




Artificial intelligence and public sector human resource management in South Africa: Opportunities, challenges and prospects



Authors:

Alouis Chilunjika^{1,2} 
Kudakwashe Intauno³ 
Sharon R. Chilunjika^{1,3} 

Affiliations:

¹Department of Public Management, Governance and Public Policy, Faculty of Commerce, Business and Economics, University of Johannesburg, Johannesburg, South Africa

²Department of Political and Administrative Studies, Faculty of Social Sciences, National University of Lesotho, Maseru, Lesotho

³Department of Governance and Public Management, Faculty of Social Sciences, Midlands State University, Gweru, Zimbabwe

Corresponding author:

Alouis Chilunjika,
chilunjika@gmail.com

Dates:

Received: 19 Apr. 2022

Accepted: 12 July 2022

Published: 21 Oct. 2022

How to cite this article:

Chilunjika, A., Intauno, K., & Chilunjika, S.R. (2022). Artificial intelligence and public sector human resource management in South Africa: Opportunities, challenges and prospects. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, 20(0), a1972. <https://doi.org/10.4102/sajhrm.v20i0.1972>

Read online:



Scan this QR code with your smart phone or mobile device to read online.

Orientation: The Fourth Industrial Revolution has transformed modern society by ushering in the fusion of advances in robotics, the Internet of Things (IoT), genetic engineering, quantum computing, and artificial intelligence (AI) among others. AI brings a range of different technologies and applications to interact with environments that comprise both the relevant objects and the interaction rules and have the capacity to process information in a way that resembles intelligent behaviour. Similarly, artificial intelligence is also being used in the human resources management (HRM) processes and functions in the public sector to map sequences to actions.

Research purpose: The study explores the opportunities, challenges, and future prospects of integrating Artificial Intelligence (AI) and Public Sector Human Resource Management (HRM) in South Africa's public sector.

Motivation for the study: The study was motivated by the need to examine the dynamics surrounding the adoption, implementation and operationalisation of the 4IR in the management of human resources in the SA public sector in this unfolding dispensation.

Research Approach: Data was collected using the extensive review of written records such as books, journal articles, book chapters among others which were purposively selected for use in this study. Data was analysed using content and thematic analysis techniques.

Research Findings: The study established that Artificial Intelligence is beneficial in the sense that it can improve public service delivery in South Africa as the HRM personnel is enabled to focus more on the strategic areas of management by taking over routine tasks, and that it helps minimize bias in public service recruitment and selection. In contrast, research on potential challenges has revealed that combining Artificial Intelligence and Public Sector Human Resource Management may pose a threat to white-collar jobs.

Practical/ Managerial Implications: This study may lead to practical applications of AI to support the HR functions of public sector entities in SA. The public managers are better informed about the impediments, gaps and opportunities that may arise from using AI in managing human resources in SA's public sector.

Contributions: This study contributes to the body of knowledge as it unpacks and informs the dynamics associated with the implementation of AI in managing human resources in public sector entities.

Keywords: Fourth Industrial Revolution; artificial intelligence; public sector; human resource management; South Africa.

Introduction

The Fourth Industrial Revolution (4IR) has ushered in advanced technology, which has manifested through artificial intelligence (AI). The automation system has continued to change societies and economies with great intensity in this global age. Artificial intelligence is a multidisciplinary discourse providing a convergence zone for information, communications and technology, mathematics, psychology and philosophy (UNESCO, 2018). In light of this, AI is the ability of a digital computer or computer-controlled robot to perform tasks associated with intelligent beings. To this effect, AI as a concept is frequently used to support developing systems that are endowed with the intellectual processes characteristic of humans, such as the ability to reason,

Copyright: © 2022. The Authors. Licensee: AOSIS. This work is licensed under the Creative Commons Attribution License.

discover meaning, generalise or learn from past experience. Park (2018) clarified AI as a programmed algorithm with learning capabilities that aspires to be human-like but outperforms humans in capability. Accordingly, it can thus be observed that AI has brought some advancements in deep learning and machine learning, which have thus created a paradigm shift in virtually every sector. Accordingly, Mohammed (2019) argued that AI is thus a basis for mimicking human intelligence processes by creating and applying algorithms built into a dynamic computing environment.

In the light of this, the development of AI has provided novel perspectives on labour and its management (Ertel, 2018). Governance and public policy, with the shift from traditional to New Public Management (NPM), has also felt the reverberations of technology. Thus, public sector organisations have to strive relentlessly on a global stage as new-fangled technology is making the world smaller (Erixon, 2018). In this vein, the rise of AI use in government coupled with the increased sophistication of AI applications is triggering many public governance and personnel management questions for public entities across the globe. Thus, it can also be observed that the expanding use of AI in government is triggering numerous opportunities for governments worldwide. According to Zuiderwijk, Chen and Salem (2021), traditional forms of service provision, policymaking and enforcement can change rapidly with the introduction of AI technologies in government practices and public sector ecosystems. In this scenario, the role of computers conspicuously comes into play in all governance and HR processes, because AI is trying to make computers think and act like humans (Mohammed, 2019). It can also be observed that the amount of data that is generated by both humans and machines far outpace humans' ability to absorb, interpret and make complex decisions based on data. As such, AI forms the basis for all computer learning and is the future of all complex decision-making in the human resource management (HRM) spheres. Accordingly, the critical characteristics of an AI system lie in the technological components that provide it with the capacity to process data and information in a way that entails intelligent behaviour, consisting of aspects of learning, planning, prediction and control (UNESCO, 2018).

Technological components have also been introduced into the public sector's governance framework and machinery. For instance, public sector human resource management (HRM), as a subdiscipline of public management, has also witnessed the introduction of information technology for the implementation of strategic HRM. In this vein, Alam (2014) goes so far as to advocate for the implementation of public sector information systems (PSIS), which are fundamental to e-governance, which is a component of NPM. Accordingly, PSIS is a system that supports the use of AI in HRM practices, systems and processes in the public sector. Accordingly, Jarrahi (2018) observed that managerial and operative functions of HRM – corporate strategy formulation, talent

procurement, training and development and performance management – have benefited from evidence-based decision-making, which is enshrined in AI.

According to Jia, Gao, Li, Li and Chen (2018), the research agenda of HRM has neglected the overall application of AI to HRM in the public sector domain. The situation is even dire in public sector HRM in South Africa. According to Reilly (2018) AI provides novel cognitive capabilities whose speed and accuracy can be utilised for the betterment of the HR function execution. However, there has been less enthusiasm for the introduction of AI-based public sector HRM in South Africa. This lack of enthusiasm might have been a result of what Zuiderwijk et al. (2021) highlighted as a lack of consensus on how to handle the challenges of AI associated with the public sector in the future. Adopting AI in public sector HRM functions and processes might actually be a panacea to a myriad of service delivery inertia in government institutions. In the end, it is therefore imperative that public sector HRM in South Africa embraces the effects of its interaction with AI as part of its ecology. This will then enable her to understand and better prepare to address any emerging AI-related challenges in the public sector domain of South Africa.

This study addresses the following questions:

- What opportunities can be derived from the integration of AI and public sector HRM in South Africa?
- What are the challenges and complexities presented by the adoption of AI in the South African public sector HRM?

Conceptualisation and review of literature

Artificial intelligence as a concept is contentious among both scholars and practitioners, with its delineations and delimitations emotionally debated. This has created complexities in generalising the understanding of AI (Agrawal, Gans, & Goldfarb, 2019; Legg & Hutter, 2007). According to Grewal (2014), intelligence is defined as a general mental ability to reason, solve problems and learn. It integrates cognitive functions such as perception, attention, memory, language and planning. In the same vein, Grewal (2014) goes on to comprehensively define AI as a mechanical simulation system that collects knowledge and information and processes the universe's intelligence (collating and interpreting) and disseminates it to the eligible in the form of actionable intelligence. In support of the given definitions, the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2018) also postulated that there are diverse definitions of AI systems based on (1) the disciplines to which they apply and (2) the phases of an AI system's lifecycle including research, design, development, deployment and utilisation.

Similarly, diverse definitions of AI can be gleaned from the evolution of the discourse. The term AI was introduced in 1956

(Stuart & Norvig, 2016). In addition, Rich (1983) defined AI as 'the study of how to make computers do things, which at the moment people are better at'. This definition has summed up AI as the replication of human capabilities in machines. Similarly, Adams et al. (2012) defined AI as a system designed for the learning and replication of human cognition and intellectual abilities to the extent of potentially exceeding human-level performance. Additionally, Thierier, O'Sullivan, Castillo and Russell (2017, p. 8) defined AI as the 'exhibition of intelligence by a machine ... near or beyond human capabilities'. According to Dwivedi et al. (2019), the consistent theme among multiple definitions of AI is the increasing capability of machines to perform specific roles and tasks presently performed by humans in the workplace and society at large. Thus, in the absence of a universally agreeable definition of AI, the study shall adopt the following working definition with a bias towards HRM. Artificial intelligence in HRM refers to the input, development and imitation of human intelligence capabilities in computer systems to aid in HR functions either autonomously or in collaboration with humans.

Human resource management contextualised

Several definitions of HRM have been proposed by a variety of scholars; however, a number of those definitions complement each other. According to Schermerhorn (2001), HRM is the process of increasing and growing a smart workforce to help the company achieve its goals, including its mission, vision and various objectives. Another definition is that HRM is a method of employee management that aims to retain a skilled and dedicated workforce through various structural, cultural and personnel techniques to give the organisation a competitive advantage (Storey, 2004). Human resource management will be defined for the purposes of this study as the process of acquiring and retaining new skills, experiences and competencies in an organisation through its personnel who uses various management methods.

Human resource management practices include recruiting new employees, hiring employees, managing employees and developing them (Wall & Wood, 2005). Most of these practices have a specific focus on retaining new employees and keeping up their satisfactory levels. This is because human resources are such a dynamic part of the company and are ever-changing; therefore, HRM needs the right management by an organisation (Bibi, Pangil, & Johari, 2016). The management and retention of HR can be argued to have special importance within manufacturing companies, which focuses on innovation within manufacturing to get a comparative advantage and better performances (Youndt, Snell, Dean, & Lepak, 1996). Human resource management's role within an organisation has evolved significantly over the years, and it is no longer simply used to manage an organisation's internal labour costs (Becker & Gerhart, 1996). More recent studies are looking into HRM as a strategic asset to organisations where employees are the most important assets and how to acquire and manage these play the most important role (Bas, 2012).

Classification of artificial intelligence

There are three categories or classes of AI, and these are artificial narrow intelligence, artificial general intelligence and artificial super intelligence (Wirtz, Weyerer, & Geyer, 2018). Artificial narrow intelligence is case-specific intelligence that is functionally dependent on human-assisted programming. It has built-in and case-sensitive capabilities that are not subject to change (Nilsson, 2003; Thierier et al., 2017). Similarly, Russell and Novig (2016) observed that narrow or weak AI refers to systems that can perform tasks that require a single human capability, such as visual perception, context understanding, probabilistic reasoning and dealing with complexity. In government set-up, narrow AI is frequently used to augment the capabilities of data analytics and data mining algorithms in order to deliver more thorough and better perspectives than human analysts can (Tan, 2021). In addition, general or strong AI alludes to (fictional) systems with human or superhuman intelligence that simulate the complex human ability to think and perform intelligent tasks such as ethical judgements, symbolic reasoning, social situation management and ideation (Brynjolfsson & McAfee, 2014). Without the assistance of humans, artificial general intelligence can learn, mutate and transmit experience and skills to subsequent assignments (Thierier et al., 2017). Artificial superintelligence (ASI) is a form of AI that is capable of surpassing human intelligence by manifesting cognitive skills of its own. In the light of this, ASI as software-based intellectually powered systems is meant to surpass human ability across almost all conceivable fields and categories of endeavours. While commenting on artificial super intelligence Adams et al. (2012) argued that superintelligence is a yet-to-be-realised intelligence capability that is expected to outperform the human brain. By and large, Thierier et al. (2017) divided AI into weak and strong AI, as well as inference AI and active AI. This research aims to provide a zone of convergence for narrow intelligence and general intelligence. This is accomplished by assessing their potential and opportunities for public sector HRM, as well as the challenges associated with their adoption and roadblocks impeding their full potential in South Africa.

Artificial intelligence in the public sector

The introduction of e-government has been widely praised for providing new stimuli to deliver services quickly and efficiently (Mbatha & Ocholla, 2011). As a result, the inclusion of AI in the e-government multiverse is critical in transforming public sector activities. Arinder (2016) argued that AI is essential in changing the institutional culture of the public sector and becoming more predictable and transparent through data and time-conscious evaluative frameworks. These frameworks also emphasise evidence-based decision-making and longitudinal cost-benefit analytics at critical policymaking junctures in providing the possible transformational implications of AI in the public sector. Similarly, Eggers, Schatsky and Viechmicki (2017) forecasted the potential changes that AI in the public sector could bring about. Accordingly, AI can change the role of humans in

policymaking processes in four ways. Firstly, AI can relieve public workers by taking over repetitive tasks, thus allowing public servants to focus on more valuable tasks. Secondly, AI can help to break up a job into smaller tasks and can take over as many of them as possible, thereby improving the efficiency of policymaking processes. Thirdly, AI can replace a human agent by automating policymaking processes. Fourthly, AI can augment the performance of public servants by complementing their skills and improving the effectiveness of policymaking processes.

Furthermore, Hadden (1986), cited in Tan (2021), contended that the initial promise of AI was primarily aimed at providing decision support for public managers. The discussion about assuming AI in the public has been more focused on public administration in general. Tan (2021) observed that although the use of AI technologies in government processes is not a new development, there have been significant advances in core AI technologies such as machine learning, natural language processing, deep learning (or neural networks), virtual agents and computer vision over the last decade. However, there is a disconnection between the potential of AI in public sector HRM and the challenges inherent in their interaction or factors impeding their integration. As a result, the purpose of this research is to broaden knowledge by investigating the potential of AI-human resource management as part of e-governance. Furthermore, with the exception of the UNESCO Forum on AI in Africa (2018), most studies on AI in e-governance have been limited to high-income economies. This has the unintended consequence of increasing the already-widening technological gap between Africa and high-income economies.

Artificial intelligence in the context of human resource management

In trying to move the discipline of HRM outside its base functionality, there was the introduction of computers in the operations and functions of HR personnel. With the advent of these technologies in recent years, a new rising tide of HR technologies known as electronic human resources management (E-HRM) has emerged (Ma & Ye, 2015). Computerisation is an emergent subject with many tasks becoming totally digitised, thus lessening the need for human contribution (Pandey & Khaskel, 2019). For instance, as a result of the presence of AI, the human interface in recruitment is becoming decreased (Bondarouk & Brewster, 2016). Chelliah (2017) argued that the development and subsequent rise to prominence of AI in workplaces reduced the importance of blue-collar jobs.

Human resource management's interest in AI stems from the emergence of human resource information system (HRIS). Dessler (2013) defined HRIS as correlated components functioning collectively towards the collection, processing, storage and dissemination of information to aid the organisation's HRM functions. The rationale behind the adoption of information systems in HR functions is well

documented (Armstrong, 2015; Dessler, 2013; Jia et al., 2018; Noe, Hollenbeck, Gehart, & Wright, 2006). Hendrickson (2003) viewed HRIS to be the backbone of modern-day HRM. A number of studies on the trends of HRM outline that AI will take a larger percentage of the HR practice and the world of HRM will transform wholly (Pandey & Khaskel, 2019). Similarly, Pandey and Khaskel (2019) proceeded to mention that AI is impacting the entire HRM process ranging from resource planning to talent acquisition to learning and development, performance management, reward and recognition, retention and job design.

However, with the emergence of the 4IR, attention has shifted towards AI in HRM. Most recent AI management literature approaches AI from the broader perspective of public administration rather than public sector HRM. The works of Wirtz et al. (2018), Reis, Santo, and Malao (2019) and Agrawal, Gans and Goldfield (2019) exemplify such attempts. To this effect, publications on AI in HRM are limited. Jia et al. (2018), Park (2018) and Reilly (2018) provided recent exploratory literature on AI applications in HRM. According to Park (2018), citing the World Economic Forum (2016), it has been predicted that the incorporation of AI into the HRM function will result in the loss of 500 million jobs by 2020. In the same vein, in 2013, Frey and Osborne (2013) estimated that computers will replace 47% of jobs in the United States of America within the next 10–20 years. In contrast, the scientific predictions conducted were more predisposed to private sector HRM-AI discourse without precise information on potential public sector changes. Therefore, there remains a research gap on the integration of AI in the discourse of PSHRM. Thus, the study strives to further the body of knowledge on AI in HRM.

Methodology

The study relied on secondary data, which was purposefully and systematically chosen for its usefulness to this study. According to Johnston (2014), secondary data are gathered for the second time and are already obtainable in other sources. The secondary analysis makes complex research questions feasible for novice researchers who might otherwise not have access to high-quality data (Chilunjika 2018; Healy 2018; Zimano & Chilunjika, 2019). The usage of readily available data offers a possible option for researchers who are short of adequate time and resources to conduct the intended research (Johnston, 2014). In other words, secondary data analysis is an affordable alternative which offers the researcher(s) the prospects of accessing quality data for a tiny fraction of the resources involved in carrying out extensive primary research through the collection of isolated data.

With regard to this study, through secondary research, the study was exposed to a wide array of data available in databases whose availability would have been costly and inconceivable if the study had opted for primary research. The data were purposively and systematically chosen in accordance with Bowen's (2009) advice that researchers using document analysis should check whether the selected

documents to be analysed are accurate, credible, authentic, representative and relevant to the research problem. This was performed to help determine whether the contents and the documents were pertinent to the purpose of the study. The researchers prioritised recent publications on the HRM-AI discourse. In addition, content check and the sources of the documents were also employed to determine the accuracy, credibility, authenticity and relevance of the chosen written documents. In this vein, the researchers consulted journal articles, books, seminal papers and online sources related to the integration of AI and HRM in South Africa. Data were also analysed using thematic classification and content analysis.

Research findings

Opportunities that can be derived from the integration of artificial intelligence and public sector human resource management in South Africa

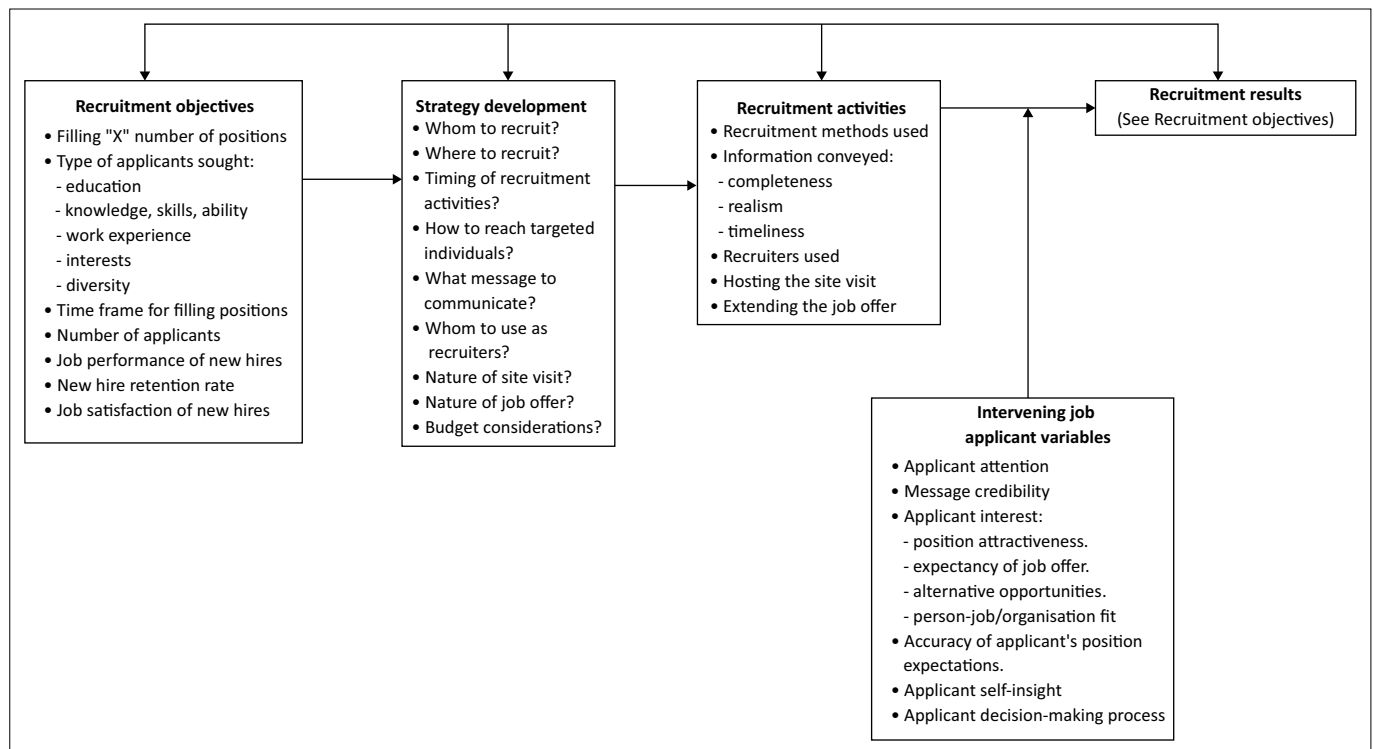
This section explores the opportunities that could be derived by the South African public sector by adopting AI, and these include effective recruitment procedures, cutting down routine administrative tasks, reduction of excessive paperwork and sound public service delivery.

Effective recruitment procedures

Most reviewed documents indicated that integrating AI with HRM is beneficial because it enhances the process of recruitment. It has been found that AI will aid in the reinvigoration and the upgrading of the traditional

recruitment procedures in South Africa. In substantiation, Galanaki et al. (2019) contended that habitually, studies are carried out on how the process of recruitment can be easy and improved with technology. Contemporarily, the focus is now more inclined towards making sure that recruiters yield maximum technological benefits, especially through the automation of the recruitment process. Artificial intelligence investments in HRM issues such as recruitment and selection are becoming more common, significantly reducing the time and cost of performing these functions (Kshetri, 2021). Bondarouk and Brewster (2016) asserted that as automation increases, the human touch in recruitment is progressively becoming much lessened. For instance, traditionally applicants' values and personalities were discussed during the job interviews (Faliagka, Ramantas, Tsakalidis, & Tzimas, 2012). However, with the intervention of new technology, AI can flick through data that are displayed on social media platforms and hence making it possible to have access to the applicant's personality traits, values and attitude. Similarly, in the private sector, some of the key HRM areas that have already been transformed by AI include time-consuming and labour-intensive recruiting tasks such as reviewing many CVs, classifying them out, selecting the most suitable candidates in a fraction of the time and establishing which employees require what sort of training (Rykun, 2019).

Figure 1 shows the traditional recruitment process that clearly delineates the five stages of the traditional recruitment procedures. In the first stage, recruitment objectives are outlined, and these take in the number of positions to be



Source: Breaugh, A.J. (2008). Employee recruitment: Current knowledge and important areas for future research. *Human Resource Management Review*, 18(3), 103–118. <https://doi.org/10.1016/j.hrmr.2008.07.003>

FIGURE 1: Model of recruitment process.

filled, the type of applicants sought taking into consideration factors such as education, skills, experience and interests; it then goes on to outline the timeframe for filling positions. In the second stage, the model outlines factors to consider under strategic development and these include, *inter alia*, when to recruit, where to recruit and the timing of recruitment activities. Recruitment methods and recruiters used are under recruitment activities, which is the third stage of the recruitment model process, and then recruitment results form the fourth and final stage. The model provides a vivid picture of how AI can chip in to perform some HR activities on behalf of human subjects in the South African public sector. Artificial intelligence will go a long way in cutting down routine administrative tasks, reducing excessive paperwork and promoting sound public service delivery.

Cutting down on routine administrative tasks

The study reveals that AI benefits recruiters when it comes to cutting down on routine and administrative tasks such as answering regular questions. This is possible by employing AI-powered chatbots that are communication-focused, employ predictive behaviour and respond to queries and requests via text and speech. According to MacLean and McQueen (2020), public sector organisations all over the world use AI to respond to questions and routine requests, auto-fill documents, facilitate payments and address complaints. In that regard, employees can work in more meaningful roles because AI frees up their time to concentrate on what really needs to be done. Automation does not replace a team or service but rather supplements it to make it completely user-centric (MacLean & McQueen, 2020), hence HRM recruiters have more time to focus on the best matches. According to Upadhyay and Khandelwal (2018), the implementation of AI in HRM can be dubbed 'the age of HR' as AI transforms the recruitment industry by substituting routine tasks that have been conducted by human recruiters. In the same vein, Johansson and Herranen (2019) stated that one of the main benefits of AI is that it improves the speed and quality of the traditional recruitment process by the removal of routine tasks. The SA public sector is poised to benefit immensely from the removal of routine administrative HR-related tasks.

Reduction of excessive paperwork

Public sector organisations in South Africa are also affected by the delivery of efficient services because of too much reliance on paper documents (hardcopies). It has been identified that using manual means in performing simple routine tasks consumes a lot of time which should be invested in other strategic responsibilities, especially within the Department of Public Service and Administration in South Africa. In the light of this, Dickson and Nusair (2010) discovered that the use of AI reduces paperwork and allows access to a wider pool of potential job candidates, particularly in the recruitment process. Additionally, AI can help keep data electronically, and the system can store and interpret it. This is consistent with MacLean and McQueen's (2020)

findings that large amounts of information from various sources are held by public sector organisations in formats such as hardcopy files, text, images and voice. However, because there is so much data and it is often unstructured, determining its value can be difficult. Artificial intelligence can skim through it and interpret this data to obtain insights that can help humans make better decisions.

Sound public service delivery

Providing sound public service delivery is one of the identified prospects of integrating AI and public sector HRM in South Africa. The South African Public Service Commission Toolkit delineated the following shortcomings, which require exigent attention:

- the filling in of posts taking exceptionally long (in many instances 9 months and longer)
- screening and shortlisting not only being flawed and open to criticism but also not producing the desired results
- selection committee members not being sufficiently prepared for the task at hand.

In elaboration, it has been observed that Africa in general and South Africa (KwaZulu-Natal in particular) have poor service delivery in their public sectors because modern technology is not utilised, or sometimes it is not even available (Ntetha, 2010 cited in Mbatha & Ocholla, 2011). However, in the light of solving public service-related problems, Singh and Raja (2010) observed that Information, Communication and Technology (ICT) has brought about an abrupt reduction in the cost and time involved in retaining, processing and conveying information, leading to an ultimate reshaping of the public sector and society as a whole. The ICT would enable public sector organisations to considerably lessen some communication constraints of space and time (Mbatha & Ocholla, 2011). In brief, the utilisation and application of AI by civil servants in the South African government would wholly restructure the public sector in a progressive manner (Mbatha & Ocholla, 2011).

As enshrined in the South African Department of Public Service and Administration document, a majority of government recruitment and selection processes are still conducted manually. Conversely, it is undeniable that the adoption and operationalisation of AI in South Africa's public sector HRM will bring about a myriad of advantages. According to the findings by BusinessTech (2018), implementing AI in the public sector HRM in South Africa will augment effective recruitment processes. These discoveries are in tandem with the literature review of this study and the observations of Upadhyay and Khandelwal (2018) who remarked that AI will take away all HR-related prejudices, and this will see resumes being vetted fairly in a manner that affords equal chances to all candidates. This is congruent with Professor Stan Sangweni, the former Chairperson of the South African Public Service Commission, who remarked that:

It is only when we select the most competent persons available within the parameters of legislation on Affirmative Action and Employment Equity that we will be able to provide the leadership and skills required to advance our democracy.

In elaboration, a Public Service Commission Review of 2010 on the state of the South African Public Sector HRM observed that one of the main objectives of public sector HRM is to ensure that candidates are hired through a fair and equitable mode. The issue of ensuring fair and equitable recruitment and selection of candidates is also provided for in the *South African Employment Equity Act* of 1998. This corroborates with the aforementioned advantage of AI use in public HRM, which is the fair vetting of resumes because there will be no or minimal human interface involved, which is normally susceptible to biased judgement and preferential selection. This is consistent with experiences in the private sector, where AI is used to reduce bias in recruitment. Cognitive solutions in AI can help tap more than one data source, allowing for accurate candidate screening. Furthermore, AI is assisting in reducing human bias in the shortlisting of applicants in the private sector. Large corporations are involved in developing AI-augmented job descriptions that are more inclusive and goal-oriented, allowing for the impartial screening of applicants (Wisetsri, Vijai, Chueinwittaya, & Jirayus, 2022).

The integration of AI with public sector HRM in South Africa will curtail the devastating effects of patron-client relationships that habitually manifest through prejudiced recruitment and selection processes in the public service. Favouritism, as defined by Chilunjika (2021), citing Prendergast and Topel (1966), entailed the recruitment, review and job evaluation on the foundation of connections rather than meritocracy. In this regard, the South African public sector recruitment procedure has been marred with political consociates dominating the selection criterion and process. For instance, in explaining the regressive effects of political deployment in the South African public service, Kekae (2017) observed that:

Regardless of the capacity that the public service has, it still finds itself with the problem of non-service delivery in all spheres of government. Reasons for non-service delivery are primarily as a result of inefficiency, unskilled personnel, poor management and political deployment of unqualified cadres. (p. 1)

In support of Kekae's (2017) observation, Transparency International (2015) warned that:

Political affiliation can play an important role in the appointment of civil servants, leading to the politicization of the public sector, as political parties have incentives to gain control over bureaucrats. Some countries implicitly or explicitly tie party membership as a prerequisite for joining the civil service, often accepted as a hidden. (p. 35)

More so, AI aids HRM departments to focus more on strategic areas of the organisation. Erstwhile literature managed to pinpoint numerous benefits of employing AI in recruiting employees. Upadhyay and Khandelwal (2018) mentioned that previously, repetitive tasks were steered by human recruiters, but AI will make some of the recruitment stages old-fashioned and obsolete. With the adoption of AI, recruiters can delegate these repetitive tasks to the AI system

and recruiters will then have more resources channelled towards strategic matters (Upadhyay & Khandelwal, 2018). In support of Upadhyay and Khandelwal's (2018) observation, Eggers et al. (2017) argued that the AI-centred technologies can be put to good use in human services to help organisations lessen the substantial administrative load and create ample time for more acute responsibilities by refining decision-making and making low-cost and quicker delivery of services in the South African public sector.

The need to provide sound public service delivery has always and will remain the prime focus of governments across the world; however, finding a lasting solution to improve public service delivery has been somewhat confounding. But with the coming of technology, the task seems to be more feasible in these contemporary times. In this regard, incorporating AI into public sector HRM will bring about efficiency, effectiveness and economical administration of public sector resources in South Africa. Its importance has been indirectly accentuated by Visser and Twinomurizi (2008, p. 39) in their study of e-government and public service delivery in South Africa where they observed that: 'The use of e-government as a service delivery enabler will definitely support government's service improvement philosophy of Batho Pele, thus putting people first'.

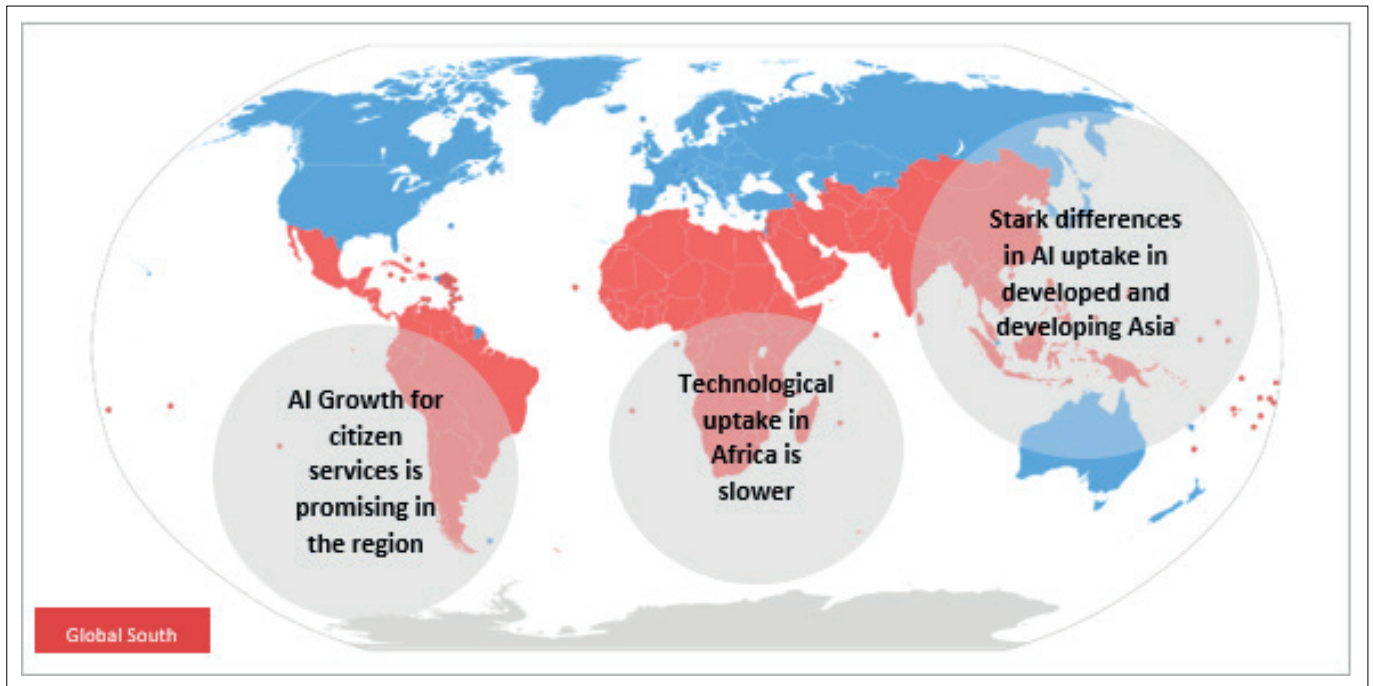
The given exposition is in harmony with Evans and Yen's (2006) observation that the employment of e-government has been commonly acclaimed because it offers a new impulse to deliver services rapidly and resourcefully. This corroborates with Kaisara and Pather's (2009) observation that ICT is lessening the traditional obstructions of space and time while information can be conveyed more quickly, in bulk and more effortlessly. Furthermore, through document analysis, the study collated that integrating AI with HRM reduces the burden of paperwork that is customary in the public sector organisations. In South Africa, although some important strides to upgrade the public sector through e-government have been made, public sector HRM departments still lag behind. The use of manual means in performing some routine human resources administration tasks is still rampant. Thus, the adoption of AI into public sector HRM in South Africa will bring about reduced use of paperwork among the HR personnel.

Challenges impeding against and the complexities presented by the adoption of artificial intelligence

This section examines the challenges militating against the implementation and the operationalisation of AI in the public sector HRM functions in South Africa.

Lagging technological uptake

A study conducted by Ntetha (2010) on social informatics in selected government departments in South Africa established that in some government departments, such as Social



Source: Gul, E. (2019). *Is artificial intelligence the frontier solution to global South's wicked development challenges?* Retrieved from <https://towardsdatascience.com/is-artificial-intelligence-the-frontier-solution-to-global-souths-wicked-development-challenges-4206221a3c78>

AI, artificial intelligence.

FIGURE 2: Technological uptake in the global South.

Development and Education, the use of ICTs by some civil servants is generally low in terms of both frequency and variety. On the same note, Assan and Thomas (2012) asserted that the utilisation of ICTs by civil servants is generally restricted to basic applications such as word processing. In Ntetha's (2010) study, civil servants identified a range of issues they regarded as inhibitors to their effective use of ICTs, particularly a lack of access or the availability of hardware and software and a lack of ICT education, skills and knowledge.

Figure 2 is a pictographic illustration of technological uptake in the Global South. The map shows that there is a slower technological endorsement in Africa with South Africa included. The use of technology in Africa is low or underdeveloped (UNDP, 2000). This sums up the view that Africa in general and South Africa, in particular, is still underprepared to fully adopt and operationalise AI in the public sector.

The given bar graphs (Figure 3) indicate technological preparedness in Africa as a whole, which is very critical in assessing the level of AI systems adoption preparedness in South Africa.

Artificial intelligence can lead to retrenchments

The integration of AI and public sector HRM poses to be a threat to a sizeable number of jobs in the South African civil service. Artificial intelligence and mobile robotics are threatening to take over office work, white-collar jobs to be precise (Seseni & Mbohwa, 2018). Accordingly, Seseni and Mbohwa (2018), argued that currently, white-collar jobs will

be replaced by AI; for instance, HR administrators can be replaced by software that performs payroll services. To this effect, employees who perform tasks that have a possibility of being replaced by AI adoption will probably lose their jobs. In the same vein, research conducted by Accenture and GIBS Business School (2017) on South Africa's AI preparedness level observed that the implementation of AI can increase unemployment figures already existential in South Africa. The experience is not unique to the public sector; similar occurrences can be found in the private sector as well. In this regard, Wisetsri et al. (2022) contends that in the presence of AI in organisations, HR professionals are constantly afraid of being replaced by machines, robots and/or clever business machines. In addition, research conducted by Chelliah (2017) on the impact of AI in America established that over 47% of the people who occupy white-collar jobs in the United States of America would be replaced by computerisation in the next 20 years.

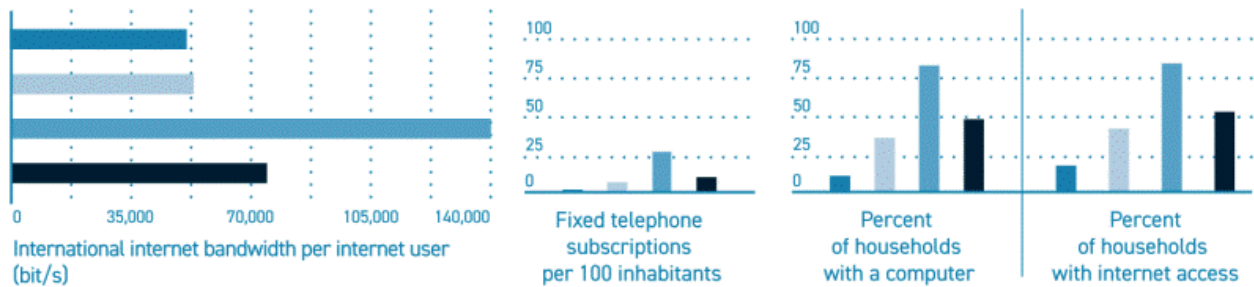
The gathered data showed that there is slow ICT adoption in the South African public sector, which hampers the full adoption and operationalisation of AI in public sector HRM. The findings correlate with Gul's (2019) discovery in Figure 2 where he indicated that technological uptake in Africa is slower. Unlike in the private sector, there is not enough investment in the ICT infrastructure in the public sector. In support of Gul's discovery, Mbatha (2009) observed that in South Africa, office transactions are usually lagging, with little or no wave of the social and technological benefits of automation in workplaces and organisations. This explains the level of unpreparedness to adopt AI systems in the South African public sector and public sector HRM in particular. According to the research conducted by Ntetha

Figure 5.1

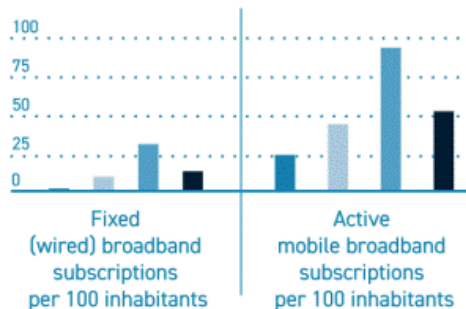
Africa's ICT development indicators

Africa still lags behind both developed and other developing countries in several indicators essential for the Fourth Industrial Revolution, especially in infrastructure, technology access, and education.

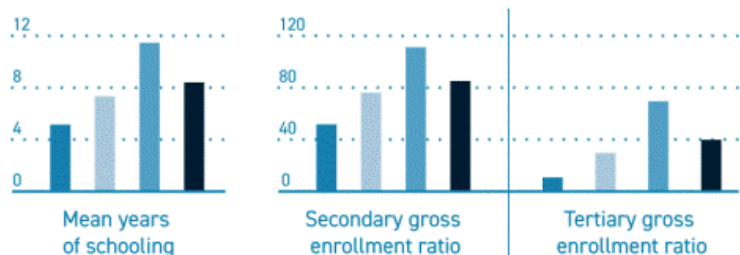
Technology access



Technology use



Technology preparedness



Legend: Africa (dark blue), All developing countries (light blue), Developed countries (medium blue), World (black).

Sources: Hebatallah Adam, "The Digital Revolution in Africa: Opportunities and Hurdles," Proceedings of the 10th International Conference on Digital Strategies for Organizational Success (2019) and International Telecommunication Union, Measuring the Information Society Report: Volume 1 (Geneva: International Telecommunication Union, 2018).

B Africa Growth Initiative
at BROOKINGS

Source: Ndung'u, N., & Signe, L. (2020). Capturing the Fourth Industrial Revolution: A regional and national agenda, foresight Africa. Retrieved from <https://www.lifescienceglobal.com/pms/index.php/jiddt/article/view/7190>

FIGURE 3: Africa's ICT development indicators.

(2010), it was observed that in Africa, the utilisation of ICTs is either low or underdeveloped. In other words, there is low technological uptake in Africa in general and South Africa in particular. Adaptability towards new technologies and AI was considered a noteworthy challenge that AI entails, because they argue that it is almost impossible for organisations to operate successfully without the full adaptation of new technologies. The ability to adapt new technology in organisations determines largely how they are able to achieve their market competitiveness (Chilunjika, Uwizeyimana & Auriacombe, 2019; Martincevic & Kozina, 2018).

However, as argued by Upadhyay and Khandelwal (2018), AI systems can be programmed to avoid unconscious biases in recruitment processes. The authors argue that skills shortages are one of the largest challenges in the hiring

industry. Even though AI-based systems are extremely beneficial at recognising talent, there are still some activities that should be conducted by humans, namely negotiations, appraisal of culture fit and rapport building (Upadhyay & Khandelwal, 2018). This argument resonates with Johansson and Herranen's (2019) discoveries that language biases and cultural understandings of machines are also challenges for AI.

Integrating AI with public sector HRM in South Africa can pose a threat to a sizeable number of white-collar jobs. For instance, some of the HRM personnel who were previously involved in recruitment and selection might lose their jobs if AI is adopted to perform their tasks. In substantiation, discussions on AI in South Africa held by Accenture and GIBS Business School (2017) sounded innumerable alarms, including workforce readiness, data quality and potential job

losses. However, according to Access Partnership's (2014) explication of the impact of AI on people's job security:

While most do find that some jobs will disappear many more will be transferred into jobs that require different skill sets, while other entirely new jobs will be created. Many jobs will continue to require uniquely human skills.

This angle, conversely, explains that although it is said from the research findings that AI poses a threat to many white-collar jobs in South Africa, it is equally true that its implementation demands new skills also, hence creating new jobs for those people who possess the demanded skills, as they will be managing the machines.

Conclusion and policy direction

In this study, the research contended that there is an existent research gap in regard to integrating AI and public sector HRM in South Africa. As part of traditional public sector administration reorganisation, the adoption of AI in the public sector has become imperative. Principally, public sector HRM restructurings have become a necessity with the adoption of advanced technology being part of the agenda.

Considering the incessant need to adopt new technologies in the public sector as part of the reformation agenda, public policy architects should also pay attention to public sector HRM restructurings. It can also be argued that the magnitude of public resources is being misplaced because of public sector recruitments related to corruption activities. Too much human interface during public service recruitment is, undeniably, providing a fertile ground for kickbacks to human resource personnel involved in recruitment and selection. This is resultantly compromising the quality of the public service workforces. Hence, integrating AI with public sector HRM will sidestep the bureaucratic hurdles compromising quality public service recruitment and selection processes in South Africa. This will also ensure that hefty public sector wage bills in some of the unproductive government sectors can be halved through the implementation of AI. This can be accomplished by downsizing the workforce that would have been solely in charge of administrative routine tasks prior to the implementation of an AI system to take over the roles. More so, based on the collated present research findings, future researchers should consider integrating primary and secondary data in probing the potential prime paybacks of AI in public sector HRM. This will help come up with research discoveries that are contemporary and indicative of the prevailing developments regarding the assimilation of AI in the public sector HRM departments in South Africa.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Authors' contributions

A.C., K.I. and S.R.C. equally carried out the same tasks in relation to the methodology, formal analysis, writing (review and editing) and project administration, although A.C. and K.I. also did much in terms of conceptualisation, the writing of the original draft and methodology.

Ethical considerations

This article followed all ethical standards of research without direct contact with human or animal subjects.

Funding information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

The views that are captured in the article do not necessarily reflect the official policy or position of any affiliated agency of the authors.

References

- Accenture and GIBS Business School. (2017). *Artificial intelligence: Is South Africa ready*. Gordon Institute of Business Science. Retrieved from <https://www.accenture.com/-acnmedia/pdf-107/accelture-ai-south-africa-ready.pdf>
- Access Partnership. (2014). *Artificial intelligence for Africa: An opportunity for growth, development, and democratisation*. Pretoria: University of Pretoria.
- Adams, S., Arel, I., Bach, J., Coop, R., Furlan, R., Goertzel, B., ... Sowa, J. (2012). Mapping the landscape of human-level artificial general intelligence. *AI Magazine*, 33(1), 25–42. <https://doi.org/10.1609/aimag.v33i1.2322>
- Agrawal, A., Gans, J.S., & Goldfarb, A. (2019). Artificial intelligence: The ambiguous labor market impact of automating prediction. *Journal of Economic Perspectives*, 33(2), 31–50. <https://doi.org/10.1257/jep.33.2.31>
- Alam, M.S. (2014). Identifying a public sector information systems (PSIS) for e-service: A case of land records e-service in Bangladesh. In M. Janssen, H.J. Scholl, M.A. Wimmer & F. Bannister (Eds.), *Lecture notes in computer science, electronic government, EGOV 2014* (Vol. 8653, pp. 106–119). Heidelberg: Springer.
- Arinder, M.K. (2016). Bridging the divide between evidence and policy in public sector decision making: A practitioner's perspective. *Public Administration Review*, 76(3), 394–398. <https://doi.org/10.1111/puar.12572>
- Armstrong, M. (2015). *Armstrong's handbook of performance management*. London: Kogan Page.
- Assan, T., & Thomas, R. (2012). Information and communication technology integration into teaching and learning: Opportunities and challenges for commerce educators in South Africa. *International Journal of Education and Development using Information and Communication Technology*, 8(2), 4–16.
- Bas, A. (2012). Strategic HR management: Strategy facilitation process by HR. *Procedia - Social and Behavioral Sciences*, 58, 313–321. <https://doi.org/10.1016/j.sbspro.2012.09.1006>
- Becker, B., & Gerhart, B. (1996). The impact of human resource management on organizational performance: Progress and prospects. *Academy of Management Journal*, 39(4), 779–801. <https://doi.org/10.5465/256712>
- Bibi, P., Pangil, F., & Johanim, J. (2016). HRM practices and employees' retention: The perspective of job embeddedness theory. *Asian Journal of Multidisciplinary Studies*, 4(5), 68–89.
- Bondarouk, T., & Brewster, C. (2016). Conceptualising the future of HRM and technology research. *The International Journal of Human Resource Management*, 27(21), 1–20. <https://doi.org/10.1080/09585192.2016.1232296>
- Bowen, G.A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27–40. <https://doi.org/10.3316/QRJ0902027>
- Breaugh, A.J. (2008). Employee recruitment: Current knowledge and important areas for future research. *Human Resource Management Review*, 18(3), 103–118. <https://doi.org/10.1016/j.hrmr.2008.07.003>

- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. Washington, DC: W.W. Norton and Company Publishers.
- BusinessTech. (2018). *4 big tech predictions for 2018*. Retrieved from <https://business.co.za/news/it-services/218809/4-big-tech-predictions-for-2018/amp/>
- Chelliah, J. (2017). Will artificial intelligence usurp white collar jobs? *Human Resource Management International Digest*, 25(3), 1–3. <https://doi.org/10.1108/HRMID-11-2016-0152>
- Chilunjika, A. (2018). *The performance of automated toll revenue mobilization systems in Zimbabwe*. Unpublished PhD thesis. Johannesburg: University of Johannesburg.
- Chilunjika, A. (2021). Revamping the Zimbabwe anti-corruption commission. *African Journal of Business and Economic Research*, 16(2), 311–327. <https://doi.org/10.31920/1750-4562/2021/v16n2a15>
- Chilunjika, A., Uwizeyimana, D.E., & Auriacombe, C.J. (2019). The politics of road tolling in Zimbabwe. *Administratio Publica*, 27(1), 202–225. <https://doi.org/10.1108/17554211011012612>
- Dessler, G. (2013). *Human resources management: Global edition* (13th ed.). Florida International University, Florida.
- Dickson, D., & Nusair, K. (2010). An HR perspective: The global hunt for talent in the digital age. *Worldwide Hospitality and Tourism Themes*, 2(1), 86–93.
- Dwivedi, Y.K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... Williams M.D. (2019). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, 101994.
- Eggers, W.D., Schatsky, D., & Viechmicki, P. (2017). *AI-augmented government. Using cognitive technologies to redesign public sector work*. Retrieved from <https://www2.deloitte.com/content/dam/insights/us/articles/3832-AI-augmented-government/DUP-AI-augmented-government.pdf>
- Erixon, F. (2018). *Ecipe*. Retrieved from <https://ecipe.org/publications/the-economic-benefits-of-globalization-for-business-and-consumers/>
- Ertel, W. (2018). *Introduction to artificial intelligence*. New York, NY: Springer International Publishing.
- Evans, D., & Yen, D.C. (2006). E-government: Evolving relationship of citizens and government, domestic, international development. *Government Information Quarterly*, 23(20), 207–235. <https://doi.org/10.1016/j.giq.2005.11.004>
- Faliagka, E., Ramantas, K., Tsakalidis, A., & Tzimas, G. (2012). Application of machine learning algorithms to an online recruitment system. *International Conference on Internet and Web Applications and Services*, 11–17 June 2012. Heidelberg, Germany.
- Frey, C.B., & Osborne, M.A. (2013). *The future of employment: How susceptible are jobs to computerization?* Oxford: Oxford Martin School.
- Galanaki, E., Lazazzara, A., & Parry, E. (2019). A cross-national analysis of E-HRM configurations: Integrating the information technology and HRM perspectives. In A. Lazazzara, R.C.D. Nacamulli, C. Rossignoli, & S. Za (Eds.), *Organizing for digital innovation* (pp. 261–276).
- Grewal, D.S. (2014). A critical conceptual analysis of definitions of artificial intelligence as applicable to computer engineering. *IOSR Journal of Computer Engineering*, 16(2), 9–13. <https://doi.org/10.9790/0661-16210913>
- Gul, E. (2019). *Is artificial intelligence the frontier solution to global South's wicked development challenges?* Retrieved from <https://towardsdatascience.com/is-artificial-intelligence-the-frontier-solution-to-global-souths-wicked-development-challenges-4206221a3c78>
- Hadden, S.G. (1986). Intelligent advisory systems for managing and disseminating information. *Public Administration Review*, 46, 572.
- Healy, A.E. (2018). *Comparative research using secondary data analysis: Exploring's changing food consumption practices*. Published PhD thesis. University of Limerick.
- Hendrickson, A.R. (2003). Human resource information systems: Backbone technology of contemporary human resources. *Journal of Labor Research*, 24, 382–394. <https://doi.org/10.1007/s12122-003-1002-5>
- Jarrahi, M. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organisational decision making. *Business Horizons*, 61(4), 577–586.
- Jia, Q., Guo, Y., Li, R., Li, Y., & Chen, Y. (2018). A conceptual artificial intelligence application framework in human resource management. *ICEB 2018 Proceedings* (p. 91). Retrieved from <https://aisel.aisnet.org/iceb2018/91>
- Johansson, J., & Herranen, S. (2019). *The application of artificial intelligence (AI) in human resource management: Current state of AI and its impact on the traditional recruitment process*. Retrieved from <http://www.diva2:1322478/FULLTEXT01.pdf>
- Johnston, M.P. (2014). Secondary data analysis: A method of which the time has come. *Qualitative and Quantitative Methods in Libraries (QQML)*, 3, 619–626.
- Kaisara, G., & Pather, S. (2009, September 02–04). E-government in South Africa: E-service quality access and adoption factors. In *Proceedings of the 11th annual conference on WWW applications*, Port Elizabeth, South Africa.
- Kekae, T.K. (2017). *An evaluation of the public service anti-corruption strategy in the department of arts and culture*. Unpublished thesis. Pretoria: University of Pretoria.
- Kshetri, N.B. (2021). Evolving uses of artificial intelligence in human resource management in emerging economies in the global South: Some preliminary evidence. *Management Research Review*, 44(7), 970–990. <https://doi.org/10.1108/MRR-03-2020-0168>
- Legg, S., & Hutter, M. (2007). A collection of definitions of intelligence. *Advances in artificial general intelligence: Concepts, architecture and algorithms*, 158(5), 12–24.
- Ma, L., & Ye, M.L. (2015). The role of electronic human resource management in contemporary Human resource management. *Open Journal of Social Sciences*, 3(4), 71–78. <https://doi.org/10.4236/jss.2015.34009>
- MacLean, N., & McQueen, J. (2020). *Intelligent automation offers public sector organizations a way to do more with less, freeing up employees to focus on serving the citizen*. Retrieved from https://www.ey.com/en_zs/government-public-sector/how-intelligent-automation-paves-the-way-to-better-public-services
- Martincevic, I., & Kozima, G. (2018). *The impact of new technology adaptation in business*. Varazdin: Varazdin Development and Entrepreneurship Agency (VADEA).
- Mbatha, B.T. (2009). Web-based technologies as key catalysts in improving work productivity and creativity: The case of Zululand district municipality. *Communication Sciences in Southern Africa*, 28(2), 82–95.
- Mbatha, B.T., & Ocholla, D.N. (2011). Contextualising the use of ICTs in the public sector: The case of selected government departments in KwaZulu-Natal. *Mousaion*, 29(2), 193–208.
- Mohammed, Z. (2019). *Artificial intelligence definition, ethics, and standards. Electronics and communications: Law, standards and practice*. British University. Retrieved from <https://www.wathi.org/artificial-intelligence-definition-ethics-and-standards-the-british-university-in-egypt-2019/>
- Ndung'u, N., & Signe, L. (2020). *Capturing the Fourth Industrial Revolution: A regional and national agenda, foresight Africa*. Retrieved from <https://www.lifescienceglobal.com/pms/index.php/jiddt/article/view/7190>
- Nilsson, N.J. (2003). *Artificial intelligence: A new synthesis* (5th ed.). San Francisco, CA: Morgan Kaufmann Publishers.
- Noe, R., Hollenbeck, J., Gerhart, B., & Wright, P. (2006). *Human resources management: Gaining a competitive advantage*. New York, NY: McGraw-Hill Education.
- Ntetha, M.A. (2010). *The access, interaction, use and impact of information and communication technologies among civil servants in the uMhlatuze area: A social informatics study*. Unpublished dissertation. KwaDlangezwa: University of Zululand.
- Pandey, S., & Khaskel, P. (2019). Application of AI in human resource management and gen Y's reaction. *International Journal of Recent Technology and Engineering (IJRTE)*, 8(4), 2277–3878. <https://doi.org/10.35940/ijrte.D4585.118419>
- Park, W. (2018). *Artificial intelligence and human resource management: New perspectives and challenges*. Retrieved from <https://www.jil.go.jp/profile/documents/w.park.pdf>
- Prendergast, C., & Topel, R. (1996). Favoritism in organisations. *Journal of Political Economy*, 104(5), 958–978. <https://doi.org/10.1086/262048>
- Reilly, P. (2018). *The impact of artificial intelligence on the HR function: IES perspectives on HR 2018*. Member paper 142. Brighton: Institute for Employment Studies Press.
- Reis, J., Santo, P., & Melao, N. (2019). Artificial intelligence in government services: A systematic review. *14th World Conference on Information Systems and Technologies*, 9–11 October 2019. Lisbon, Portugal.
- Rich, E.A. (1983). *Artificial intelligence*. New York, NY: McGraw-Hill.
- Russell, S., & Norvig, P. (2016). *Artificial intelligence: A modern approach* (3rd ed.). New York, NY: Prentice Hall.
- Ryken, E. (2019). *Artificial intelligence in HR management – What can we expect?* Retrieved from <https://thebossmagazine.com/ai-hr-management/>
- Schermerhorn, J.R. (2001). *Management update 2001* (6th ed.). New York, NY: John Wiley and Sons.
- Seseni, L., & Mbohwa, C. (2017). *Occupational health and safety of furniture manufacturing SMMEs in Soweto, South Africa*. Bristol: IEOM Society.
- Singh, R., & Raja, S. (2010). *Convergence in information and communication technology: Strategic and regulatory considerations*. Washington, DC: World Bank.
- Storey, J. (2004). *Leadership in organizations: Current issues and key trends*. London: Routledge.
- Stuart, R., & Norvig, P. (2016). *Artificial intelligence: A modern approach* (3rd ed.). New York, NY: Prentice Hall.
- Tan, E. (2021). *A conceptual model of the use of AI and blockchain for open government data governance in the public sector*. Retrieved from <https://soc.kuleuven.be/io/digi4fed/doc/d-3-2-1-a-conceptual-model-of-the-use-of-ai-and.pdf>
- Thierer, A., O'Sullivan Castillo, A., & Russell, R. (2017). *Artificial intelligence and public policy*. Mercatus Center at George Mason University. Retrieved from <https://www.mercatus.org/system/files/thierer-artificial-intelligence-policymercatusv1.pdf>
- Transparency International. (2015). *National Integrity System Assessment: Ukraine 2015*. Transparency International Ukraine. Retrieved from <https://www.oecd-ilibrary.org/sites/9789264270664-3-en/index.html?itemId=/component/9789264270664-3-en>
- UNDP. (2000). *World report on human development 2001*. Brussels: United Nations Development Programme, De Boeck University for UNDP.
- UNESCO. (2018). *Global Education Monitoring Report 2019: Migration, displacement and education: Building bridges, not walls*. Paris: UNESCO. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000265866>
- Upadhyay, A.K., & Khandelwal, K. (2018). Applying artificial intelligence: Implications for recruitment. *Strategic HR Review*, 17(5), 255–258. <https://doi.org/10.1108/SHR-07-2018-0051>
- Visser, W., & Twinomurini, H. (2008). E-government and public service delivery: Enabling ICT to put 'people first' – A case study from South Africa. *Journal of Systemics, Cybernetics and Informatics*, 6(6), 36–41.

- Wall, T.D., & Wood, S.J. (2005). *The Romance of human resource management and business performance and the case for big science*. Harmondsworth: Penguin.
- Wirtz, B., Weyerer, J., & Geyer, C. (2018). Artificial intelligence and the public sector – Applications and challenges. *International Journal of Public Administration*, 42(7), 596–615. <https://doi.org/10.1080/01900692.2018.1498103>
- Wisetsri, W., Vijai, C., Chueinwittaya, K., & Jirayus, P. (2022). Artificial intelligence in human resources management – An overview. *Journal of Positive School Psychology*, 6(2), 2688–2693.
- World Economic Forum. (2016). *The future of jobs – Employment skills and workforce strategy for 16 the Fourth Industrial Revolution*. Geneva: World Economic Forum.
- Youndt, M.A., Snell, S.A., Dean, J.W., Jr., & Lepak, D.P. (1996). Human resource management, manufacturing strategy, and firm performance. *Academy of Management Journal*, 39(4), 836–866. <https://doi.org/10.2307/256714>
- Zimano, F.R., & Chilunjika, A. (2019). Mixed methods in multi-level sampling: A research paradigms teaching and learning case to spur downstream innovation. *International Journal of Innovation in Education*, 5(4), 323–339. <https://doi.org/10.1504/IJIE.2019.102625>
- Zuiderwijk, A., Chen, Y.-C., & Salem, F. (2021). Implications of the use of AI in public governance: A systematic literature review and research agenda. *Government Information Quarterly*, 38(3), 34–78. <https://doi.org/10.1016/j.giq.2021.101577>