Artificial Intelligence in Personnel Management:

The Development of APM Model

Author & Affiliations: Kirk Chang (Department of Management, University of Sharjah. University City Road, Sharjah, PO Box 27272, United Arab Emirates, UAE; TEL: +971-6-5585000, FAX: +971-6-5585099; Email: Kirk.Chang@gmail.com)

Article classification: Conceptual Paper (Category: Viewpoint)

ORCID: http://orcid.org/0000-0002-5689-7780

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Words-Count: 4,591

Corresponding Author: Kirk Chang (see author's details above)

Abstract

Purpose: Managers have mixed views of how artificial intelligence (AI) affects personnel management. The current article aims to identify potential knowledge gap and brings new insights to the AI-personnel management literature.

Design/methodology/approach: Both applicability- and theoretical- perspectives are adopted to critically discuss the constraint and opportunity of AI in personnel management. Tables and narrative analysis are utilized to clarify the role of AI in managerial practices.

Findings: Research findings have helped to develop a new model titled APM (AI in Personnel Management). The APM model unfolds itself in three levels, followed by potential outcome. The three levels comprise "organizational-, managerial- and individual job- levels", and the outcome comprises "organizational performance, employees' well-being, and staff turnover rate".

Practical implications: The APM model helps managers to understand the implication of AI in their workplace. With better understanding of AI's implication, managers are more likely to develop appropriate AI-driven managerial policies, which in turn benefits employees and their organizations. The APM model acts as a reference guide, helping managers to evaluate the AI's constraint and opportunity in their managerial practices.

Originality/value: The APM model is valuable and informative to the academic researchers, as it has first responded to Malik *et al*. (2019)'s call (*re: the absence of AI and management literature*); and, more importantly, it has advanced the knowledge of AI-Management relationship, supporting scholars to further understand the role of AI in personnel management.

Keywords: AI; Artificial Intelligence; Career Opportunity; Personnel Management.

Introduction

In layman's terms, *artificial intelligence* (AI) is intelligence demonstrated by machines and programmes. AI often refers to the technology adopted to execute a command (or task) that needs intelligence to accomplish (Brown, Ling & Gurdeniz, 2017). More recently, AI has shifted from laboratory experiments into business and management world. In the finance industry, for instance, managers are implementing AI models in order to increase revenue and reduce cost through better and faster decision-making in the management system (Wisskirchen, Biacabe, Bormann *et al.*, 2017). In personnel management, managers are keen to improve staff performance via the AI-based techniques such as performance monitor apps (Ernst & Young, 2018). Duchessi, O'Keefe, and O'Leary (1993) also state that AI has the ability to change the ownership and responsibility for decision making in management.

Every story has two sides, so does AI. While some managers appreciate the convenience of AI as it facilitates the decision-making-process in management, other managers feel that AI has ripped off their imperativeness at work and threatened their career opportunity. Coincidently, Chang (2019) has found that managers and subordinates of the canteen had mixed views about using AI in their job allocation, e.g., AI helped to cut down the personnel cost, but also implied less staff appointment; canteen staff had reservations about how AI would work and they understood very little about how their canteen affected or was affected by the AI-driven management. In addition, Duchessi and O'Keefe (1995) indicate that AI applications are unlikely to be used if no incentives are offered, perhaps because that managers and organizations are not entirely sure how AI can be utilized into the managerial practices.

Interestingly, despite of the aforementioned views and barriers in application, AI does not refrain its influence on personnel management (PM), along with the following reasons. To begin with, the top management, corporate stake holders and business owners are always interested in improving their organizational performance and employee engagement. In line with this interest, Ernst and Young (2018) have found that AI offers opportunities to improve PM functions, such as self-served transactions, and recruiting-talent-acquisition programmes. They comment: "*Human resources executives have faith that merging AI into managerial functions will benefit and improve the overall employee experience. This will provide more capacity, more time and budget, and more accurate information for decisive people management, p.3*". In a similar vein, several business and enterprises have adopted "Big-Data & Cloud" in

their staff management practice, with a view that the use of AI analyses offers better insights into how to execute and operate in performance appraisal, staff succession planning and performance management (Wang, Wang & Huang, 2017).

Another point to be borne in mind is: AI outperforms human intelligence in two characters (Grace, Salvatier, Dafoe *et al*., 2018). These are: *cognition* (e.g., translating languages, writing essays, driving vehicles) and *coordination* (e.g., selling and customer-interaction skills, operating surgeries). Spurthi (2018) scrutinizes the difference between natural intelligence (NI) and AI, summarizing that NI exceeds AI in sensors, creativity, and adaptability, but AI surpasses NI in complex calculation and information transferring. Interestingly, AI and NI are equally competent in using and acquiring information. These characters are crucial to personnel management, as the organization nowadays tends to have complex structure, in which departments and teams share great number of tasks and distributed responsibility (Mullins, 2016). Following this logic, one shall expect managers to perform better and more effectively when AI supports their decision-making-process (which requires cognition) and team management (which relies on coordination). Ernst and Young (2018) also suggest that AI-based management applications have strong potential to raise management efficacy as well as employee productivity, such as training new managers to become knowledgeable and skilful managerial practitioners, which in turn boosts teamwork and employee performance. Following this logic, one can imagine that AI-based management applications will soon have an ability to analyze, predict, diagnose and become more powerful and capable resources in the field of personnel management.

In addition, over 67% of managerial practitioners (e.g., CEOs, business owners, managers) recognize the significance of Big-Data and AI for the existing and future personnel management; yet, only 7% of the surveyed organizations have managers who are confident in utilizing Big-Data and AI in their management practices (Keystone Consulting, 2017). In a different but management-relevant survey, only 38% of the surveyed managers are found to focus their efforts on AI tools in people management, although manages generally agree that AI will definitely play a more proactive role in the practices of personnel management (Ernst & Young, 2018). Coincidently, IT and technology industry is keen to adopt AI-based programmes in recruiting top talents (e.g., psychometrics-based recruitment software: Wang *et al*., 2017), as well as enhancing employee experience (e.g., health monitor app: Ernst & Young, 2018).

In view of what has preceded, understanding the role of AI in personnel management has become imminent and imperative, as AI becomes more advanced and ubiquitous across enterprises and industries, and AI-powered personnel management will encompass much more than just workflow optimization. AI has a great potential to make management better. To sum up, regardless of its potential side effect and threats, AI has possessed numerous merits and outperformed human intelligence in different aspects of human life. AI-based management applications have strong potential to raise employee productivity and help managers become knowledgeable agents that facilitate teamwork and boost employee performance. Our view is: the success of any organization depends on how effectively it combines people, process and technology to deliver transformational value at optimized cost, and we strong believe that AI can help to efficiently automate many back-office functions for reliable personnel management transactions and service delivery. Rather than worrying the possibility that AI-technology might replace millions of jobs over the coming decades, it would be more practical and sensible to find out the opportunity and constraint of using AI in personnel management and practices.

AI in human resource management – From the applicability perspective

To further evaluate the applicability of AI in personnel management, this article now turns to the introduction of current AI practices. Depends on the business field and organizational context, organizations tend to perceive the concept of AI differently and thus adopt different approaches in their personnel management. For instance, Kaushik (2011) states that some organizations adopt AI to identify the resource and spot errors, while others adopt AI to reduce cost and manage job allocations. Interestingly, experts and scholars have different views in how managers should approach AI. As it is presented in Table 1, some scholars focus on the origin of AI (e.g. what makes AI and how it work), but others suggest it is crucial to understand the opportunity and limitation embedded within the AI applications (e.g. what's the edge over AI, avoid over-reliance on AI). In the realm of personnel management, more specifically, there are several common AI approaches shared by business and managers (Kolbjornsrud, Amico, & Thomas, 2016). These approaches are outlined below:

Approach One: Leave Administration to AI

Managers usually spend great amount of time in conducting mundane work such as business administration, staff management and resource coordination (Chang, 2019). However, many decisions

require insights beyond what AI can squeeze from data alone, and managers often use their knowledge of organizational history and culture, as well as empathy and ethical reflection. This is really the essence of human judgment – the application of experience and expertise to critical business decisions and practices. Kolbjornsrud *et al*. (2016) indicate that managers have a sense of a shift in this direction and identify the judgment-oriented skills of creative thinking and experimentation, data analysis and interpretation, and strategy development as the top new skills that will be required to succeed in the future. Following this logic, managers may see AI as extra hand or playing an assistant role, dealing with administration related tasks. Simply put, AI may focus on the hassles, so managers themselves can have more time in concentrating on the judgement work.

<Insert Table 1 About Here>

Approach Two: Treat AI tools as colleagues

Intriguingly, not all managers regard AI as their assistant such as playing a supporting role in their managerial practices. Indeed, there are managers who are willing to respect the merits of AI and adopt a more amicable approach in working with AI. Kolbjornsrud *et al.* (2016) comment that managers who view AI as a kind of colleague will recognize that there's no need to "race against a machine". While human judgment is unlikely to be automated, intelligent machines can add enormously to this type of work, assisting in decision support and data-driven simulations as well as search and discovery activities (Wang *et al*., 2017). 78% of the surveyed managers also believe that they will trust the advice of intelligent systems in making business decisions in the future (Kolbjornsrud *et al.,* 2016). Following these findings, one can imagine that not only will AI augment managers' work, but it will also enable managers to interact with intelligent machines in collegial ways, through conversation or other intuitive interfaces. To a certain degree, AI may become managers' always-available colleague or even adviser.

Approach Three: Work like a designer

Some people may assume that AI makes innovation and offers creativity, which is not entirely accurate. Scholars actually suggest that AI often helps managers to compile data, diagnose ideas, and integrate the information (Duchessi *et al*., 1993). Although AI does not necessarily produce creativity, it works like a designer; namely, while managers' own creative abilities are vital, perhaps even more important is their ability to harness others' creativity (Ernst & Young, 2018). Manager-designers (i.e., management and AI

jointly) bring together diverse ideas into integrated, workable, and appealing solutions. They embed design thinking into the practices of their teams and organizations. Kolbjornsrud *et al.* (2016) state that 33% of the managers have identified creative thinking and experimentation as a key skill area they need to learn to stay successful as AI increasingly takes over administrative work.

Based on the aforementioned practices, one can summarize that AI has implied great opportunity and applicability in personnel management. AI has huge potential to help managers in making better decisions. Through various AI practices in personnel management, organizations and managers are able to identify the resource, spot the human errors, monitor managerial targets, locate best teamwork and output. Moreover, Ginni Rometty is one of the world-class and well-known managers, and she is the first female CEO (2011-present) from the bottom line in the IBM history. Rometty is famous for her fierce AI-driven management and evidenced-leadership in IBM. During an interview with CNN's Fareed Zakaria on the side-lines of the 2017 World Economic Conference in Davos, Rometty made the following remark: "…*some people call this artificial intelligence, but the reality is this technology will enhance us…*". In echoing Rometty's remark, we believe that, compared to humans, AI is able to crunch numbers, identify patterns, and make faster data-driven decisions. (*c.f.*; AI has the ability to process large amounts of data and spit out trend directions and actionable advice; Brown *et al.*, 2017). We also propose that AI application can be a vital tool for any manager looking for some quantitative support in their decision-making for personnel management. By learning how to work with AI and using the advice it can provide, we believe that managers can adapt and improve their managerial options and create more value to the organization.

Moreover, AI in personnel management may help to plan recruitment and appraisal of employees, such as performing deep behavioral analysis on subordinates to better identify their needs and aspirations (Ernst & Young, 2018). Coincidently AI-driven applications have become popular in Asian enterprises, for instance, Alibaba's HR software for staff appraisals, and network-based programmes for recruitment and shortlisting (http://www.hcpersonnel management.com/). Chang (2019) indicates that the era of AI-driven management has arrived, and such management concept will be refined with the integration of emotional intelligence, giving the AI system greater insight into human nature. Considering the existing evidence, it is sensible to imagine a trend where AI becomes essential and indispensable part of every enterprise. Enterprises are thus

encouraged to appreciate such trend and escalate their efforts to not only incorporate AI in personnel management but also integrate AI into all other functions of the business as well.

Furthermore, experts and scholars have raised ethical concerns about how AI should be applied in general management. One common caveat is pertinent to the information processing and integration. Scholars have mixed viewpoints of such caveat but, generally speaking, the caveat includes: who creates AI rules and managerial guidelines, how AI collects information, who supervises the collection process, how the AI-gathered information is analysed, shared and managed, who reviews the AI users, and what policies (or protocols) are required for the validation and re-verification of AI guidelines (e.g. Harris *et al*., 2011; Tsohou *et al*., 2015). Duly, as AI in personnel management is still in its infancy stage, more empirical studies and longitudinal research are encouraged to understand the opportunity as well as constraint of AI in personnel management. To respond to the rise of AI as well as the aforementioned concerns, the Chartered Institute of Personnel and Development (CIPD: a professional association for people management professionals in the United Kingdom) has initiated a series of AI-related proposals in April 2019 (CIPD, 2019). Hopefully, the outcome will not only contribute to the knowledge of AI, but also clarify its applicability in personnel management.

AI in personnel management – From the theoretical perspective

Earlier discussion of applicability perspective has revealed that managers evaluate AI's potential differently and their views vary. Some managers value the technological merits of AI and see AI as powerful tool in people management, whereas others regard AI as career threat and downgrade its applicability. In a similar vein, Malik *et al*. (2019) also comment that there is no theoretical basis within personnel management literature for understanding how AI impacts on employees and their management. To address this theoretical gap, three relevant theoretical approaches are discussed below, helping to interpret AI's role and clarify its potential influence in personnel management.

<Insert Table 2 About Here>

Job demands-resources: Bakker and Demerouti (2007) indicate that whereas every occupation may have its own specific working characters, these characters are generally divided in two categories (job demands vs. job resources), thus constituting an overarching model that may be applied to various occupational settings, irrespective of the particular demands and resources involved. Bakker and Demerouti

continue that people may feel stressed when the demand-resource relationship is not balanced (e.g., when job demands are high and when job resources are limited). Similarly, when AI is regarded as job demands (AI functions as an innovative and assistive tool; Wisskirchen *et al*., 2017), organizations without AI knowledge and skills are more likely to miss profit opportunities, whereas those with AI knowledge and skills may secure more opportunities instead. When AI is regarded as job resource (as AI helps to efficiently automate many back-office functions for reliable transactions and service delivery; Wang *et al*., 2017), organizations with AI resources are more likely to gain competitive advantage, compared to those without resources. Following this line of analysis, managers shall remain cautious of AI's influence in their managerial practices, as AI has potential to become job demand and job resource, and the absence of either potential may put the organization at a disadvantageous position.

Psychological contract: Broadly speaking, human beings are a social species and rely on relationships in every aspect of their life. In the workplace, for instance, employees may negotiate what they must do to satisfy their side of the bargain, and what they can expect in return, and this give-take relationship has formed the sense of psychological contract (Rousseau, 1989). The aforementioned negotiation appears in different ways, such as conducting appraisal and performance review sessions, exchanging expectations between assessors and assesses, or acting/reacting to organisational policies. Moreover, psychological contract helps all parties (e.g., organization, manager, subordinate) to understand what each party should or should not do, and how it should be done; thus, when the parties' expectations match each other, objectives are likely to be accomplished and satisfaction obtained (George, 2010). Following the concept of psychological contract, managers shall remain cautious in their introduction as well as implementation of AI in personnel management, as managers and subordinates may have different roles or expectations. Take the health monitor app for example, subordinates are reminded that the app helps share their physical data with managers for the purpose of health management and well-being support, whereas managers are expected to learn and use the data in refining their managerial practices (Ernst & Young, 2018). Although the purpose of health monitor app is authentic, subordinates' psychological contract may be breached if they feel being overwatched or the data being abused (Chang, 2019). In addition, organizational leaders and senior executives have the responsibility to learn AI and understand how to use it, and AI should be adopted in an appropriate manner, at least in a way that empowers employees, not threatens them (CIPD, 2019).

Job replacement: Scholars have found that AI may re-shape employees' job tasks and hence make them exposed to the redundancy risk (Malik *et al*., 2019), and that AI acts like as amalgamation of innovation and efficiency in implementing tasks (Brown *et al*., 2017; Duchessi *et al*., 1993). Following this line of research, Huang and Rust (2018) have specified four intelligences required for service tasks (i.e., mechanical, analytical, intuitive & empathetic) and outlined the way managers should decide between labor and machines for accomplishing those tasks. According to Huang and Rust, AI's influence evolves in a staged manner, with mechanical mostly preceding analytical, analytical mostly preceding intuitive, and intuitive mostly preceding empathetic intelligence. They assert that AI job replacement occurs fundamentally at the task level, rather than the job level, and usually for lower intelligence tasks initially. Based on their argument, AI may first replace some of a service job's tasks, a transition stage seen as augmentation, and then progresses to replace human labor entirely when it has the ability to take over all of a job's tasks. The progression of AI task replacement from lower to higher intelligences results in predictable shifts over time in the relative importance of the intelligences for service employees. As such, analytical skills will become trivial in future jobs, as AI may take over more analytical and complex tasks, giving the intuitive and empathetic skills more weight and credits in the job market. Eventually, AI will have the capability to perform not just mechanical and routine tasks of a job, but also in its entirety, even jobs that have high intuitive and empathetic content.

The discussion above has offered a comprehensive analysis on how managers and employees interact with (or are affected by) AI in their workplace. Managers are encouraged to plan themselves in training of AI management; in addition to traditional labor management, they are expected to know how to manage AI or at least equip themselves with skills in managing AI software/hardware. A summary table (Table 2) is compiled, outlining the main argument of each approach. These approaches are different in nature but they all have their unique merits, analyzing how AI may be constructed, interpreted and hence different outcomes may emerge. The table also helps managers to understand to what extent AI may incorporate into (or could be embedded within) the existing personnel managerial practices.

Model development: AI in Personnel Management (APM)

The applicability perspective has discussed the AI-management relationship, contributing to the development of AI-management protocol for the managerial practitioners. The theoretical perspective has

evaluated how, and to what extent, AI impacts on personnel management. Both perspectives have suggested that AI has important implication in personnel management, and that employees interpret AI's influence differently. Following this logic, a new model of AI in personnel management (APM) is proposed, in line with the rationale below. As it is shown in Figure 1, the model unfolds itself in three levels, followed by a component of potential outcome. The three levels comprise "organizational-, managerial- and individual job-levels", and the outcome comprises "organizational performance, employees' well-being, and staff turnover rate". Details are presented below:

<Insert Figure 1 About Here>

Organizational level. Following the discussion of job demands-resources model, scholars suggest that AI may affect managerial practices, as AI has potential to become either job demand or job resource, and the absence of either potential can put organizations at a disadvantageous position (Bakker & Demerouti, 2007). Organizations with AI knowledge/skills (job demand-wise) are found to secure profit opportunities (Wisskirchen *et al*., 2017), whereas organizations with AI resources (job resource-wise) are more likely to gain competitive advantage (Wang *et al*., 2017). In view of what has preceded, the APM model proposes to include *profit opportunity* and *competitive advantage* at the organizational level.

Managerial level. Successful personnel management often depends on managers' experiences and their managerial approaches, such as managers' understanding of management, managerial strategies, leadership skills, management of communication, arrangement of delegation and autonomy (e.g., Macey & Scgeneider, 2008; Robert, & Davenport, 2002). Clear instruction, non-abusive supervision and person-organization fit are also found to be related with employees' organizational identification and job satisfaction (e.g., Chang *et al*., 2013; Elsbach, 2001). Moreover, earlier discussion (*c.f.* applicability perspective) offers preliminary credence that how managers view AI and their approach in learning AI may impact on their personnel management practices, and that implementing AI requires great attention and careful arrangement. As such, we propose to include two components at the managerial level. These are: *manager's views of AI in personnel management* and *implementation of AI-driven personnel management policies*.

Individual job level. AI is pertinent to job security as it has potential to replace jobs and expose employees to the redundancy risk (Malik *et al*., 2019); namely, the more tasks AI can take over, the more risk employees are exposed to. From the task-intelligence perspective, Huang and Rust (2018) suggest that

tasks with heavy-intelligence-requirement are less likely to be replaced by AI, whereas tasks with light-intelligence-requirement are more likely to be replaced. These arguments seem to infer that the replacement may occur at the task level and for lower intelligence tasks first. Thus, we propose to include *job security* and *intelligence requirement* at the individual job level.

Outcome. The APM model comprises three levels (organizational-, managerial- and individual job-levels), and each level helps to explain how AI is relevant to specific aspects of personnel management practices. These three levels are meaningful, bringing new insights to the AI-Management literature. These levels also help scholars to understand the potential consequence of AI's influence in personnel management. Specifically, at the discussion of organizational level, we have learnt from literature that both profit opportunity and competitive advantage are found to contribute to the overall organizational performance (Robbins & Judge, 2012). At the discussion of managerial level, we have learnt that managers' knowledge of management and skill sets are important to subordinates' workplace experiences (Gomez-Mejia, Balkin & Cardy, 2008), and both leadership styles and managerial strategies are associated with employee's well-being (Jordan, 2019). At the discussion of individual job level, we have learnt from literature that job security plays a key role in staff turnover, as insecurity causes an intention of leaving the organization (McCloy, Purl & Banjanovic, 2019). To sum up, prior studies have offered valuable insights to the consequence of AI-driven personnel management policies. As such, we propose to include: *organizational performance*, *employees' well-being* and *staff turnover rate* as the potential outcome.

Discussion and directions of future studies

The development of APM model is valuable and informative to the academic researchers in several ways. To begin with, the APM model has responded to Malik *et al*. (2019)'s call (*re: the absence of AI-personnel management literature*); specifically, the model has advanced the knowledge of AI-personnel management, supporting scholars to further understand the role of AI in personnel management. Next, the emergence of APM model is vital to general managerial practitioners as well, as the model helps managers to scrutinize the implication of AI in their workplace. With better understanding of AI's implication, managers are more likely to develop appropriate AI-driven managerial policies, which in turn benefit employees and their organizations. Finally, the model acts as a reference guide, helping managers to evaluate the AI's

constraint and opportunity in their managerial practices. It is our hope that the review of literature (i.e., AI-personnel management) and the model in this paper will provide research with a lunching point.

Despite the fact that a great deal of research has been conducted on AI and personal management, there remain several opportunities for future research. Based on the *job demands-resources model* (Bakker & Demerouti, 2007), future studies may investigate the best demand-source equilibrium for AI implementation, i.e., when and how AI should be provided to managers, should AI be offered via internal trainings or incorporated into the existing PDR process? Alternatively, is it necessary for organisations to appoint AI specialists to work with managers in their personnel management policies and practices? If AI specialists are appropriate and to be appointed, whether the role of specialists might be overlapped with managers' decision-making? Scholars are encouraged to consider these questions in their future attempts.

From the perspective of employees' well-being, future studies may investigate how AI should be deployed to maximize the efficacy of managerial policy. For instance, in order to help employees maintain healthy psychological contract at work, scholars may research the most appropriate or feasible ways to support the victims (i.e., the employees who are affected by AI-driven management policies; Huang & Rust, 2018), so victims do not feel being left behind and receive an opportunity to recover? Probably more importantly, as AI becomes more advanced and ubiquitous across enterprises and industries (Ernst & Young, 2018), what personnel management strategies could managers adopt to ensure their subordinates are confident and capable in interacting AI, rather than becoming the victims of AI implementation?

Last but not the least, the APM model is potentially important to related topics in which AI has implied but yet not tested. Concerning the AI-personnel management literature, scholars may research APM-related themes in two ways. On the one hand, what might define task-level jobs and what assistance may be required to support those who are affected such as victims and the people around victims? These questions are salient to personnel management, as managers and organisations do have responsibility to look after their employees as well as protecting employees' career development opportunities (CIPD, 2019). Allowing employees face AI's consequence alone is unethical and harms organisational interests in the long run (Chang, 2019). On the other hand, scholars may conduct further research to analyze the potential impact of AI in processing heavy-cognition-component jobs. A recent case explains that AI outperforms radiologists in detecting breast cancer, but others suggest that AI only works in certain conditions (McKinney, Sieniek & Shetty, 2020). Namely, AI

may be powerful in the task-level jobs, what AI can contribute to in the more advanced jobs, or how people can work with AI in the heavy-cognition-component jobs are still unknown. Further studies on these themes are therefore encouraged.

Summary

The current research has adopted two specific perspectives (applicability vs. theory) to review and critically discuss the constraint and opportunity of artificial intelligence (AI) in personnel management. The applicability perspective helps inform an AI-driven set of management guidelines and contributes to the development of AI-management protocol for the managerial practitioners. The theoretical perspective has adopted three theories to evaluate how, and to what extent, AI impacts on personnel management. These perspectives jointly have contributed to the knowledge advancement of AI-personnel management, and developed a new model of APM, bringing new insights to the AI and management literature.

References

Bakker, A.B., & Demerouti, E. (2007). The Job demands-resources model: State of the art. *Journal of Managerial Psycholog*y, *22* (3): 309-328.

Brown, J., Ling, T., & Gurdeniz, E. (2017). *Managing next generation of AI in Banking*. New York: Oliver Wyman - Marsh & McLenna.

Chang, K. (2019). *Has the era of artificial intelligence (AI)-driven management arrived yet: The case of Fudan University Student Canteen*. (In Chinese). Fudan Development Institute (FDDI). Shanghai, CHINA: Fudan University.

Chang, K., Kuo, C.C., Su, M., & Taylor, J. (2013). Dis-identification in organisation and its role in the workplace. *Industrial Relations*, *68* (3): 479-506.

CIPD (2019). Artificial intelligence and automation in the workplace. Published: 30th April 2019. London: Chartered Institute of Personnel and Development CIPD. (Access: 21st August 2019)

https://www.cipd.co.uk/knowledge/work/technology/emerging-future-work-factsheet

Duchessi, P., & O'Keefe, R.M. (1995). Understanding expert systems success and failure. *Expert Systems with Applications*, *9* (2): 123-133.

Duchessi, P., O'Keefe, R., & O'Leary, D.E. (1993). A research perspective: AI, management and organizations. *Intelligent Systems*, *2* (3): 151-159.

Elsbach, K. D. (2001). Coping with hybrid organizational identities. In: J. Wagner (Ed). *Advances in Qualitative Organization Research* (Vol 3, pp. 59-90). Oxford: Elservier.

Ernst & Young. (2018). *The new age: artificial intelligence for human resource opportunities and functions*. London: Ernst & Young LLP.

George, C. (2010). *Psychological contract: Managing and developing professional groups*. Maidenhead, G.B.: Open University Press.

Gomez-Mejia, L.R., Balkin, D.B., & Cardy, RL. (2008). *Management: People, Performance, Change* (3rd ed.). New York: McGraw-Hill.

Grace, K., Salvatier, J., Dafoe, A., Zhang, B., & Evans, O. (2018). *When will AI exceed human performance? Evidence from AI experts*. Oxford: Future of Humanity Institute, Oxford University.

Harris, I., Jennings, R.C., Pullinger, D., Rogerson, S., *et al*. (2011). Ethical assessment of new technologies: a meta-methodology. *Journal of Information, Communication & Ethics in Society*, 9(1): 49-64.

Huang, M. H., & Rust, R. T. (2018). AI in service. *Journal of Service Research*, *21* (2): 155-172.

Jordan, H. (2019). The line manager's role in mental wellbeing. *HR Magazine*. (Aug ed). London: MAG.

Kaushik, S. (2011). *Artificial Intelligence*. Delhi, India: Cengage Learning.

Keystone Consulting. (2017). *Big-Data and its role on the efficacy of human resource management*. Investigative Report. Shanghai, CHINA: Keystone Consulting Ltd.

Kolbjornsrud, V., Amico, R., & Thomas, R.J. (2016). *The promise of artificial intelligence: Redefining management in the workplace of the future*. New York: Accenture Institute for High Performance.

Macey, W., & Scgeneider, B. (2008). The meaning of employee engagement. *Industrial and Organizational Psychology*, *1* (1): 3-30

Malik, A., Budhwar, P., Srikanth, NR & Varma, A. (2019). May the bots be with you! Opportunities and challenges of artificial intelligence for rethinking human resource management practices. Paper Accepted for presentation at the *Annual Conference, British Academy of Management* 2019.

McCloy, R.A., Purl,J.D., & Banjanovic, E.S. (2019). Turnover modeling and event history analysis. *Industrial and Organizational Psychology*, *12* (3): 320-325.

McKinney, S.M., Sieniek, M., Shetty, S., (2020). International evaluation of an AI system for breast cancer screening. *Nature*, *577* (1), 89-94.

Mullins, L.J. (2016). *Management and organizational behavior*. (11th ed.). Essex, England: Pearson.

O'Leary, D.E. (1993). AThe impact of manager philosophy on knowledge management systems. *Intelligent Systems*, *17* (2): 111-126.

Robert, D., & Davenport, T. O. (2002). Job engagement: Why it's important and how to improve it. *Employment Relations*, *29* (3): 21-29.

Robbins, S.P., & Judge,T. (2012). *Organizational behavior*. (15th ed). London: Pearson.

Rousseau, D.M. (1989). Psychological and implied contracts in organizations. *Employee Responsibilities and Rights Journal*, *2*(2): 121-139.

Spurthis, K. (2018). *AI versus Humans*. ATG.World. (Accessed: 25 May 2019)

https://www.atg.world/view-article/AI%20versus%20Humans-26011

Tsohou, A., M. Karyda, S. Kokolakis., *et al*. (2015). Managing the introduction of information security awareness programmes in organisations. *European Journal of Information Systems*, *24* (1): 38-58.

Wang, A.M., Wang, T.L., & Huang, C.J. (2017). *BigData on human resource management: Model, theory and application*. Beijing, CHINA: Tsinghua University Press.

Wisskirchen, G., Biacabe, B.T., Bormann, U., Muntz, A., *et al*. (2017). *Artificial intelligence and robotics and their impact on the workplace*. London: IBA Global Employment Institute.
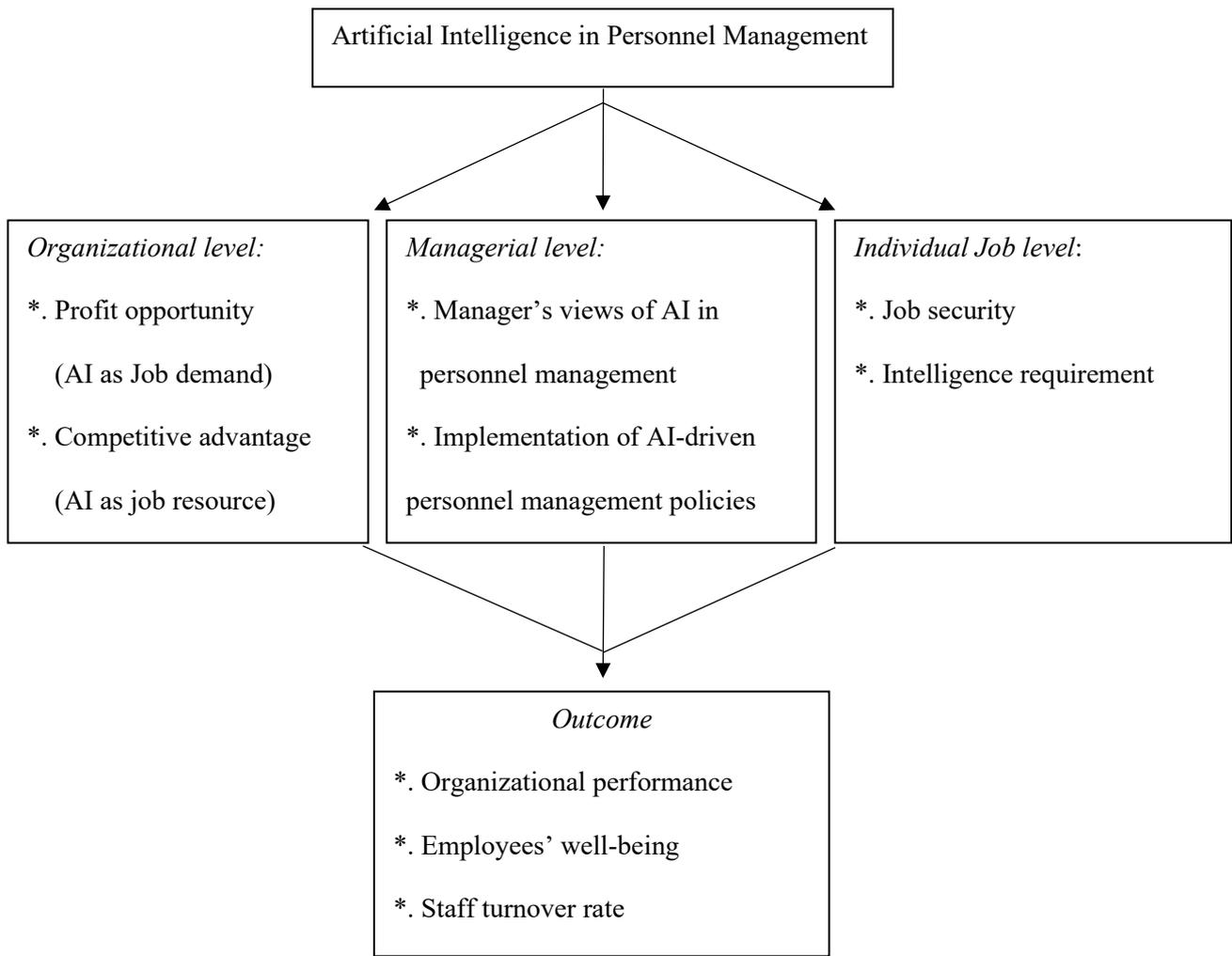
```
                    ┌─────────────────────────────────────────────┐
                    │ Artificial Intelligence in Personnel Management │
                    └─────────────────────────────────────────────┘
```

Organizational level:

*. Profit opportunity

   (AI as Job demand)

*. Competitive advantage

   (AI as job resource)

Managerial level:

*. Manager's views of AI in

  personnel management

*. Implementation of AI-driven

personnel management policies

Individual Job level:

*. Job security

*. Intelligence requirement

Outcome

*. Organizational performance

*. Employees' well-being

*. Staff turnover rate

Figure 1. The Model of APM (AI in Personnel Management)

Table 1: How should managers approach AI in their practice?

Expert	Affiliation	Recommended approach
Dario Gil	Vice President, AI Quantum Computing, IBM	Understand what AI is and what it will become
Prof. Julian Birkinshaw	London Business School	Be aware of the rising AI tide
Prof. Dominique Hanssens	UCLA	Test your black box data Don't rely on AI to drive growth
Prof. Tomo Noda	Japan Shizenkan University	Know where you have the edge over AI
Bruno Di Leo	Senior Vice President of The IBM	Consider your broader responsibilities
Prof. Bernard Yeung	National University of Singapore	Update your own education
Ricardo Forcano	CIO of the BBVA	Define your values and sense of purpose
Nico Rose	Vice President, Bertelsmann Entertainment	Don't just hire people, build an ecosystem
George Bernard Shaw	Irish playwright and polemicist (1856-1950)	Stay spiky - Insistency Simply

Note.

Author compiled Table 1 using the information from internet and refined the findings at an institutional workshop. Table 1 describes how managers and experts perceive AI, including their recommendations managerial approaches.

Table 2: Manifestation of theoretical approaches

Theoretical approaches	Main scholars	AI's potential impact
Job demand-resource	Arnold B Bakker Evangelia Demerouti (2007)	AI affects managerial practices, especially when AI has potential to become either job demand or job resource, and the absence of either potential may put employees and employers at a disadvantageous position.
Psychological contract	Denise M. Rousseau (1989) Christeen George (2010)	Implementing AI requires great attention, and managers have the responsibility to learn AI and understand how to use it. To ensure employees maintain healthy psychological contract, AI must be adopted in an appropriate manner, at least in a way that engages employees, not threatens them.
Job replacement	Ming-Hui Huang Roland T Rust (2018)	Due to the AI's influence, job replacement occurs fundamentally at the task level, rather than the job level, and for lower intelligence tasks first. Tasks with heavy-cognition-component are less likely to be replaced at present, although more advanced AI devices (hardware, software) may develop over time and gradually change the course of replacement.