of Winfield and Jirotka (2018) and was well summarized by Participant L: *"I think trust will be built with relevance. I think that's mostly it".* Since it is a data-heavy technology, demonstrating through data the gain in

efficiency (time and money saved) and reliability (low error rate) can be seen as a compelling way to relieve any trusting concerns employees might have.

Being transparent is also a helpful tool when it comes to addressing ethical concerns. This aspect was discussed in the literature review by stating that leadership and change require an ethical foundation (By *et al*., 2012). It was also corroborated by the participants, who shared that managers should establish clear governance practices and be transparent about how the confidentiality of data is being managed. There was, however, a perplexing observation regarding ethics. It was clear during the interviews that ethical concerns should be addressed by managers to help with the AI adoption process. Suggestions were given by the participants, such as establishing clear governance guidelines, as mentioned above, as well as ensuring mechanisms are in place to flag biases or errors. Nonetheless, the importance of accountability, explored in the literature review and expressed by Howard (2019) as important during human-machine interactions, was not explicitly discussed by the participants. It seems that errors are prone to happen with such a data-heavy technology and it is conceivable that developing a clear set of rules acknowledging who is responsible in case of a problem would help relieve some concerns. While the participants did discuss the need for governance guidelines, accountability was not specifically mentioned. Perhaps accountability is not a priority in the context of this thesis (predictive models) and only seen as an important concept in which an AI could lead to bodily injuries or death (i.e., self-driving cars). Nevertheless, having your employees aware of the practices in place in case of errors was seen as a tool to help build trust in the AI and should be addressed by the managers.

5.1.3 Skill-based to trust-based. The goal of the thesis was to identify essential managerial competencies to develop in an AI context. Beyond these competencies, the thesis highlighted a larger topic: the need for a shift of management style from skill-based to trust-based. This could also be considered a shift from traditional management to becoming a leader. While the literature did indeed show that managers need to upskill to lead in an AI context, the findings demonstrated that transforming managers into leaders was seen as a key aspect of a successful AI implementation.

The importance of transformational leadership during any organizational change was first discussed in the literature review (Hechanova & Cementina-Olpoc, 2012), but the findings demonstrated how it is essential when working alongside an AI system. One aspect of becoming a leader was seen as having to build trust in both the technology and its employees. As Participant D shared: "*A manager looks at the results, the processes, the figures. A leader focuses on humans, the changes it requires, and inspires*". Both the literature and the findings illustrated a sentiment of relinquishing the traditional skill-based managerial role in several ways. To begin, with AI algorithms being able to assist leaders in decision-making, Migliore and Chinta (2017) believe leaders should be comfortable relying on the AI systems' predictions, especially in complex situations, rather than only on what they think they know. Leaders should be wary of their own limited thinking capacity and learn to recognize the situations in which they should rely on the machine's objectivity to achieve success. This observation was discussed in the findings as well. Another reason why managers are required to shift away from skill-based and become leaders is that they will now be leading employees who are highly skilled in AI technology. As Participant E described: "*The reality for managers is that they'll have to employ more and more people whose skills they don't even understand. I mean they understand the basis of it, but they can't grasp the technicalities, since they've never worked with anyone like this before."* This finding, which was one of the five AI managerial challenges, was surprisingly not identified during the literature review. Learning to rely on the expertise of the staff members when managers are not able to become experts was deemed a crucial skill, particularly in an AI context. Participant D described it as being "*eyes-on, hands-off".* Since they might lack the knowledge to adequately challenge the work of some of their employees, it was implied that managers should shift towards transformational leadership, by focusing on gaining their employees' trust, acting as their coach rather than their manager, while also making clear what the outcomes are, such as the overall goals and objectives of the team. The lack of information on this topic during the literature review raises the possibility that it might be an under-explored topic and further investigation is needed.

5.1.4 Psychological-based challenge. An important contribution of this thesis is the surprising discovery of the multi-faceted psychological impact of the implementation of an AI

system on employees and ways managers can help address it. The literature review presented three perspectives when it comes to forecasting how AI-based technologies will support and change work practices (Ross et *al.*, 2017). The most featured and agreed upon in AI literature suggests introducing data analytics and AI will *"empower managers and workers by allowing them to use this information to improve workplace efficiencies and replace "gut instinct" or ad hoc decision-making with evidence-based data analytics"* (Ross et *al*., 2017, p. 121). It is clear there will be a shift in the tasks and responsibilities, and consequently, in the competencies of both employees and managers; but more importantly, the findings demonstrated how introducing an AI system can lead to employees revisiting their professional identities. Results showed that as the AI system becomes more knowledgeable, it can result in the employees questioning their worth and intellect. The impact of this *"psychological element*" should not be diminished since it attacks the very definition of "*how people present themselves and perceive their values."* (Participant D). Managers must become aware of this unique consequence; however, while some suggestions were shared to overcome this challenge, the participants did not expand much on the topic. Several factors were identified as limiting the negative impact of such a challenge, such as managers giving their employees sufficient time to experiment with the technology to embrace the changes, as well as sharing employees will not be penalized for any mistakes made during the transition period. Although these actions were found to help manage the possible nervousness surrounding the AI, it seems to barely begin to address such a complex challenge. Be that as it may, the findings established that employees can experience internal conflicts with the arrival of an AI system and organizations and managers alike need to be cognizant of it since it can become detrimental to an AI adoption.

5.1.5 Failure Culture. The previous chapters uncovered several realities facing organizations and managers when introducing an AI system. Participant N described one of these realities as the technology not being *"plug and play"*. Compared to a traditional IT implementation, an AI implementation is an evolving and ongoing process with its own challenges. As a matter of fact, Participant B shared how he believes the path to a well-implemented AI is through exploration. This was corroborated by Participant I who stated: *"The*

whole thing that's exciting about these systems is that they can adapt and improve over time. So, there's like this unpredictability in its performance after it goes live as well". This need for exploration was found to be followed by a fascinating culture shift. The literature and the findings discovered that managers should embrace a culture of failure to achieve adoption. Unsurprisingly, Carillo (2017, p. 615) does express the difficulties that arise with such a culture shift: "*it contradicts the basic nature of a manager's job: time is money and failing costs even more money".* Still, he explains that *"it is only through direct experimentation that one can seize that incremental learning that allows to reach higher ends"* (Carillo, 2017, p. 615). This idea of needing exploration to discover the potential of AI systems was also shared by Participant B: "*We are going to do beautiful things, we are going to do some bulls%it, and eventually we will normalize all that. We need to test the waters because we haven't discovered the full potential yet."* As Participant E described: "*in terms of business management, it takes a willingness to risk.".* Not only will exploration result in discovering the potential of an AI system, but Hengstler *et al*. (2016) also found that a consequence of employees being empowered to experiment with the technology reduces their perceived risk and resistance. In this context, the findings demonstrated that managers will need to welcome ambiguity and curiosity, as the ever-changing technology, with its many unknowns, can only improve through exploration and trial-and-error. As previously stated, Hengstler *et al.* (2016) also found it to be an effective method for building trust in AI systems. Developing an experiential mindset and embracing a failure culture will be even more challenging since it revisits the managers' traditional roles and responsibilities.

5.2 Practical Implications

5.2.1 The AI challenges and the leadership skills required to overcome them. Though AI technology is prevalent, many organizations around the globe are facing similar practical issues while implementing an AI technology (Manyika & Bughin, 2018). Namely, Manyika and Bughin (2018) found that the technology will shift processes and directly impact the workforce. In addition, recent studies, identified in the literature review, explored how new technologies create significant disturbances within the leadership role (Sousa & Rocha, 2019; Weiner *et al.*, 2015). Although previous studies examined specific leadership competencies that may be

particularly useful in an AI context (Di Fiore, 2018; Brock & von Wangenheim, 2019; Huang & Rust, 2018; Piccarozzi *et al.*,2018), the thesis identified the most important leadership competencies to acquire in an AI context. In addition to the thesis first synthesizing the literature, the findings chapter then identified five main challenges managers will need to overcome for a successful AI implementation. Each of these challenges was presented with a list of skills and knowledge that helps address them.

The first challenge expressed the importance for managers to become technologically proficient in order to utilize AI technologies to their maximum capacity and value. Developing a basic understanding of the technology allows managers to bridge the gap between the business and technology silos of an organization by being able to communicate and give feedback on more technical details, in addition to having the knowledge to become more transparent with their employees. As a result, the opportunities and value of the AI system are expected to increase.

The second challenge shared how mistrust in the performance of an AI and the presence of ethical issues are the two biggest barriers to AI adoption. It was deemed important that managers learn how to convince employees to trust the machine as well as address all the ethical issues surrounding it. Helping to establish clear governance practices and proper monitoring gives managers the opportunities to flag the system for biases, for errors and ensure there is no privacy violation, which in turn helps alleviate ethical concerns. In addition to being employee-centric, managers should learn how to show tangible proof of AI effectiveness since demonstrating gain in efficiency and reliability through data was said to be a great step in addressing concerns and improving AI adoption.

The third challenge managers are confronted with is learning to embrace the evolving nature of an AI system. Since AI technologies adapt over time through a discovery process, it is suggested managers continuously adapt as well. Allowing for experimentations and showing leniency when errors are made is key to embracing this process and improving the technology. Curiosity and accepting ambiguity are two other skills managers should adopt, since there are still so many unknowns surrounding the technology. It was found that an AI system is continuously evolving because it also requires constant data input for effective results. Managers

should learn to encourage and embrace collaboration as data collection and input are best achieved through a team effort and leads to producing reliable results.

The fourth challenge identified is that AI implementations require organizations to undergo an internal reorganization. For managers, this means they will be leading multidisciplinary teams with employees whose technical skills far outweigh their own. As such, it is recommended that managers become cross-functional and learn basic knowledge of this new technology, to adequately collaborate with their subordinates and initiate productive conversations. Since managers might lack the knowledge to adequately challenge the work of these new employee profiles, it was implied that managers should shift towards transformational leadership, by focusing on gaining their employees' trust, acting as their coach rather than their manager, while also making clear what the outcomes are, such as the overall goals and objectives of the team. Ultimately, introducing an AI will not only shift teams, but also the managers' role and management style.

Lastly, the fifth challenge identified is of a psychological nature: introducing an AI system can lead to employees and managers alike revisiting their professional identities. Several consequences were analyzed including that employees might start questioning their worth and fear of underperformance might arise. To overcome these consequences, managers should give an appropriate time for adjustment and not penalize any employees during this process to gain their trust. It is helpful if managers also explicitly address the purpose of the AI system, as well as make sure the training programs are being modified to guarantee employees aren't gradually losing knowledge over time. In addition to giving their employees the possibility to inspect the AI system for errors, these actions will help to address the possible nervousness or fear regarding the AI system.

5.2.2 The ethical dimension of an AI implementation. Another important contribution of this thesis concerns the ethical dimension of an AI implementation. Indeed, the literature review found that ethical concerns are an under-explored topic surrounding AI implementations. As such, the findings contributed to a deepening of knowledge on the importance of ethics in an AI context and presented several managerial skills associated with that dimension, such as knowing

how to establish proper monitoring of the system and prioritizing transparency with staff members by sharing the knowledge engineering of the technology. As previously noted, the assertion that leadership and change need an ethical foundation is far from new (By *et al*., 2012). However, as Wright and Schultz (2018) believe, despite the recent advancements in artificial intelligence, the ethical concerns surrounding such automation have been less studied and are less understood. Parry *et al*. (2016) also found that introducing an AI system within an organization could be a dangerous path if the firm does not incorporate moral and ethical values and if its leaders aren't given the possibility to develop such ethical competencies. The literature review acknowledged several ways to address ethical concerns, including having leaders develop their sensemaking abilities to help enhance their ethical decision-making (Thiel *et al.,* 2012) and practice ethical governance as a necessary step to building employee trust in an AI system (Winfield & Jirotka, 2018). Our findings further investigated the topic of ethics in an AI context and demonstrated that ethical concerns are some of the most important factors hindering AI adoption. In addition to supporting the skill-based model presented in the literature review, the findings illustrated the significance of becoming technologically proficient to address many ethical concerns, thus improving the success of AI adoption. As such, another practical implication of this thesis is having identified the importance for managers to not underestimate the ethical dimension in an AI context. The presence of an AI will raise multiple ethical questions and addressing them was seen as a crucial step to reaching AI adoption.

5.2.3 Training Programs and OD Professionals. This thesis contributes to the topic of managerial training programs by sharing a list of skills, competencies, and knowledge that managers should acquire to thrive in an AI context. Firstly, it allows organizations to understand whether they are ready to implement such technology, by observing the current skill sets of their managers and analyzing if it corresponds to the appropriate skills for a successful AI implementation. Secondly, Kotter (1996) shared that change initiatives do not fail because of a lack of vision, but because the people who institute the change do not see the realities faced by the employees affected by that change. As such, this thesis also helps organizations wanting to implement this technology by providing them with five concrete AI-based challenges which their

managers will be faced with. Additionally, it seems that learning about the challenges will not only help deepen the managers' understanding of the technology but will also act as justification for developing certain skills. Regarding the learning process itself, surprisingly only seven participants gave suggestions, and their answers were very brief when they did (become self-taught (n=5), reading books (n=1), attending conferences (n=1), attending networking vents (n=2) and reading research blogs and other forms of documentation (n=1)). It is also worth noting only one participant suggested there should be some form of company training. The brevity of their answers raises the question, who should start the process of upskilling managers?

While the thesis gives managers specific tools to prosper in an AI context, those who are best equipped to handle such a change are Organizational Development (OD) professionals. As demonstrated in the thesis, an AI implementation will have an impact on multiple fronts: it is not an ordinary technical change, but an organizational process that requires the managers' buy-in and the employees' involvement as it will redefine jobs and require new forms of collaboration. As Anderson (2016, p. 10) stated: *"While some OD interventions do incorporate training programs and skill building, OD is more centrally concerned with the context that would make a training program successful, such as management support, job role clarification, process design, and more".* In that regard, it is suggested that OD professionals can benefit from learning about the skillsets identified in the thesis; but, when building interventions to help organizations through an AI implementation, they will most importantly profit from the results of the thesis describing the larger context in which each skill should be used and the challenge it helps to overcome. Relatedly, Burke (2008, p. 28) notes: *"for OD, individual development must be in the service of or leverage for system-wide change.".* These two authors demonstrate how valuable the thesis is to OD professionals since contextualizing the skillsets managers should acquire, provides them with a basis with which they can create OD interventions to develop systemic long-lasting changes in an organization.

5.3 Strengths and limitations of the study

5.3.1 Strengths. Before discussing the limitations of the study, it was deemed important to share its strengths. First, it was important to search for and select high-quality participants

who had real knowledge of an AI implementation. Though the original criteria for the ideal participant were modified due to unforeseen complications in finding such participants, perseverance was key to identifying participants who would provide useful and relevant knowledge for this thesis.

Another strength of the thesis was to try to uncover as much data as possible by analyzing differences in answers between the participants who had practical knowledge versus those with more theoretical knowledge, to try to uncover patterns that could emerge from such a contrast. The same was done with participants who had played an external role with an AI Implementation, such as a consultant, as opposed to participants who had an internal role in the organization. While an effort was made to try to find any discrepancies between their answers, in the end, nothing of note was found and included in the findings. It was, however, important to share such an effort was done to put to rest any questions that could arise from having a heterogeneous group of participants. Although no specific patterns were uncovered in this thesis, another study perhaps could identify differences between the groups.

Lastly, another strength of the study was to complete a pilot test to solidify the interview questions before completing the rest of the interviews. Once it was clear that candidates would be difficult to recruit, a pilot interview took place with a participant outside of the field of study, so as to not lose a high-quality participant to that process. The pilot interview was completed by an individual who specialized in human resources, and who was able to help rewrite several questions for added clarity and change the order of some of them to establish a more logical sequence.

5.3.2 Limitations. Although certain strengths were presented, this thesis also has limitations that must be considered. First, when creating the framework of the study and deciding on which AI technology to focus on, a rather simplistic view of AI was selected. Even though it was clear to not include any robots, more effort perhaps could have been put into researching, clarifying, and identifying a more precise definition of the AI chosen for the study. The thesis included a very generic definition of AI, namely machine learning-based predictive analytics, offering improved decision support, as well as helping to optimize processes, in addition to

requiring human collaboration to function. It may be that by researching further into the specificities of AI systems, several nuances could have appeared. Indeed, the simplified definition of an AI system led to selecting a heterogenous group of participants for this thesis. If it had been a more selective group, more nuanced answers perhaps would have been identified.

Second, in that regard, it should be noted that some participants had more practical experiences with an AI implementation than others. Unfortunately, finding participants was a challenging task and it was decided to include participants who had either practical or theoretical knowledge of an AI implementation. A clear assumption would be that there is a clear benefit to preferring to interview only participants with "real-life" knowledge of the consequences of an AI implementation. Despite the participants with theoretical knowledge having reliable sources of information, it begs the question of whether the findings would have been different if only participants with practical knowledge had been interviewed.

Third, another limitation of the study is the sample size of 12 interviews. It would have been more advantageous to stop the data collection due to saturation, but since it was difficult to recruit participants, the sample size had to be determined by the number of individuals that were found.

Fourth, the last limitation of the thesis is the time it took to complete it once interviews were conducted. This thesis started in 2019 and finished in 2022. As described throughout the thesis, AI is a technology that evolves quickly and as such, the AI landscape and research surrounding it were evolving as the thesis was written. The interviews were completed two years ago now, with the data collection happening at that specific point in time. This thesis, therefore, perhaps did not uncover or discuss themes that are now more prevalent.

5.4 Avenues for future research

This thesis, first, categorized the most important leadership competencies, found in the literature, to help achieve a successful implement an AI system. The findings then confirmed that an AI system introduces new managerial challenges which require the development of specific skillsets. It was found that not only should leaders upskill to better interact with the technology, but it is also necessary for them to offer support to their workforce experiencing significant

challenges as well. This section identifies suggestions for possible future research surrounding this topic.

First, it would be remiss to not include the significant event that occurred while this thesis was being written: a global pandemic. Covid-19 certainly brought a lot of organizational changes and with AI still being used and implanted in organizations worldwide, this must have created additional managerial challenges. With more employees working from home, a question it raises is if the role of a manager has shifted in the era of covid and post-covid, and if so, what are the lessons to be learned from such an event? Future research could investigate on how remote work, heavily promoted during the pandemic, has impacted the role and responsibilities of a manager.

As for AI technologies, the findings demonstrated the importance of consistency and collaboration for accurate results. With the pandemic, some organizations closed their doors for several days, weeks or months. For those that use AI systems, it can be assumed that they most probably gathered irregular data during that time. This must have had long-term consequences for these organizations. It would be fascinating to analyze how managers accommodated that difficulty. In addition to having to work with irregular data and its consequences, some managers also had their employees working from home. Since it was identified that AI systems require collaboration, future research should analyze how remote work affects collaboration and what, in an AI context, managers can do to address that additional complexity.

In addition, the AI systems discussed in this thesis are predictive models. It would be valuable to complete a study to identify the differences in the managerial role and the competencies needed when introducing a predictive model versus a traditional robot with AI capabilities. With robots, employees are being replaced at a more rapid pace than predictive models, and there must be other significant challenges and fears to address with such a technology. It is also a technology that is more frequent in organizations, which implies the possibility of a larger sample size.

Lastly, this thesis focused on the role of managers in the context of an AI implementation. It analyzed the skills, competencies, and knowledge they would need to develop to thrive in an AI context and lead the change successfully. This leads to the question, how can the framework

presented in the literature review and the findings be extended? What other components of an organization will be impacted by an AI implementation? It would be interesting to research other components of an organization to identify the critical success factors, in addition to leadership competencies. Organizations would benefit from a wider perspective to understand where to focus their time and resources for a successful organization-wide AI implementation.

Conclusion

The thesis aimed to research into the leadership role and identify the competencies and knowledge managers should acquire to participate and thrive in a successful AI implementation. A survey completed by 451 Research (2021) found that 95% of businesses surveyed consider prioritizing AI technology in their digital transformation efforts. In addition, a survey by Infosys (2018) established that an AI transformation impacts the leadership role in several ways, including by decreasing transparency in the business, requiring the ability to be more agile and responsive, as well as creating a need to foster a culture of lifelong learning as the AI evolves (Infosys, 2018). Brown *et al.* (2019) also identified the importance for upskilling leaders to reach the true potential that can be achieved with an AI technology. As such, there is a clear need to understand how leaders, who are key figures in reaching a successful AI implementation, should prepare to welcome an AI system and which competencies they should acquire to prosper in an AI context.

The literature review first found there is some excitement, and anxiety, as organizations in various sectors are exploring how they can utilize their data to create value (Manyika, 2011; Vidgen *et al.*, 2017; Yiu, 2012). Different risks linked to an AI implementation were identified, such as privacy issues, lack of transparency and accountability concerns. This demonstrated the need for leaders to become sufficiently knowledgeable to address these challenges. A whole new dimension of leadership development was suggested since AI technologies not only impact organizations, but also shift the leadership role.

The literature review then explored the themes of leadership, change management, and technology adoption. Numerous studies helped demonstrate the importance of leadership during an organizational change and how leader competencies and behaviours can have a significant impact on the success or failure of organizational change initiatives (Eisenbach *et al*., 1999; Higgs & Rowland, 2005; Mehta *et al.*, 2014; Van der Voet *et al*., 2016). These studies were highly relevant to the research question at the core of this thesis, since they served as a basis for understanding how the specificities of AI might impact the leadership role and skills.

Building upon the skills identified in this section, as well as the general competencies for effective leadership presented by Mumford *et al.*'s (2000) skill-based model, the literature review continued by further investigating the topics of leadership and AI. The goal was to consolidate all the works that have identified successful leadership competencies in an AI context, in the hopes of contributing to a larger perspective on the topic, by expanding the Mumford *et al.* (2000) skill-based model. The competencies identified in the literature seemed to reflect three different categories of skills. As such, they were first grouped into these categories: *business-related competencies*, *technical competencies*, and *ethical competencies*. However, since the Mumford *et al.*'s skill-based model (2000) was used for structuring the results, the literature review concluded with a synthesis table, integrating all the literature found on AI leadership competencies, and was structured into these four categories of skills: *problem-solving*, *social judgement*, *technical* and *an ethical dimension*.

After conducting twelve interviews to collect as much in-depth knowledge as possible on the topic of AI and leadership, the findings confirmed the need to upskill leaders to help achieve AI adoption. The chapter demonstrated that AI introduces new managerial challenges which require the development of specific skillsets. The findings further shed light on these five unique challenges by describing them and identifying the key skills, abilities, and knowledge managers need to acquire to navigate these challenges properly. As such, these five challenges were:

- AI technologies can only reach their maximum potential and value if managers become technologically proficient
- Mistrust and ethical concerns are the two barriers to AI adoption to overcome
- AI technologies continuously adapt over time through a discovery process and managers must embrace its evolving nature
- Introducing AI creates the need for internal restructuration and results in managers leading teams comprised of technical experts whose technical skills far outweigh their own
- AI systems can lead to employees and managers alike revisiting their professional identities

The findings, and the discussion that followed, uncovered several key contributions to the topic of AI and leadership. Key skills were identified, such as advocating for transparency and shifting from a skill-based to a trust-based leadership style. The importance of collaboration was investigated and found to be essential for identifying potential threats in the AI system, as well as collecting and inputting the large amount of data needed to train the system. A discovery was made regarding the multi-faceted psychological impact of an AI implementation on employees and ways managers can help address it. Lastly, the importance of embracing a culture of failure to achieve AI adoption was shared, since the path to a well-implemented AI is through exploration.

Another important contribution of this thesis concerns the ethical dimension of an AI implementation. Indeed, the literature review found that ethical concerns are an under-explored topic surrounding AI implementations. As such, the findings contributed to a deepening of knowledge on the importance of ethics in an AI context and presented several managerial skills associated with that dimension, such as knowing how to establish proper monitoring of the system and prioritizing transparency with staff members by sharing the knowledge engineering of the technology.

The thesis explored how AI technologies bring forth new challenges and added complexities to the leadership role. While the technology is unique, the process of upskilling leaders should be based on already heavily studied, and established, organizational practices. As discussed, leaders are required to develop new competencies and will be able to accomplish that if organizations put in place the correct structures and training programs to help them learn about, and overcome, the specific AI managerial challenges identified in this thesis.

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Appendix

Appendix A

Interview Guide

Introduction

1. Can you give me a brief outline of your main tasks at work?

2. Can you share a brief history of the AI implementation?
   - *Can you share with me a brief description of the AI (and the type of interaction it requires from you and your employees?)*

3. How does the implementation of this technology and the changes that followed compare to another IT software implementation?

4. How do you think the implementation went?
   - *what would you have done differently?*

5. What changes to your job and your team occurred once the AI was implemented?
   - *Which ones were expected, which ones were unexpected?*

6. What did you, as a leader, do to prepare you and your employees for these changes?

(is the participant bringing up trust & ethics?)

Training

7. What kind of training was offered to you and the other leaders?

8. Are you aware of the kind of training other firms that are using AI offer to their employees?

9. Nowadays, how adjusted would you say you are to this new technology?
   - *What happened to make you be in this position?*

(How has the AI impacted your job and your relations?
- *within your team?*
- *with your own supervisor?*
- *Has it changed the way you make and take decisions?*
- *what aspects of your job has been replaced by the AI?*
- *what can you now focus on now that AI has replaced it?)*

10. What skills or competencies should you need to be well adjusted?

Employees

11. What were your employees' initial reactions to working with the AI?
- *What difficulties emerged*
- *What went smoothly?*
- *What did you do to deal with them?*

12. Nowadays, how is the AI perceived? (current issues, concerns or disadvantages AND benefits)

13. Nowadays, how adjusted would you say they are to this new technology?

14. Would you say the AI is being used to its maximum potential?
- *What does that mean?*
- *What would that require on your part?*
- *What would that require on the part of your employees?*

Others

15. Do you know of any other leaders (within your organization or any other one) that were faced with a similar situation?

16. Is there anything I've left out in my questions that would be worth researching?