AI IN PERFORMANCE MANAGEMENT: WHAT ARE THE EFFECTS FOR LINE MANAGERS?

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ABSTRACT,

Purpose: This research is focussed on identifying implications of Artificial Intelligence (AI) usage for performance management activities and assess how the role of line managers changes regarding those activities. To achieve this goal, the benefits and drawbacks of AI usage are presented and applied to the role of line managers.
Design: A systematic literature review is performed, which is complemented by three cases, constructed out of semi-structured expert interviews. The literature review aims to form an understanding of AI usage' implications in performance management. The findings of the expert interviews were combined with those of the literature review to answer the research questions.
Findings: Performance management is influenced by AI usage in a way that it becomes more accurate through the use of more current and accurately collected data which is gathered easier, is done more continuously, is less biased, and done with a more pro-active attitude than before AI was implemented. AI implementation enables a transition to where line managers have more time available to coach employees, which in a performance management context, means helping employees to perform to the best of their abilities, and aid them in their development.
Research limitations: Due to a relatively small number of cases the validity of this research could be questioned. This is however not likely since the presented findings were unanimously confirmed in the cases. Further research could be performed to increase validity, as the found results look very promising for line managers.
Theoretical implications: Where current academic literature focusses only on AI implementation effects for HR managers and/or performance management in general, this research presents implications for line managers specifically. Also, a contribution is made to the HR devolution theory, confirming that under the influence of AI usage, responsibilities are transferred to line managers.
Practical implications: The results of this research provide line managers, their employees, and HR managers with insight in how AI usage for performance management might look like, and what implications it holds for their functioning.

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Artificial Intelligence, Performance Management, HR-activities, line manager

1. INTRODUCTION

1.1 HR & Line managers' roles in performance management

In our digital and modern society, all aspects of life are subject to continuous change (Kurchina, 2019). One of those changes in our modern society is the introduction of Artificial Intelligence (AI). More and more businesses realize that AI can be of a benefit to them in their operations, and utilize them to perform more effectively (Buck & Morrow, 2018; Euchner, 2019; Marvin & Horowitz, 2018). The field of Human Resource Management (HRM/HR) and its corresponding HRM activities are no exception to this (KPMG International, 2019, p. 2; Renkema, 2019, p. 1).

In the context of HRM, line managers are responsible for observing and executing HRM practices on the operational work floor (Nehles, Van Riemsdijk, Kok, & Looise, 2006, p. 257). This understanding is supported by the devolution theory, which suggests a move of HR responsibilities from human resource managers to line managers that is going on globally (Buitenhuis, 2017; Butkute-Van de Voort, 2010; Intindola, Weisinger, Benson & Pittz, 2017; Perry & Kulik, 2008).

As the term 'line manager' can be subject to different interpretations, the definition that will be used in this research will be that a line manager is responsible for managing employees and resources, with the goal to contribute to certain functional or organizational goals (Reh, 2019). Next to that, due to a line manager being part of the lower management of a firm, a line manager also always reports back to a higher-ranking manager (Reh, 2019).

One of the primary HR activities where line managers have the most connection with the workforce is managing employee attitudes and behaviours, which is encouraging and motivating employees to perform in appropriate ways to contribute to company goals (Lepak & Gowan, 2016, p. 5). This ties in with the understanding that a line manager is responsible for managing employees in such a way that they contribute to organisational goals. The primary HR activity of attitude and behaviour management is linked mainly to the performance of employees and the efforts they make in achieving that performance (Lepak & Gowan, 2016, p.10). This can, in turn, be related to the notion that the management of performance is considered a core HRM practice in the engagement of employees (Albrecht, Bakker, Gruman, Macey, & Saks, 2015). Combining these notions about HR activities being carried out by line managers, and performance management being a prime activity for line managers to be of added value, it is argued that performance management as an HR activity is also delegated to a line manager (Nehles et al., 2006, p. 257). The definition of performance management that will be used is that it is a way of getting better results by providing employees with the means to perform well within an agreed framework of planned goals, standards and competency requirements (Armstrong, 2006, pp. 334-335).

All in all, Buck and Morrow (2018, p. 261) argue that performance management, being an ongoing data-driven process where employees need real-time positive feedback, is going to benefit greatly from AI usage. The adoption of AI for automating repetitive, administrative, tasks to focus more on the core performance management activities would benefit line managers tasked with the execution of HR activities greatly (Armstrong & Taylor, 2014, p. 341; Buck & Morrow, 2018, p. 261). A successful performance management system should include several components. These are the planning of performance, or goal setting (1), the review or appraisal of performance (2), which can be done in any pattern as the company sees fit, giving feedback on the performance, combined with identifying an employee's training opportunities (3). Also, it is very important to reward good performance by employees (4), and to draft a performance improvement plan together with the employee to set new goals and how to achieve those (5) (Juneja, 2020). Core performance management activities to fulfil these components are mainly interactions with employees by managers, to set goals, review performance, or assess the activities of the employee.

The management of performance requires line managers to engage in various formal and informal activities with their employees, such as performance appraisal or coaching interactions (Van Waeyenberg & Decramer, 2018, pp. 3105-3106). In the execution of performance management activities, a line managers beliefs regarding the usefulness of those activities, together with the line managers' AMO (explained in chapter 2.3) to implement performance management systems contribute to the effectiveness of performance management in a company (Dewettinck & Vroonen, 2017, p. 2492; Van Waeyenberg & Decramer, 2018, p. 3106). In other words, the correct involvement of line managers is of substantial importance to the successful execution of performance management.

As stated earlier, AI is changing businesses around the world, and HR activities are not an exception to this. Thus can be argued that the usage of AI for performance management can lead to changes in the role of a line manager. This research aims to present possible implications of AI usage in the performance management of employees for the role of line managers in organizations, and how the line managers' role changes due to the usage of AI. In other words, what the effect of AI can be for the performance management that line managers do of employees on all levels of a business.

1.2 What is AI and how can it be applied in businesses?

To identify what AI can mean for line managers in the execution of HR activities, first a definition of what AI is must be established. In this research, AI will be viewed as an intelligent agent, which can interact with its environment, and thus makes decisions that will lead to a higher chance of success for the goals it strives to achieve. This definition follows the perceptions of several leading textbooks that are written on AI (Legg & Hutter, 2007, pp. 7-8; Luger, 2009, pp. 30-31; Poole, Mackworth, Randy, & Goebel, 1998, p. 1; Russel & Norvig, 2003, p. 55). Following this definition, an AI system is required to have several recurring capabilities to be able to function. The most prevalent in these are language processing (1), the ability to understand and communicate in a human language; knowledge representation (2), the ability to store what the system knows or picks up; automated reasoning (3), the ability to use the information that was stored to solve problems and questions; and machine learning (4), the ability to adapt to changing circumstances and to filter out and apply patterns in the stored data (Luger, 2009, pp. 30-31; Russel & Norvig, 2016, p. 2).

The adoption of AI systems in business is accelerating rapidly and is starting to impact more and more departments in companies (Buck & Morrow, 2018, p. 262; Euchner, 2019, p. 10;). An AI system can be implemented in a company in one of two ways. It can be done on a small, manager assisting level, where it could save money by improving a small part of the business by, for example, optimizing inventory. AI could also be implemented on a larger, company changing, level, where it enables the complete redesign of core business processes (Euchner, 2019, p. 10). However, in an environment where interaction and human judgement is vital, it is not feasible to implement a large AI that replaces humans altogether. In such an

environment, it would be best to have an assisting AI, that would help the line manager to better make decisions in support of the execution of their core performance activities (Euchner, 2019, p. 10). Since AI is defined as an intelligent agent, it could be argued that AI would replace line managers altogether. However, an intelligent agent is a system that acts in such a manner that it is appropriate for its circumstances and goal, and it is flexible to a change in those circumstances and goals as it learns from experience (Poole, Mackworth, Randy, & Goebel, 1998, p. 1). Therefore an AI system can also be designed with the goal of assisting the line manager taken in mind, and not aimed at replacing the line manager.

1.3 Research goals and questions

However, the problem most line managers face nowadays is that they have limited knowledge of AI possibilities, and that ignorance causes aversion of AI usage (Euchner, 2019, p. 11). This limited knowledge can lead to line managers believing their role will be replaced by an AI system, which could be viewed as a big AI (Euchner, 2019, p. 10), while it might just be the case their roles in performance management are supported by AI instead of replaced, which corresponds with the small AI (Euchner, 2019, p. 10).

The usage of AI provides many opportunities, such as leaving administrative tasks to it, or focus on decision-related tasks (Buck & Morrow, 2018; Euchner, 2019; Kolbjørnsrud, Amico & Thomas, 2016, pp. 4, 11). To provide businesses with a clearer view on AI usage, the main goal of this research is to provide a clear overview of the possibilities that AI has for line managers in managing employees to appraise their performance. The above-described knowledge gap of line managers showing an aversion to AI due to having limited knowledge about it shows that there is plenty of room for AI usage in HRM activities, and specifically performance management, so a clear analysis of the benefits and drawbacks of AI usage is necessary to be able to provide a significant contribution. The goal that is described above can be best achieved by answering the following research question:

"In what ways does the usage of AI in performance management of employees change the role of line managers?".

To help answer that main question, several sub-questions were drafted as well. These are:

1) "*What are the benefits and drawbacks that AI usage has on performance management by line managers?"*

2) "*How would AI usage be best organised to make performance management easier to execute for line managers, and how does that change the line managers' role?"*

This research is aimed at contributing to several concepts. First of all, the understanding and identifying ways in how AI can be used in the support of performance management activities that are executed by line managers. Also seeing how the roles of line managers change by the usage of AI is in the scope of this research. The results that are gathered by answering the research questions would likely be very valuable for line managers themselves, as well as the upper management of a firm, as it provides insight into AI usage for performance management purposes. Next to that, it contributes to the existing academic literature since other researchers may build further upon the results in studies that focus on performance management and the possible effects of AI usage.

2. THEORETICAL BACKGROUND

By reviewing existing literature, a theoretical background is given to performance management, developments in performance management, and opportunities for AI usage.

2.1 Performance management activities

The management of performance, as defined by Armstrong (2006, pp. 334-335), is a way of getting better results by providing employees with the means to perform well within an agreed framework of planned goals, standards and competency requirements. Performance management aims to develop the capacity of employees to meet and exceed expectations and to achieve their full potential to benefit themselves and the organization. Aligned with that aim, is clarifying how employees are expected to contribute to the achievement of organizational goals by aligning their individual objectives with the organisations' strategic objectives. This notion is confirmed by Lepak and Gowan (2016, pp. 11-12), whom state that performance management is not just a single yearly review of an employee along a fixed set of criteria, but instead making sure that performance criteria that are properly aligned to the organizational goals are clearly communicated to make sure that employees are more confident that they are directing their efforts to the most important activities in the organization. In making that performance management effective, attention also needs to be given to providing employees with continuous feedback regarding performance and helping those employees how to continually improve. Also, as Robbins et al. (2016, p. 151) pointed out, research conducted in organizational interventions to improve performance management resulted in the understanding that frequent, specific feedback to solve problems is linked to having higher performance, and infrequent feedback on past problems proved much less effective. For this research, we will define performance management as aligning employee goals with organizational goals and guiding employees in improving their behaviour and capacities to better achieve their personal and thus organizational goals.

2.2 Performance management developments

Recent literature suggests that a revolution in performance management is currently happening. More and more companies transfer from the traditional yearly review, executed once or twice a year, to more frequent and informal check-ins (Cappelli & Tavis, 2016, pp. 1-2; Sloan, Agarwal, Sherman Garr, & Pastakia, 2017, pp. 66-67). This transition enables the shift from talking about people to talking with people in more frequent open conversations (Sloan et al, 2017, p. 67), thus enabling employees to receive more real-time feedback (Buckingham & Goodall, 2015, p. 4; Sloan et al, 2017, p. 68). This aligns with Buck and Morrows' (2018) view on changes within performance management, stating that companies are increasingly recognising the need for employees to receive real-time feedback. This new method ceases to utilize 360-degree feedback, which is the practice of asking colleagues of an employee for feedback on an employees' performance, since 360-degree feedback is not considered to be the most objective feedback tool out there (Buckingham & Goodall, 2015, p. 8; Cappelli & Tavis, 2016, p. 62) and is extremely time-consuming (Mueller-Hanson & Pulakos, 2019, p. 122). However, as many organisations do use the method of 360-degree feedback as part of the performance management process, it is vital to find a way to reduce the time needed for the execution and administration of these reviews. As Buckingham and Goodall (2015, p. 1) state, companies realize that they are more in need of something nimbler, real-time, and more individualized, which is solely focused on fuelling performance in the future rather than assessing it in the past. This need amongst companies provides a multitude of possibilities for AI usage and is therefore relevant to investigate.

2.3 Possible hindrances for Line managers' HR execution

Research has already been conducted on the benefits and downsides of the execution of HR activities by line managers. Several factors that are presented by this research are causing line managers to have an impaired ability to perform performance management activities. These hindering factors could be addressed by AI to increase the effectiveness of performance management execution by line managers. Such a theory is the Ability-Motivation-Opportunity (AMO) theory, which explains that line managers' performance on a task is dependent on the manager having the *ability* to carry out the task (1), their *motivation* to do so (2) and the *opportunity* to carry out the task in the working environment (3) in which the manager has to operate (Appelbaum, Bailey, Berg, & Kalleberg, 2001, pp. 86-87); Paauwe, 2009, p. 133). It is therefore argued that inability, non-motivation, or a lack of opportunity can also impede the execution of HR activities by line managers (Bos-Nehles, Van Riemsdijk, & Looise, 2013, p. 862). AI could especially be of use for addressing the a*bility* aspect of line managers' performance management execution, as it influences the manner how the activities can be carried out.

Besides the AMO theory, Nehles et al. (2006, p. 874) show with an extensive field study, that there are several other complementary factors that can hinder the successful execution of HR activities by line managers. These are the lacking of *willingness* (1), no *time* to spare for spending on these additional HR responsibilities (2), having insufficient *competencies* to apply HR activities (3), they are not well *supported* by the HR department (4) or they have no clear *policy or procedure* for the execution of these HR activities (5). These factors are in turn backed up by Armstrong and Taylor (2014, p. 345), who sum up several conducted pieces of research' results, that show that line managers are often hindered in the execution of their HR tasks. These theories could provide some guidance in the process of answering the research question.

3. METHODOLOGY

As the goal of the research is exploratory, and to gain insights into reasons or motivations of individuals, a qualitative data gathering method was the best fit (Minichiello, Aroni, Timewell, & Alexander, 1990). To identify what is already known in the current available academic literature on AI use for performance management, a Systematic Literature Review (SLR) was conducted.

The goal of this review is to gather the benefits and challenges of AI usage for line managers executing performance management out of existing academic literature. A literature review can be conducted in one of two ways as described by Webster and Watson (2002). They state that literature reviews can be divided into two types. The first type analyses and constructs an accrued body of knowledge, and the second type focusses on an emerging issue that would benefit from exposure to potential theoretical foundations (Webster & Watson, 2002, p. xiv). The second type of review focusses more on finding literature to provide a theoretical background to a societal phenomenon, and as such is not suitable for this research. Because the literature review aims to identify what is known in current literature and use those results as a starting point for further research, this literature review is based on the first type described, executed in a systematic manner. With executing an SLR, the aim was to identify what is already known in the existing literature about the benefits and challenges for line managers of AI usage for performance management activities. The results of the SLR will be used as a foundation in answering the main research question, combined with several cases, constructed with the outcomes of the interviews.

Because Scopus has a wide selection of academic literature, and the goal is to provide a sound theoretical basis, the initial review was done on Scopus, with the use of several inclusion and exclusion criteria. First, the search was focused on finding literature written in the English language. Second, only literature not older than five years was assessed, as the development of AI is undergoing a renaissance (Euchner, 2019, p. 10). Thus, older literature most likely contained outdated or less relevant information. And the last criteria was solely searching for results in the fields of Engineering and Business, Management, and Accounting.

First, a search was conducted with the words *"Artificial Intelligence" and "Performance Management" and "Line Managers".* However, this yielded not even a single result. Therefore, several pairs of search words were used. These pairs were: *"Artificial Intelligence" and "Performance Management", "Digitalization" and "Human Resource Management"* and *"Artificial Intelligence " and "Human Resource Management".*

These searches on Scopus resulted in an initial total of 799 results. After applying the inclusion and exclusion criteria that were described, 179 results remained. By assessing the titles and abstracts of these results, the list was narrowed down to the 16 articles. Of these, two were not accessible, and after reading the full-texts, 12 results remained to be included in this review. The titles and abstracts were assessed on their usability based on the fitness to contribute to providing an answer to the research question.

To complement the Scopus search, a search with the search word pair *"Artificial Intelligence"* and *"Performance Management"* was executed on Google Scholar. Due to the technical restrictions of Google Scholar, these vary slightly from the criteria used for the Scopus search. However, the criteria were chosen to best resemble the initially chosen inclusion and exclusion criteria. The inclusion criteria that were used are: 'Publications since 2016' and 'Every language'. Patents and citations were excluded from the search. This initially resulted in 6020 results, ordered by relevance. As filtering through all these results would prove to be an enormous task, only the first five pages of the results were analysed, which were 50 results in total. This was again done by reading the titles and abstracts of the results. This analysis returned 17 useful results. Unfortunately, two of these results could not be accessed online, and thus were not taken into account.

The review process of both reviews can be found in Figure 1 and Figure 2. The main findings of both the Scopus and the Google Scholar review are presented per topic in the sub-chapters of chapter 4.1, and an overview of this is presented in Appendix 9.1.

Next to the systematic literature review, to improve the alignment of the research with the working field, several cases of AI software suppliers are made. These different cases are presented below. Interviews were conducted with representatives of those companies to construct the cases. In these interviews, the goal was to identify practical examples of AI usage for performance management to assist line managers, as well as identify the effect of that AI usage on the role of line managers in that process. Interviewees of software companies were selected based on their expertise and experiences on AI design and usage in performance management. Three respondents were included in the interviews, with respondents representing a diverse selection of companies. These interviews were held in a semi-structured way, meaning that the interviews were conducted along the lines of a set of questions, but interviewees were given plenty of room to give

more attention to their own respective experiences and insights and follow-up questions depending on the answers of interviewees. The used set of questions can be found in Appendix 9.2. After transcribing the interviews, the transcript was sent to the interviewees to ensure no wrong information was included in the results. The transcript was subsequently read carefully to extract data from the interview. With the combination of both existing literature and contemporary relevant insights from business experts, the aim was to lead to useful insights in satisfying the research goal.

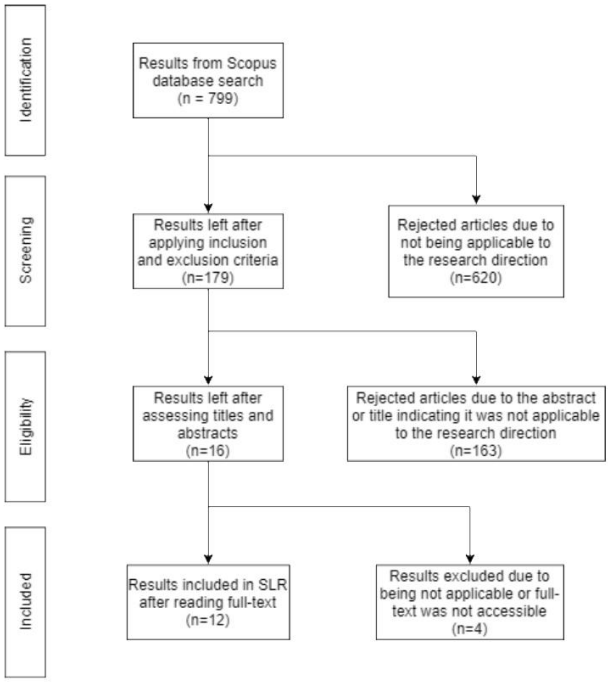

Figure 1. Scopus SLR Flowchart

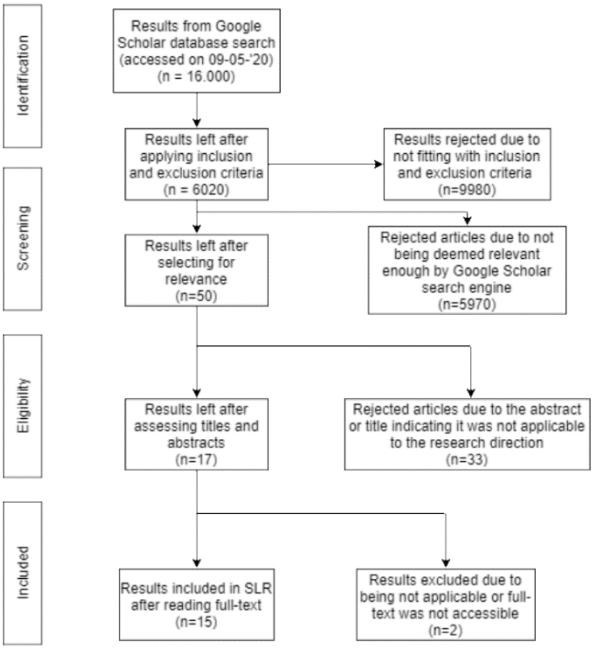

Figure 2. Google Scholar SLR Flowchart

3.1 Cases

3.1.1 Infor

Infor is a technology company that provides Enterprise Resource Planning (ERP) software to help its clients optimize the usage of their resources to create the most value for stakeholders. These resources can be human, equipment, assets, supplies, materials, and money. Their focus is really on optimizing how people and technology interact. The interviewees both were very familiar with the field of HR and performance management, having worked in it for a combined total of many years.

3.1.2 Visma Raet

Visma Raet is part of the Visma group, which is a group of software companies working on service solutions. They do this in two main ways. One, they primarily have software on HR activities, salary managing, and talent portfolio. These service solutions are offered through a cloud solution. Second, Visma Raet offers its own implementation services, which is a large portion of the company, offering Business Process Outsourcing to clients.

3.1.3 Workday

Workday is an international market leader in the field of HR, finance, budgeting, planning, and analytics software. It is a 'native cloud vendor' company, meaning that Workdays' product was born as a Software-as-a-Service (SaaS), and is still that to this day. Workday is an American company in its origins, but is currently operating around the globe, and helping its clients with working more efficient and conducting better business.

4. RESULTS

4.1 Systematic Literature review

It was found that the introduction of digital technologies for the execution of performance management has had positive and negative implications. In this chapter first the positive, and then the negative ones are presented.

4.1.1 Performance management digitalization under AI influences

The most prevalent positive effect is the new ease of data collection for managers and HR managers. Performance management is preferred to be done when backed by data, for example, completion times for tasks or other performance statistics. Thus managers rely on factual information to make decisions. However, when employees collaborate within multiple teams and departments, valuable employee contributions to organizational goals may be missed. AI systems may streamline the information collection, and enable the manager to extract the correct information at the right time (Chakraborty, Giri, Aich, & Biswas, 2020, p. 5877). This is also supported by Bhardwaj, Singh, & Kumar (2020, p. 49), who state that AI applications continuously assess the objectives and employee efforts, and gather performance data from different perspectives to enable better performance management. Agarwal & Lenka (2018, p. 307) also state that e-performance management systems help the manager to evaluate the performance of employees for attaining the set goals. Ewenstein, Hancock, & Komm (2016, p.2) support these claims, and state that companies are indeed collecting more objective performance data through digital systems that automate real-time analyses. The tools to synthesize and analyse the performance data have rapidly advanced in the last few years, with statistical modelling software, machine learning technology, and AI applications becoming more mainstream (Burnett & Lisk, 2019, p. 108). Rather than relying on a once-a-year, inexact analysis of individuals, companies can get better information by using systems that continuously collect data on the performance of

people and teams to yield more accurate insights, which can then be used as input for continuous performance management activities (Ewenstein et al., 2016, p. 5). Such e-HRM systems help ensure that performance reviews are undertaken, and it provides a recording system that holds the outcomes of performance management activities (Njoku, 2016, p. 277). Because data is collected in real-time from fresh performance events, employees find the information more credible, while managers can draw on real-world evidence for more meaningful coaching dialogues. As companies automate activities and add machine learning and AI to the mix, the quality of the data will improve exponentially and will be collected much more efficiently (Ewenstein et al., 2016, p. 6).

Not only the data collection is made more continuous and real-time, but it is also possible to give feedback continuously and in real-time. Sigala (2019, pp. 2-3) and Makarova, Shubenkova & Pashkevich (2018, p. 3) underline the change that is happening regarding performance evaluations and specifically the shift from the past to the future. The shift from backward-looking assessments towards forward-looking feedback can be ideally supported by AI applications. An AI platform can provide or facilitate continuous feedback and real-time performance reviews. This is beneficial for employees, as it shows them better how their contribution helps in reaching organizational goals. (Bhardwaj et al., 2020, p. 49; Burnett & Lisk, 2019, p. 108-109; Chakraborty et al., 2020, p. 5877; Gao, Wang & Yan, 2019, pp. 132-133; Garg, Srivastav, & Gupta, 2018, p. 115; Jiang, Du, Fu, & Xiao, 2019, p. 259; Stanley & Aggarwal, 2019, p. 354). A good example of such an AI platform is given by Ewenstein et al. (2016, p. 7), which sketches the image of an online application that facilitates the continuous collection of real-time peer feedback from multiple sources. This example has been included in Appendix 9.3.

4.1.2 Main strengths for AI usage in performance management

Several results brought forward which activities are best suited for AI application, and what the strengths of AI usage are. Traditionally, the administrative work that accompanies performance management, and HR activities in general, takes a long time and is very labour intensive. Such tedious and repetitive work can partially, if not entirely, replaced by an AI system with analytical support (Bengtsson & Bloom, 2017, p. 8; Chakraborty et al., 2020, p. 5876; Ewenstein et al., 2016, p. 6; Fenech, Baguant, & Ivanov, 2019, p. 168; Jia, Guo, Li, Li, & Chen, 2018, p. 106; Jiang, Li, Du & Wang, 2018, p. 177; Jiang et al., 2019, p. 259; Li, 2018, p. 134; Parveen & Palaniammal, 2019, p. 515; Verma & Bandi, 2019, p. 963). It is even argued that AI will do more than simply facilitating daily work, and that AI will increase the ease of documentation, speed and ease of communication and enable a better accessibility to data (Fenech et al., 2019, p. 172). Due to an AI system needing large amounts of data to be sufficiently trained and administrative tasks having a relatively low personal impact on employees and are carried out daily, in contrast to more drastic HR decisions like hiring or firing of people, AI is also more suitable for application in the administrative field (Cappelli, Tambe, & Yakubovich, 2019, pp. 2-3); Ewenstein et al., 2016, p. 6) support this notion, and write that technology cannot replace performance conversations between managers and employees, as these centre around observations by managers, peers, and human interaction.

As described earlier, AI can process vast amounts of data in a fraction of the time a human can. This also translates into the speed at which decisions can be made, based on the processed data. Both these characteristics are of great use for HR activities, as they speed up daily repetitive tasks (Bolander, 2019, p. 849; Chakraborty et al., 2020, p. 2876; Jiang et al., 2019, p. 259; Li, 2018, p. 134; Mahmoud, Al Shawabkeh, Salameh & El Amro, 2019, p. 110). Not only is the data processed better and faster, but the collected data is also improved in quality, enabling a shift from backward-looking evaluations towards frequent fact-based performance and development discussions (Ewenstein et al. 2016, p. 3).

Another strong point of AI is that it feels no bias towards individuals. AI assess data and patterns and has no opinion that might influence decisions (Bhardwaj, 2020, p. 49; Ewenstein et al., 2016, p. 5; Jiang et al., 2019, p. 259; Stanley & Aggarwal, 2019, p. 354). The danger exists, however, that AI is trained using biased historical data. Precautions must be taken to avoid this, as debiasing current HR decisions is potentially the most valuable opportunity for AI in HR decision making in the short to medium-run. The successful removal of human arbitrariness from HR decision-making should by itself lessen algorithmic aversion, and make workers accustomed to AI (Cappelli et al., 2019, p.30). Where HR and line managers now can be accused of having their personal opinions about employees interfere with their HR responsibilities, by having AI support decision making not only the bias can be eliminated, also the number of human mistakes can be diminished. AI helps to not only make faster decisions, but it also reduces human errors and is observed to perform better than humans by reducing employee turnover rate and raising talent retention (Bhardwaj, 2020, p. 50; Chakraborty, 2020, p. 5880; Jiang et al., 2018, p. 177). Next to reducing the needed manpower for daily performance reviews, the evaluation is done more accurate and objective by applying AI. (Jiang et al., 2018, p. 177; Li, 2018, p. 134).

Only a single source suggested a connection between the digitalization of HR and the involvement of line managers in the execution of HR activities. E-HR, defined as practising HRM activities with the latest web-based and computer-based tools and applications, enables those executing HR activities to occupy themselves less with administrative and paperwork and develop themselves more on the strategic functions of HR. The self-service aspect of e-HR creates more involvement of employees and line managers in HR practices (Baykal, 2019, p. 282). As established earlier, line managers are increasingly tasked with the execution of HR activities, with performance management being one of those activities. In that line, e-HR enables line managers to be involved more in performance management activities as well.

To summarize, several applications and benefits of AI in HR practices came forward, while very little was mentioned about the link between Performance Management or HR practices and line managers. The most prevalent benefits of AI usage are the taking over of administrative work, enabling HR professionals and line managers to spend more time on the strategic HR function (1), making the collection of employee performance data easier and improving the quality of said collected data (2). Improving the speed and quality of decision making on the collected data (3), with the crunching and analysing of large amounts of data and recognizing patterns being a strong point of any AI system, and making continuous feedback easier to achieve for HR managers (4). Lastly, AI can reduce any bias and reduce the errors made in HR decision making and performance management (5). Though little to no relation was made between AI usage and line managers executing performance management activities, these AI benefits could very well be supportive of the line managers in managing the performance of their employees.

4.1.3 Main challenges for AI usage in performance management

AI usage does not only have a lot of benefits, but it also has several drawbacks that hinder it in replacing humans in performance management and HR practices. The most prevalent of which is that AI software lacks human touch (Fenech et al., 2019, p. 172). It is not (yet) advanced enough to take over human decision making, which in the core cannot be compared to AI decision making (Bolander, 2019, pp. 852-853). We cannot yet communicate with AI systems the way we communicate with fellow humans, and AI systems cannot explain their reasoning and behaviour the way humans can. Human intelligence and machine intelligence have a rather distinct set of strengths and weaknesses. Some tasks that are easy for humans to solve have turned out to be exceedingly difficult for machines, and vice versa (Bolander, 2019, p. 850). This inherent difference also results in it becoming difficult to have employees getting to accept algorithms for executing HR processes since a range of complex socio-psychological concerns exists amongst employees in their own decision making. As a result of this, being able to explain, justify, and getting employees to accept the algorithms being used is crucial. If that acceptance is lacking, employees are capable of adversarial reactions that affect organizational outcomes. Human decision-makers see this and can correct for it, but an algorithm can't see this (Cappelli et al., 2019, p. 3). It is even claimed that when AI is used to replace the communication between managers and employees, it will make employees feel less valued. AI will not achieve the same level of affinity of communication between people, thus will not get the real ideas of employees, nor can the person's emotion be digitized and recognized by programming (Jiang et al. , 2019, p. 260). In its core, HR is about understanding and respect the human resource, and that part cannot be replaced by AI to improve HR (Jiang et al., 2018, p. 176). One way to negate these issues is setting requirements for AI usage. A rather demanding, but still reasonable, principle for the deployment of AI is to say that it can and should only be employed for partial or full automatization when it can be guaranteed that it is better than what it replaces on all parameters. That is when a task is (partly) automatised by AI, it should produce at least the same quality of problem-solving as before automatization (1), and also AI should always enhance transparency, fairness, and explainability of decisions and processes, not diminish them (Bolander, 2019, p. 857). In short, AI can help HR do some basic work, improve their work efficiency, and work scientifically and accurately. But when looking at concrete HR activities, AI cannot be as flexible as humans, thus a strategy to put people first and use AI to amplify what they can achieve should be used (Jiang et al., 2019, pp. 260-261; Kolbjørnsrud et al., 2016, p. 3).

Another relatively large problem, that might cause employees to have reservations about AI usage in performance management, or any other HR activity, is the lack of transparency that algorithms have in their decision making. Due to the way AI works, decisions can be made (or proposed) based on historical data and patterns that the AI system was 'trained' with (Bolander, 2019, p. 849; Pugna, Dutescu & Stanila, 2018, p. 822). Since outcomes of HR decisions have large impacts on individuals and society, ethics are paramount. Such decisions require sounding reasoning, and AI with its pattern recognition usually lacks in that reasoning (Cappelli et al., 2019, p.3).

Several other issues were brought forward by a smaller number of authors. These are considered to be subsidiary to the issue of AI not being sophisticated enough to replace human decision-makers. One of such smaller issues is that employees might get the feeling that they are watched by 'big brother'. They feel that their every step is watched and evaluated (Ewenstein, 2016, p. 7) which might, in turn, lead to decreased performance. If a person is not satisfied and engaged with their job, they might not only be less inclined to perform well, they might also negatively affect team performance (Burnett & Lisk, 2019, p. 111)

It was also suggested that when data is only gathered by an AI system, the risk of de-contextualization exists, in which only data from the specific factual situation and alternative possibilities for actions are assessed, and all context is disregarded (Pugna et al., 2018, p. 822). This might have large negative consequences for the individual and organizational performance, as it promotes a culture where "truth" is centralized, and the value of that truth and trustworthy performance management collapses (Cinquini, 2019, p. 847). An example of data becoming de-contextualized is when employees could attempt to game AI performance appraisal systems and be rated in the top 10%, or give fake bad ratings to co-workers, to prevent them from receiving a high-performance score (Ewenstein, 2016, p. 7).

All these issues are reinforced by companies facing difficulties starting at the right point for the implementation of AI (Machado, Winroth, Carlsson, Almström, Centerholt & Hallin, 2019, p. 1117).

To summarize, several challenges of AI usage came forward as a result of the SLR. The main issue is that AI is not similar to human decision making, which in the field of HR is quite an important aspect. Also, the transparency of those decisions is lacking, which adds to any aversion employees might have of AI usage. Smaller issues that were brought forward are that employees feel that are being watched by an observational system with the likes of 'big brother', and that data gathered by such a system could become de-contextualized, leading to un-trustworthy decisions.

4.2 Cases

To support the findings of the literature review, several cases will be presented of companies that provide AI software for HR activities. An interview was held with representatives of these companies, in which the relations between AI, HR, performance management, and line managers were discussed. The cases are explained in the Methodology chapter.

4.2.1 AI applications

In the field of AI products for HR, several different categories are discerned. The first is a digital assistant (1), which is made to "*enable humans to spend more time to do things more uniquely valuable to humans … by letting technology to the administrative and transactional functions of their role*". Such a digital assistant has an important advisory capacity, by augmenting human intelligence to enable better human decision making. The second is robotic process automation (2), which "*automates cumbersome and manual tasks like validating licenses of suppliers*". Robotic process automation is also utilized to validate information that is manually entered by employees, as was described by Visma Raet. The third application is machine learning (3), designed to "*predict, for example, demand or planning decisions, based on historical data combined with additional data points like weather circumstances*". Workday indicated that machine learning is a big part of their cloud product, which "*might help to gain insight into retention risks*". The above are also all features of different products that Infor makes for companies. One example of such is the Talent Science® product, which is "*a behavioural assessment tool. It extracts an applicants' behavioural DNA, and scores them on their suitability for a job, assesses if they have a cultural fit with the firm, and predicts if he/she will perform well in a particular role*". A quote that reflects the strength of the Talent Science®

product is that "*it has already been used to assess 200 million people so far, which is a pretty good sample size*".

4.2.1.1 *Replacing humans with AI*

The most prevalent aspect of AI usage that was brought forward by Infor, Visma Raet and Workday, was that AI is not meant to not replace human decision-makers, but instead is meant to help them make better decisions and act in a supporting manner. AI cannot replace humans in an environment with employees, as "*human behaviour can never be fully quantifiable*" and "*humans are complex and communication is a problem in 100% of companies I've worked for*". Due to this, there will always be a need for people to understand each other, for which AI will never give all necessary insights. Human intuition and empathy are able to provide these insights and enable humans to communicate and understand with each other, therefore will consistently be needed in HR, as was also illustrated by Workday, "*[AI] will never replace that human interaction, as it will always be necessary*".

4.2.1.2 AI benefits for HR activities in general

AI has benefits for HR activities in general, as well as performance management specific benefits. First, the general benefits will be discussed, and in the next sub-chapter, the performance management specific benefits will be discussed.

Regarding HR and HR managers in a more general sense, AI will take over responsibility for maintaining employee compliance, which will be a contribution to the evolvement of HR; "*It's not going to be about HR maintaining compliance … HR is going to get involved when things are getting really complex, really challenging, and those line managers don't know how to handle a situation*". Combined with the earlier establishing of HR activities being more and more executed by line managers, AI has made the inherent collaboration of line managers and HR managers easier, by enabling "*collaboration based on data…*" which allowed " *… a shared language between the line manager and HR*" to be created. However, this is somewhat contradicted by Visma Raet, as "*AI will enable the line manager to be more behind the wheel themself*", which indicates that line managers will have increased autonomy in HR decisions. Subsequently, the evolvement of HR goes further than a change in role. "*HR used to be very reactive… instead, HR managers are looking at data … And then HR managers go to line managers and pro-actively say that they should pay attention to a certain employee more*". With the increasing use of data, HR activities have been undergoing an important philosophical shift from reactive HR to pro-active HR, as carried out by line managers.

All three companies agreed that freeing line managers from having to worry about employee compliance, administrative or automatable tasks, grants them a considerable amount of time to spend on other activities; "*time is the most valuable commodity on the planet and if AI can save us time, and make sure that we are spending our time doing things that require truly, unique, human interaction, that is the key*". As was perfectly described by Workday, "…*AI helps to bring together a lot of information, which allows [line managers] to focus on human interaction and how to actually help their employees*". That unique human interaction will become the strength of line managers in AI. By enabling line managers to spend more time on that human interaction "*They can develop a meaningful, authentic relationship with their people and understand them in a more intimate way. So that they are helping that person to reach their full potential*".

4.2.1.3 AI benefits for performance management

Several advantages of AI usage by line managers for performance management were brought forward. First, AI can reduce subjectivity, or bias, amongst line managers executing performance management. Infor brought forward that "*we can all recognise that performance management is inherently subjective as well. So if I would do a performance evaluation of someone, it is biased based on my perspective if I like him*", and Visma Raet stated that "*AI can indeed enable a more unbiased assessment of an employee's performance*". However, as was brought forward in the SLR, AI might also be biased by using biased historical data to train it. One way to counter this, as illustrated by Infor, is using an extremely large sample size of 200 million people, which could remove any possible bias. Another way, which Workday implemented in their product, is using hidden fields in the assessment, which, amongst others, eliminate the use of some data that could induce a bias.

Reducing human subjectivity is an inherent effect of using data for performance reviews. As Infor indicated, "*by using data whether or not if someone is performing well in their job, and adding the human element to that data*", the accuracy of the review increases. This was also confirmed by Visma Raet, stating that when bringing together data from a lot of different sources "*you get a much more objective image of an employee's true performance*". Thus, improving accuracy is achieved by combining data with the human relationship between employees and the line manager, which is a second concrete example of a benefit of AI usage. And again, that human relationship is important to add to the equation because "*there is a lot of things you don't know about a person without spending time with someone*". In essence, Infor stated that "*the way that AI can help us get to a more accurate picture, is by aggregating data, combining it with conversations with people, and then combining with a manager's observations*". Thirdly, something that AI, and technology in general, will also enable, is making feedback more continuous. The aforementioned shift from reactive to pro-active HR adds to performance management "*[not being] this once-a-year conversation, rather being an ongoing dialogue that never ends*", which has brought forward by both Infor and Visma Raet. Workday indicated that the overall culture within companies will "*… instead of the traditional performance cycles… the culture will shift to one of [employee's] giving feedback*". This can be combined with making the collection of performance data easier to enable a more continuous real-time performance review. Such easier data collection is done, for example, by means of Infor's 'rave' tool, which allows co-workers of an employee to directly give feedback about someone to them and their managers, to be saved in a digital personnel file. Or as was described by Workday: "*in the old days one had to gather a lot of information themselves, and AI helps by gathering all kinds of data*". The realization of all these benefits is enabled by the earlier mentioned applications of AI in HR, which are the digital assistant, the robotic process automation, and machine learning. These different systems allow managers to save time, by not having to worry about administrative or trans-actional parts of their role. In a general sense, they are implemented to make a line manager's life easier, as is claimed by all three companies.

4.2.1.4 AI challenges in performance management

There is however more than only benefits to AI usage for performance management. Several challenges that AI usage brings were brought forward. The most prevalent is the risk of de-contextualized data being used for HR or performance management purposes. Several examples were given to reflect the danger of simply basing decisions only on data. One such example is about Amazon, which started to nominate employees for termination, solely based on data reflecting how fast they could pick an order, and if that order was correctly picked, packed and shipped. Such a way of working houses a multitude of issues, but the one discussed in the interview, is that by only utilizing that data, an employee whom is very experienced and is

interrupted a lot by co-workers with questions could perhaps be 'fired by the system' because his/her data reflects that the person is very slow in their work. To avoid such a de-contextualization, it is vital that "*we can't just look at the data, we have to have a conversation too*".

The other main challenge that was discussed has already been brought forward earlier in chapter 4.1.2.1., and that is that humans are inherently complex, and due to the nature of human communication, there is always going to be a need for people to come together and have a conversation. Also, as was indicated by Workday, "*In performance management, two sorts of KPIs are used. Hard ones, related to sales data for example, and soft ones, related to humans. And in the world of performance management, those human KPIs cannot be replaced by AI assessment*".

4.2.1.5 Influence on line managers' role in the future

In the previous subchapters, several influences of AI usage for HR in general and performance management specifically were established, which all influence the role of line managers that are responsible for the execution of performance management. The most prevalent influence on line managers' role, is the transition towards a more coaching role. In performance management, more time to spend on things that only a human can do will mean that line managers will go from 'compliance officers' to being coaches for their employees. As Infor defined, the core of being a coach is that "*A coach wants you to reach your full potential*", "*Motivating people, creating an authentic and genuine relationship with people and then also recognize that your viewpoint over time is going to change … part of the role of the manager is to understand where are you today, and what do you want to do next year and the year after that. You cannot let technology do that*". Coaching in a performance management setting means that a line manager is more actively and continuously engaged with the goal setting and development of an employee, instead of only having an assessment conversation once a year. Both Visma Raet and Workday described this coaching role as being a "*people manager*" instead of a line manager. This means that instead of spending time on automatable tasks, a line manager can help an employee with personal development. For example, as Workday and Infor described, using AI to determine a suitable career path together with an employee, "*…part of the role of the manager is to understand where an employee is today, and what he/she wants to do next year and the year after that. You cannot let technology do that*", which corresponds with the essence of coaching employees to help them reach their full potential. The previous is another example of line managers having much more tools now to help and guide employees, and more importantly, "*[AI] … will be giving more time to have those conversations so that employees and managers can understand each other better*". Another example of such a tool, and an extension of the coaching by line managers, is a flight risk, or retention, tool. This alerts managers of indicators that an employee might leave the company in the foreseeable future. This alert allows managers to connect with the employee before they decided to leave the company, and perhaps take away any motivating factor(s) the employee has to leave the company. Also tackling flight risk early on is considered an important part of coaching employees, again, which is an important benefit of AI usage for performance management, as confirmed by Infor, Visma Raet and Workday combined.

This principle of line managers becoming an employee's coach is only achieved by combining the strengths of technology and the strengths of humans. The aforementioned Talent Science® product does not simply rely on AI assessments, as it provides line managers carrying out hiring interviews with questions to ask, to complement the AI assessment of a candidate. As was established earlier by Infor, Visma Raet, and Workday alike, it is that AI will never replace humans but is extremely suited for augmenting human intelligence.

What was not already discussed is the skillset a line manager will need to work with AI products in the future. A line manager will be needed to have not only technological skills, to be able to use advanced technology, but also due to the use of substantial amounts of data, analytical skills will be needed. And third, one which managers arguably already have to possess, is social skills. However, this skill must be expanded to encompass also the skill of handling employees that are technology averse, and do not want to, or do not know how to, use technology. However, Workday contradicted this by stating that, like in the consumer world, a product must be extremely user-friendly and intuitive in its use. This user-friendliness leads to the line manager not requiring any additional skills to use an AI tool.

The core of AI's influence on the line managers' role is that instead of line managers having to spend considerable amounts of time on ensuring their employees are complying to company regulations, they are freed up to spend time on coaching their employees, building a relationship with them, and ultimately guiding them to achieve the best of their ability. This will not make a line managers' role bigger but will grant more responsibilities and autonomy to the line manager. Despite AI being able to deliver accurate data analysis on the performance of employees, line managers will retain their decision making role. Due to human communication being complex, and it not being possible to fully quantify this communication, line managers will never be replaced by AI. There will always be a need for humans, in a process that deals with humans.

5. DISCUSSION

The goal of this research was to answer the research question "*In what ways does the usage of AI in performance management of employees change the role of line managers?".* To the extent of answering the main research questions, the following sub-questions were drafted.

1) "*What are the benefits and drawbacks that AI usage has on performance management by line managers?"*

2) "*How would AI usage be best organised to make performance management easier to execute for line managers, and how does that change the line managers' role?"*

In this chapter, the two sub-questions will be answered based on both the SLR and the cases. In the conclusion, the answer to the main research question

5.1 Benefits and drawbacks of AI usage

5.1.1 Benefits

Several benefits of AI usage on performance management managers were identified in the SLR that was executed, however, there was little to no mentioning of a link of those benefits specifically to line managers. The main advantage that was mentioned, was that AI will be able to take over time-consuming processes, such as administrative work (1). Supportive of that, increased ease of data collection was mentioned (2) as well as the ability of AI to reduce bias and human errors through the utilization of performance data as input for the performance review process (3). That new data can be processed faster and better, to enable improved decision making based on that data (4). Also, the adoption of AI and technology enabled a shift in the performance management process to make it more continuous instead of once-a-year (5).

In the cases that were constructed, almost identical benefits of AI usage were presented, but instead concerning line managers that have to execute the performance management activities. The view that AI usage can save line managers a large amount of time by taking over time-consuming and labour-intensive was supported wholeheartedly (1). Due to this saved time, line managers will be able to transform into coaches for their employees, instead of supervising people and making sure they are complying with company policies. What was also deemed an important effect of AI, is that it enables line managers to move from a reactive HR attitude, towards a pro-active attitude (2). By having an AI system analyse data, future employee actions can be predicted and acted upon before it occurs. Next to these benefits being most significant, other benefits that were also found in the SLR were confirmed in the interviews. These benefits are the reduction of human bias or subjectivity in performance management (3), and thus increasing the accuracy of the performance reviews (4). It must however be noted that AI can be trained with biased data to begin with, and precautions must be taken to avoid this. Other benefits are easing the collection of performance data (5) and increasing the frequency at which performance reviews are carried out (6). The cases thus confirm the benefits of AI usage found in current academic literature but extend those benefits specifically to line managers carrying out performance management.

5.1.2 Drawbacks

Besides the aforementioned benefits, AI usage has some drawbacks as well. The most prevalent drawback or limitation that was introduced by the existing literature was that AI software lacks a human touch, and is not advanced enough to replace humans (1). A few sources mentioned that AI would not ever be able to replace humans, as AI and human intelligence are inherently different. Several smaller issues that were brought forward were the risk of de-contextualizing data (2), the lack of transparency in how algorithms make decisions (3), and that some employees might feel like 'big brother' is watching them (4). Also for the drawbacks, there was no mention found of these drawbacks applying to line managers in the existing literature. The conducted interviews again confirmed most of the findings out of the existing academic literature. Due to humans and human communication being so complex that it can never be fully quantifiable for AI, it was stated that AI simply cannot replace line managers in performance management, as the human intuition and empathy will always be needed in a process that revolves around humans (1). The risk of de-contextualization of data was also indicated in the cases (2), but presented in relation to the previous point that a human aspect will always remain in performance management, and that data alone should never be the grounds for HR decisions.

5.1.3 Answer to the sub-question

As an answer to the sub-question "*What are the benefits and drawbacks that AI usage has on performance management by line managers?*" we can conclude that mostly benefits of AI usage exist and that the most important drawback is caused by the inherent difference between artificial and human intelligence.

5.2 AI usage changing line managers' role

The answer to the sub-question *"How would AI usage be best organised to make performance management easier to execute for line managers, and how does that change the line managers' role?"* was mainly brought forward in the different cases. It was stated that AI usage is best done in support of line managers, taking over time-consuming processes, such as administrative or compliance-related tasks. Due to freeing up the valuable time of line managers by eliminating the parts of the job that do not need human interaction, the role of line managers changes from a manager who points employees to compliance issues, to a coach of the employee. This coaching role in its core is a manager wanting the employee to reach his/her full potential. This is not only drafting performance improvement plans with the employee, and formulate which skills need to be developed by the employee, but also assessing where an employee will be in the future. In all these steps, AI can assist the line manager, by collecting, processing, and analysing (performance) data. Thus, AI will be best organised as a supporting system to the line manager, to change the line managers' role towards a coaching one.

6. LIMITATIONS AND CONTRIBUTIONS

6.1 Limitations

The conducted research suffers from several limitations. Firstly, due to a relatively small number of expert interviews, the validity of any claims that are made regarding the changing role of line managers could be questioned. However, due to the striking similarities between the results of the SLR and the cases, as well as between the cases themselves, it seems unlikely that the results are questionable. However, further research with a larger number of cases could be performed to increase this validity, as the found results are very promising for line managers. The found results regarding the benefits and drawbacks of using AI for performance management in general are substantiated properly, and thus have no threat to their validity.

Another limitation is that the companies that were interviewed to construct the different cases could be perceived as biased in favour of AI usage. This is due to the case that the companies are possibly interested in making AI usage look more positive, and thus more appealing for use by line managers and HR managers alike, to increase the number of clients that purchase such systems from them. However, such an impression was not given during the interviews that were conducted to construct the cases, and all company representatives were honest in acknowledging the drawbacks and limitations of AI usage.

6.2 Theoretical implications

The results of this research have several practical and theoretical implications. Of those, first, the theoretical ones will be discussed. It was seen that the existing academic literature does not reflect a focus of AI usage effects on line managers in the performance management field, and instead presents AI usage effects for HR managers and/or performance management in general. Due to the overwhelming similarities in results from the literature study and the cases, combined with the explicit notion extracted out of the expert interviews, that the benefits and drawbacks do apply for line managers, it is the belief that the presented results fill the knowledge gap found in the literature review, as described in chapter 4.1.2.

Next to this, a contribution is made to the existing devolution theory, which suggests the transfer of HR responsibilities from HR managers to line managers. The results of this research present several factors implying that line managers are taking over HR responsibilities from HR managers, and thus support the devolution theory. In this case of the devolution of performance management it is implied that, under the influence of AI usage, line managers experience an increase in autonomy and responsibilities over their peers whom not use AI for these activities.

Finally, as was discussed in chapter 2.3, existing research indicated possible hindrances for line managers in executing HR activities. The most prevalent possible hindrances flow forward out of the AMO theory and are those that hinder the ability, motivation or opportunity of line managers. The notion that AI

usage could especially influence the ability of line managers to execute performance management was already established. The results indicate that AI indeed has an effect on the *ability* of line managers to execute performance management. However, the *opportunity* aspect was also addressed, as with the usage of AI, line managers have access to more time to perform uniquely human tasks. The *motivation* aspect is not influenced by AI usage, as the willingness to engage in performance management with one's employees should exist within a line manager nonetheless. The understanding that AI usage influences both the A and the O aspect of the AMO theory, can be regarded as a contribution to academic literature as well, but requires further empirical research to determine the exact extent of influence.

6.3 Practical implications

This research also has several practical implications. First of which, is that all involved management layers and employees can be given insight into how AI usage for performance management might look like, and what implications it holds for their functioning. The listed benefits and drawbacks provide understanding for them, before implementation and during the usage of it.

Next to that, and more specifically focussed on line managers, this research provides somewhat of a guideline for line managers to how their role in executing performance management activities changes upon implementation of AI solutions. This enables line managers to prepare for their changing role, and improve on skills they might lack before AI is actually implemented.

Finally, whereas AI will free up time for line managers to spend more time on uniquely human activities, HR managers will also be freed up in time from answering basic requests by employees. HR managers having more time, combined with the devolution of responsibilities, enables HR managers to focus more on strategic HR activities such as data-driven workforce management.

7. CONCLUSION

In our digital and modern society, all aspects of life are subject to continuous change. The change that was explored in this research is the usage of AI in performance management activities by line managers. To explore this, the main research question "*In what ways does the usage of AI in performance management of employees change the role of line managers?"* was formulated. By conducting a SLR and complementing that with cases based on expert interviews, a number of results were obtained that give insight into the usage of AI and the effect on line managers. Thus by combining the aforementioned answers to both sub-questions, an answer on the main research question is presented.

Performance management is influenced by AI usage in a way that it becomes more accurate through the use of more current and accurately collected data, performance data is gathered easier, is done more continuous, is less biased and done with a more pro-active attitude than before AI was implemented in the process. The drawbacks of AI usage should always be closely monitored, as such that data is never used as a sole determinator in HR decisions, and that employees should always be coached in what the effect of AI actually is for them. The most important aspect of the changing role of line managers is the transition to a role where line managers have more time available which is used to coach employees. In a performance management context, coaching means helping employees to perform to the best of their abilities, and aid them in their development where possible. All in all, AI usage shows to be very promising in improving the life of line managers and their employees in the process of performance management.

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10. APPENDICES

10.1 Appendix 1 – Systematic Literature Review results

Author(s)	Year	Title	Main benefits	Main challenges
Jia, Q., Guo, Y., Li, R., Li, Y, Chen, Y.	2018	A conceptual artificial intelligence application framework in human resource management	- AI reduces bias/errors - AI enables continuous feedback	
Stanley, D.S., Aggarwal, V.	2019	Impact of disruptive technology on human resource management practices		
Machado, C.G., Winroth, M., Carlsson, D., Almström, P., Centerholt, V., Hallin, M.	2019	Industry 4.0 readiness in manufacturing companies: Challenges and enablers towards increased digitalization	- e-PM systems help managers evaluate performance	- Companies have difficulty with implementation
Agarwal, S., Lenka, U.	2018	Managing Organization Effectiveness Through E-Human Resource Management Tool - E-Learning: Indian Cases, A Qualitative Approach	- AI taking over administrative work	
Bengtsson, C., Bloom, M.	2017	Human resource management in a digital era: A qualitative study of HR managers' perceptions of digitalization and its implications for HRM	- AI taking over administrative work - HR managers support the digitalization of PM	
Fenech, R., Baguant, P., Ivanov, D.	2019	The changing role of human resource management in an era of digital transformation(Article)	- AI taking over administrative work	- AI software lacks human touch, and is not advanced enough to replace humans
Baykal, E	2019	Digitalization of human resources: E-HR	- Performance management processes are changing - Increased involvement of line managers	
Makarova, I., Shubenkova, K., Pashkevich, A.	2019	Development of an Intelligent Human Resource Management System in the Era of Digitalization and Talentism	- AI taking over administrative work - Makes data collection easier - AI reduces bias/errors - AI enables faster/better decision making based on better collected data - AI enables continuous feedback	
Chakraborty, S., Giri, A., Aich, A., Biswas, S.	2020	Evaluating influence of artificial intelligence on human resource management using PLS-SEM (Partial least squares-structural equation modeling)	- AI reduces bias/errors - Makes data collection easier - AI enables continuous feedback	
Bhardwaj, G., Singh, S.V., Kumar, V.	2020	An empirical study of artificial intelligence and its impact on human resource functions	- AI taking over administrative work	

			- AI reduces bias/errors	
Cappelli, P., Tambe, P., Yakubovich, V.	2019	Artificial intelligence in human resources management: Challenges and A path forward	- Makes data collection easier - AI enables continuous feedback	- AI software lacks human touch, and is not advanced enough to replace humans - Lack of transparency in how algorithms make decisions.
Burnett, J.R., Lisk, T.C.	2019	The Future of Employee Engagement: Real-Time Monitoring and Digital Tools for Engaging a Workforce	- AI taking over administrative work - Makes data collection easier - AI reduces bias/errors - AI enables faster/better decision making based on better collected data	
Ewenstein, B., Hancock, B., Komm, A.	2016	Ahead of the curve: The future of performance management	- AI taking over administrative work	- Big brother is watching - Data becomes de-contextualized / employees game the system
Parveen, N.A., Palaniammal, V.S.	2019	A Study On Artificial Intelligence In Human Resource Management Today And Tomorrow		
Cinquini, L.	2019	Editorial: JMG Symposium on "Evaluation, performance and governance in the digital age"	- AI taking over administrative work - Makes data collection easier - AI reduces bias/errors - AI enables faster/better decision making based on better collected data - AI enables continuous feedback - AI should be utilized as a support	- Data becomes de-contextualized / employees game the system
Jiang, F., Du, C., Fu, T., Xiao, R.	2019	Research on the Application of Artificial Intelligence in Human Resource Management	- Suggested performance management changes	- AI software lacks human touch, and is not advanced enough to replace humans
Gao, N., Wang, B., Yan, B.	2019	Improvement Countermeasures of Human Resource Performance Management	- AI enables continuous feedback	
Sigala, M.	2019	Redefining Performance Management	- AI taking over administrative work	
Verma, R., Bandi, S.	2019	Artificial Intelligence & Human Resource Management in Indian IT Sector	- AI taking over administrative work	

			- AI reduces bias/errors - AI enables faster/better decision making based on better collected data	
Li, X.	2018	New Thinking of Human Resource Management in the Age of Artificial Intelligence	- AI enables faster/better decision making based on better collected data	
Mahmoud, A., Al Shawabkeh, T., Salameh, W., Al Amro, I.	2019	Performance Predicting in Hiring Process and Performance Appraisals Using Machine Learning	- AI enables continuous feedback	
Garg, V., Srivastav, S., Gupta, A.	2018	Application of Artificial Intelligence for Sustaining Green Human Resource Management	- AI taking over administrative work - AI should be utilized as a support	
Kolbjørnsrud, V., Amico, R., Thomas, R.	2016	The promise of artificial intelligence: Redefining management in the workforce of the future		
Pugna, I.B., Dutescu, A., Stanila, G.O.	2018	Performance management in the data-driven organisation	- AI taking over administrative work - AI reduces bias/errors	- Data becomes de-contextualized / employees game the system - Lack of transparency in how algorithms make decisions.
Jiang, F., Li, J., Du, M., Wang, F.	2018	Research on the Application of Artificial Intelligence Technology in Human Resource Management	- Makes data collection easier	- AI software lacks human touch, and is not advanced enough to replace humans
Njoku, E.	2016	An Analysis of the Contribution of e-HRM to Sustaining Business Performance	- AI enables faster/better decision making based on better collected data	
Bolander, T.	2019	What do we lose when machines take the decisions?		- AI software lacks human touch, and is not advanced enough to replace humans - Lack of transparency in how algorithms make decisions.

10.2 Appendix 2 – Interview questions

General

Could you shortly explain what activities are done by **company X**?

Could you, in more detail, describe **company X**'s activities in the field of AI development for HR applications?

What kind of software/AI products does **company X** have for HR practices?

Performance Management specific

What benefits do AI products have for performance management?

What are limitations/persistent problems in performance management that cannot be solved by AI?

And what are 'traditional' problems that have been negated by the introduction of AI solutions?

How are **company X** AI solutions operated by line managers?

How has the role of line managers/HR professionals changed by introduction of AI solutions for Performance Management?

Regarding the specific stage of performance management (*Management involvement*, *Goal setting*, *Learning and Development*, *Assessment*, *Feedback and Coaching*, *Ongoing conversation*), what are the benefits / challenges of implementing AI for that?

Which stage of PM has been most viable for AI intervention? And which one hasn't?

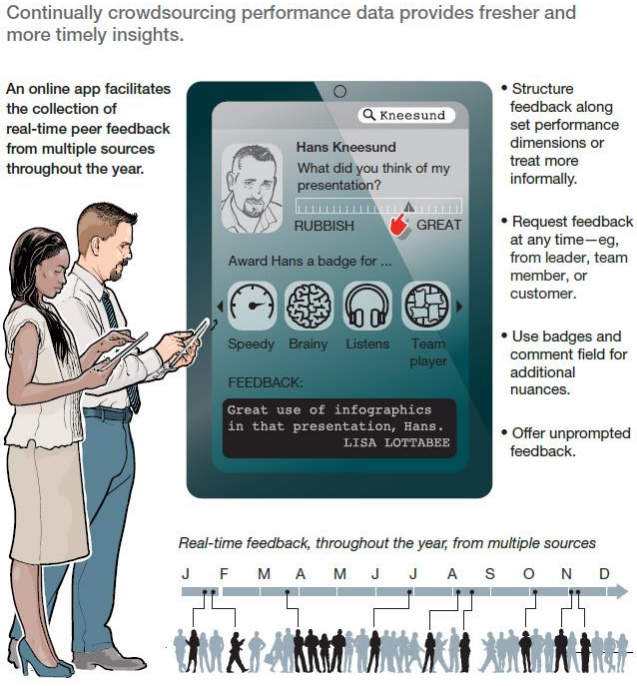
Line managers assisted by AI in performance management execution

Arguably, AI has made PM easier to execute. How do you view the influence of AI on the transition of PM execution to LM's?

As was the case for recruitment, literature suggests that AI mainly has implications for HR managers, and not for Line managers. How do you see this?

In the future, how do you see the role of AI for the Performance Management execution by LM

10.3 Appendix 3 – AI feedback platform example



Example by Ewenstein et al. (2016, p. 7) of an AI feedback platform.