SA Journal of Human Resource Management
ISSN: (Online) 2071-078X, (Print) 1683-7584

Human resource managers' perceptions on the impact of AI on the South African workforce

Authors:
Paul Poisat[1]
Margaret Cullen[1]
Andre P. Calitz[2]

Affiliations:
[1]Business School, Faculty of Economic Sciences, Nelson Mandela University, Port Elizabeth, South Africa

[2]Department of Computing Sciences, Faculty of Science, Nelson Mandela University, Port Elizabeth, South Africa

Corresponding author:
Andre Calitz,
andre.calitz@mandela.ac.za

Dates:
Received: 20 Mar. 2024
Accepted: 02 July 2024
Published: 22 Aug. 2024

How to cite this article:
Poisat, P., Cullen, M., & Calitz, A.P. (2024). Human resource managers' perceptions on the impact of AI on the South African workforce. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, *22*(0), a2593. https://doi.org/10.4102/sajhrm.v22i0.2593

Orientation: Organisations are undergoing digital transformation and incorporating artificial intelligence (AI) into business processes and functions. The use of AI technologies, instead of people to perform specific low-level repetitive tasks has become common practice.

Research purpose: The research aimed to investigate the impact of AI technologies on the South African workforce, specifically from the perspective of senior human resource (HR) managers.

Motivation for the study: The adoption and implementation of AI, robotic process automation (RPA) and large language models, such as ChatGPT in a business, change the way personnel perform specific tasks, interact and participate in business processes.

Research approach/design and method: The study used a qualitative research design and a deductive approach. A survey with open-ended questions was conducted among senior HR managers working for leading manufacturing organisations and institutions in South Africa. Content analysis was used to analyse the responses.

Main findings: Human resource managers emphasised the importance of AI and RPA in remaining globally competitive and streamlining business and HR processes, highlighting the need to empower the workforce, identify ideal employee traits for AI and RPA integration and effectively manage these technologies within organisations.

Practical/managerial implications: The senior HR managers offered advice on how to manage the use of AI and RPA technologies in an organisation.

Contribution/value-add: The study highlights senior HR managers' perceptions of the use and impact of AI and RPA in organisations in South Africa.

Keywords: artificial intelligence; business processes; workforce impact; HR managers; South Africa.

Introduction

Digital transformation has been a key part of the enterprise landscape and has increased during the past years, as the coronavirus disease 2019 (COVID-19) pandemic has changed the work arrangements and environment (McKinsey Global Institute, 2021). The Fourth Industrial Revolution (4IR) or Industry 4.0 is changing the world of work and specifically changing organisations' business models, strategies, stakeholder relationships, products, processes, skills, value and supply chains (Kagermann et al., 2013; Macpherson et al., 2022). Emerging technologies are introducing widespread automation and irreversible changes in the structure of jobs and the nature of work (Kergroach, 2019).

Industry 4.0 has introduced significant technological and operational changes in organisations, specifically in the manufacturing industry (Macpherson et al., 2022). The management of human resources has had to adopt and embrace the introduction of new technologies in order to enhance business productivity and competitiveness (Vanisree & Vijaya Shree, 2024). Industry 4.0 introduced new technologies, such as collaborative robots (Cobots), artificial intelligence (AI) and robotic process automation (RPA). These new technologies required the continuous re-alignment of employees' skills and competencies and required organisations to rethink and redesign their talent management strategies (Calitz et al., 2017).

Industry 4.0 focussed on the use of new technologies, automating business processes and functions. Industry 5.0, on the other hand, caters for a more human-centred approach (Alves et al. 2023). Industry 5.0 is a strategy that places the human factor at the centre of production,

prioritising the well-being of the worker. Human centricity implies that workers are empowered to improve their individual skills and competences in association with the use of digital technologies (Alves et al. 2023).

Artificial intelligence is software-based applications that leverage computers and robots to mimic the problem-solving and decision-making capabilities of a human. The rapid development of AI has seen AI applications being incorporated and used in various business applications (Peretz-Andersson et al., 2024). Robotic process automation is the automation of various business processes and repeatable tasks, usually associated with back-office processes using software bots (Druker, 2018). The main benefits of RPA are business processes and productivity improvements (Czarnecki & Auth, 2024).

Artificial intelligence and RPA applications have further changed and digitised human resources (HR) functions (Vijai & Mariyappan, 2023). Automated HR applications and systems allow for a more intuitive, personalised and simple HR experience for candidates and employees (Patel & Goplani, 2024). Large language models (LLM), such as ChatGPT, Claude and Gemini have had a significant impact on HR functions (Kaur, 2023). The human capital model indicates that employees can increase their productive capacity through education and skills training (Ross, 2023).

Artificial intelligence is being used to meet the needs of employees and applicants through talent sourcing, applicant evaluation and selection, employee training and development, automating HR processes and communicating with employees using RPA applications (Vanisree & Vijaya Shree, 2024; Vijai & Mariyappan, 2023). The AI tools and technologies available for HR can eliminate the transactional and tactical burden of HR managers (Sage, 2024).

The article is structured as follows: the following section presents the objective of the study, followed by the literature review and thereafter the research design and methodology section. The subsequent section details the findings from the qualitative study and the accompanying section discusses the managerial implications. The final section presents conclusions and future research.

Objectives of the study

The objective of this study was to investigate the perceptions of senior HR managers regarding the impact of emerging AI technologies on the labour market, specifically in relation to the workforce in South Africa. The main research question for the study was: 'What are the senior HR managers' perceptions of the impact of AI on the South African workforce?'

A survey was conducted among senior HR managers at leading manufacturing organisations and institutions in South Africa and selected international organisations, who operate in South Africa, to determine the perceptions from an HR management perspective.

Literature review

The future of work

Disruptive changes to business processes, driven by digital transformation and new technologies are having a profound impact on employment and jobs, with significant job creation, job displacement, increased productivity and the widening of the skills gaps (WEF, 2016). Arlitt et al. (2023) indicate that the future of the workforce includes economic, technological, ecological and social changes. Social changes include white and blue collar workers becoming new technology collar workers and the workers ready for technology becoming tech-ready workers (Arlitt et al., 2023). Management and HR managers must change from training workers to reskilling, upskilling and continuing education of the workforce (Ross, 2023).

PEGA (2020) in their survey of 3000 senior managers and frontline information technology (IT) staff indicates that business leaders are focussing on technology to save costs (46%), to generate revenue (43%), to achieve higher quality work (65%), more reliable work (50%) and 49% seeing technology as a means to increase employee satisfaction. Automation is significantly changing the way people work. Artificial intelligence and RPA are being used by organisations to assist with digital transformation, placing more cobots in manufacturing plants and warehouses and adding self-service customer kiosks and service robots in customer interaction arenas (McKinsey Global Institute, 2021).

Jobs are constituted by a set of tasks. If some of these tasks are automated, job profiles change by adding new tasks or modifying existing ones instead of suppressing a job entirely (Ernst et al., 2018). The widespread adoption of AI has led to new job skills and competencies required by organisations to complete certain tasks. One new popular position organisations require is that of a data scientist (Armstrong & Lee, 2021). Data scientists are required to have a combination of skills, including Big Data applications, data analytics, AI and IT.

There are significant changes in the nature of work because of technological advancements. Businesses and society need to find ways of maximising the benefits and mitigating the challenges of technological advancements (Rodriguez-Bustelo et al., 2020). These benefits included a great promise for future prosperity and job creation, coupled with major challenges requiring adaptation by organisations, governments, societies and individuals (WEF, 2016). One of the concerns is the mismatch between available and required skills for the workforce of the future (Rodriguez-Bustelo et al., 2020).

During periods of recession, the share of jobs with mainly routine tasks declines as organisations seek to control their

cost base, while dealing with margin pressure and to mitigate uncertainty by improving efficiency. Two ways they have performed this are by adopting automation technologies and redesigning work processes (McKinsey Global Institute, 2021).

Artificial intelligence-enabled software is used in greater numbers to assist employees (and sometimes replace them) by taking over certain administrative tasks, as well as customer-service interactions (Bouquet, 2020). The potential disruption of the 20th century employment model that is linked to mass production and contracted employment with wages and the welfare system is of particular concern, for not only the next production revolution but also social stability and cohesion (Kergroach, 2019). It is important that awareness and the willingness to adapt to future requirements be clarified so that intended policies and re-training interventions are successfully implemented (Rodriguez-Bustelo et al., 2020).

Artificial intelligence

Artificial intelligence is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings (Copeland, 1993). The development of AI has benefitted from three interrelated trends: the availability of large (unstructured) data, the explosion of computing power, and the increase in venture capital to finance innovative, technological projects (Ernst et al., 2018). Artificial intelligence is replacing mental tasks rather than physical ones, which were the target of previous waves of mechanisation. Artificial intelligence applications are also embedded in software robots that can learn and operate free from the control or influence of people (Czarnecki & Auth, 2024). Artificial intelligence can also operate in the working environment without any reprogramming when combined with advanced mechanical and electrical engineering (Kergroach, 2019).

Gomez et al. (2019) indicate that a recent analysis of AI found that organisations that use AI to support innovation rather than just cut costs are employment creators. Artificial intelligence systems have the ability to learn, decide and make decisions using various algorithms (Mathur, 2019). Recent developments in large language models, such as ChatGPT, and Claude and Gemini have the ability to achieve general-purpose language generation and understanding (ChatGTP, 2023). Artificial intelligence reached new heights for humanity in early 2024. ChatGPT 4.0 can now see, hear and speak. Data are updated directly from the Internet in real-time instead of relying on historical data ending in 2021, as seen in the ChatGPT 3.5 version.

Advancements in AI have created the fear of job loss and a rise in inequality (Ernst et al., 2018). Artificial intelligence, on the other hand, will have a positive impact on the economy by creating jobs that require the skill set to implement new systems; however, the lack of these skills is the biggest challenge when employing AI programmes (Marria, 2019). Intelligent automation fuels better decisions through AI and can put real-time insights to work, which allows organisations to scale and adapt to the changing context of customers and employees (PEGA, 2020).

Artificial intelligence chatbots

Chatbots are AI-driven conversational tools that perform routine tasks efficiently. One platform that has taken the world by storm is the release of ChatGPT in 2022. ChatGPT has incredible analytical skills, a natural language interface and generates human-like responses through texts (ChatGTP, 2023). ChatGPT can generate programming code, write stories, poems, resumes, answer test and exam papers, among others. Microsoft scientists can control robots and aerial drones with OpenAI's ChatGPT (Kan, 2023).

Chatbots are versatile applications that can be used in various departments in an organisation, specifically the HR department, focussing on employee service or a helpdesk. Chatbots are one of the most important AI trends in 2020 (Karczewski, 2020). Employees interacting with a chatbot in a natural way can deliver better results than using traditional, human-powered interaction methods. An excellent example of machine-voice interaction is Google Duplex, an AI personal assistant (see https://www.youtube.com/watch?v=Mip_ymg-L-A).

Robotic process automation

Robotic process automation is the automation of repeatable and redundant, rule-based human action through the use of software bots (Druker, 2018). Robotic process automation automates repetitive and tedious tasks performed by humans, increasing productivity, efficiency and performance (Czarnecki & Auth, 2024). Robotic process automation requires organisational transformative change on a great level and this involves changing the culture of an organisation to one that embraces and manages change and engages stakeholders and employees every step of the way (Druker, 2018).

Robotic process automation is the application of technologies that assist organisations to perform routine tasks and to work with structured and unstructured data (Calitz et al., 2017; Ernst et al., 2018). Robotic process automation can replace humans by automating their functions instead of just improving information systems (Van der Aalst et al., 2018). Automation technology has evolved exponentially, and looking ahead, it is expected to take over numerous tasks that currently require human intervention (Arvato, 2019; Czarnecki & Auth, 2024).

Ernst et al. (2018) indicated that digital technologies may allow larger segments of the labour market to improve their productivity and to access better-paying occupations. Robotic process automation can assist an organisation with digital transformation and business performance improvement (Czarnecki & Auth, 2024; Ivančić et al., 2019). Robotic process automation is part of standard business practices globally (Madakam et al., 2019).

Robotic process automation has changed traditional HR operations and transforming the way organisations manage their workforce (Vijai & Mariyappan, 2023). Robotic process automation has had an impact on various HR functions including

recruitment, onboarding, employee data management, payroll administration, performance management and employee engagement. Artificial intelligence technologies and RPA in HR operations provide improved efficiency, accuracy, compliance and employee satisfaction (Vijai & Mariyappan, 2023).

Challenges and workforce training

Artificial intelligence and RPA need to be scaled across the whole organisation, which requires a greater focus on technology and culture (PWC, 2020). This requires transparency in terms of the future and the role automation will play. Employees need to be upskilled and reskilled and trained in resiliency and dynamic thinking (Shukla, 2019).

Artificial intelligence's biggest impact is augmenting specific tasks so they can be performed more effectively by current employees. Artificial intelligence systems are as good as the people engaged with the technology, which means employees will need to be reskilled to learn how to work in tandem with smart machines to perform aspects of their jobs in new and improved ways (Vaughan & Carroll, 2020). Organisations need to find a balance between employing and reskilling. Dondi et al. (2021) identified four broad skills categories, namely, cognitive, digital, inter-personal and self-leadership, with 13 skill groups and 56 foundational skills belonging to the categories. These are referred to as distinct elements of talent required in the new world of work environment (Dondi et al., 2021; Robinson, 2021).

High-level skills have become increasingly important because of automation. Zirar et al. (2023) identified four themes: (1) Employees' distrust in workplace AI stems from it being seen as a job threat, (2) AI in the workplace entices worker–AI interactions by offering to augment worker abilities, (3) AI and worker coexistence requires workers' technical, human and conceptual skills and (4) workers need ongoing reskilling and upskilling to contribute to a symbiotic relationship with workplace AI.

Organisations must take an active role in supporting their existing workforces through reskilling and upskilling. Individuals must take a proactive approach to their own lifelong learning, supported by organisations creating an enabling environment to assist (Hupfer, 2020). The mindset of employees must evolve to embrace a technology-centric approach, wherein technology, particularly AI, is regarded as a collaborative partner and supportive assistant in navigating the intricacies of emerging digital business models (Neeley & Leonardi, 2022).

Ethical concerns of AI

Bossmann (2016) highlights the following ethical issues regarding AI. Firstly, the loss of jobs, and secondly, how will wealth be distributed? He also highlights how AI will affect humanity as machines will affect our behaviour and interaction. Other issues include AI error, bias, control and security. The Protection of Personal Information Act (POPIA) and data privacy were highlighted as an important concern for employees. Tillemann and McCormick (2017) indicated that the managerial challenges organisations face include privacy and/or data sharing, the environment and ethics.

Employee characteristics

People make technology work (Vaughan & Carroll, 2020). The United Nations Sustainable Development Goal No. 8 aims to promote inclusive and sustainable economic growth, employment and decent work for all, where workers have access to 'safe and secure working environments' and there is a reduction in precarious employment (U.N., 2019). The implementation of AI solutions in organisations is not possible without the acceptance of the new technologies by employees. Employees' trust in AI is one of the key factors determining the level of acceptance (Zirar et al., 2023). The objects of trust are not only people but also institutions and organisations that are created by people (Lapinska et al., 2021). In the AI environment, trust also relates to technology and thus a human-technology relationship develops.

Artificial intelligence is changing the relationship between people and technology at work. Oracle (2019) indicated that 65% of workers are optimistic, excited and grateful about having robot co-workers. The Oracle (2019) study showed that 82% of people think robots can do things better than their managers. The respondents indicated that robots are better at providing unbiased information (26%), maintaining work schedules (34%), problem-solving (29%) and managing a budget (26%). The top three tasks managers did better than robots were understanding their feelings (45%), coaching them (33%) and creating a work culture (29%).

The changing human resources landscape

Artificial intelligence and machine learning are becoming increasingly popular across various departments, specifically HR (Murugesan et al., 2023). The adoption of AI lowers levels of HR management and employee engagement (Vanisree & Vijaya Shree, 2024). Applications such as Glassdoor and Seek use machine learning algorithms to produce interaction maps, which are based on the applicants' previous searches, clicks, posts, among others. Machine learning (ML) applications are used for applicant tracking and assessment, and HR personnel work with the latest HR software applications to track a candidate's journey through the interview process (Patel & Goplani, 2024).

The following are areas highlighted by Verlinden (2024), Kaur (2023), Rathi (2018), and Armstrong and Lee (2021) on how AI and ChatGPT can impact HR functions:

- Artificial intelligence can reduce administrative burden by capturing and analysing organisational HR-related data.
- Artificial intelligence-based employee engagement tools can collect data and identify trends of dissatisfaction or needs expressed by employees.
- Artificial intelligence can manage and improve workflows through business process automation.
- ChatGPT can automate repetitive and time-consuming HR department tasks, such as answering questions and

queries, scheduling interviews and updating employee records.
- ChatGPT can assist with talent acquisition, by screening and shortlisting candidate curricula vitae (CVs) or applications. ChatGPT can analyse job descriptions and match them with relevant candidates and also assist in formulating screening and interview questions.
- ChatGPT can reduce employee turnover by analysing qualitative HR data and assist in identifying potential reasons for employee turnover, such as exit interviews, employee surveys or queries. It can identify patterns, detect common themes and highlight potential areas for improvement. Human resource professionals can then take proactive measures to address issues, improve employee satisfaction and reduce turnover.
- ChatGPT can improve employee engagement by providing personalised responses to employee questions, offering company policies and benefits guidance, and facilitating communication between HR and employees.
- ChatGPT can also assist in developing employee engagement initiatives, such as surveys or recognition programmes.

Human resource applications that incorporate AI and ML include employee turnover detection software, which uses advanced pattern recognition technology to analyse a set of employee-related variables (Kaur, 2023; Vanisree & Vijaya Shree, 2024). Other ML applications include the individual skills management of employees and improving their performance (Patel & Goplani, 2024). Robotic process automation can add value to the core business processes, including HR analytics, employee payroll, employee status changes, new candidate hiring, resume screening and onboarding (Madakam et al., 2019; Vijai & Mariyappan, 2023).

A natural language processing-based software, such as ChatGPT can identify suitable candidates in the recruitment process and can be used for employee training and to automate the process of applicant evaluation (Kaur, 2023). International Business Machines (IBM) uses an AI-based application, which is able to predict which employees will leave their job with 95% accuracy. Also, the AI-based software is currently performing tasks that were recently carried out by up to 30% of the HR department's staff (Karczewski, 2020).

The new employment model, which is being driven by technology, has two fundamental elements: the implementation of these advanced technologies and the attraction and retention of the best talent (Jatoba et al., 2019). Human resources are both digital and human because the combination between the two needs to be optimised (Meister, 2019). The effective application of AI to human resources' problems presents very different challenges, which include the complexity of HR outcomes, the relatively small data sets, legal labour frameworks, socio-psychological concerns and adverse reactions to algorithmic decisions (Tambe et al., 2018). Organisations need to overcome the trust and bias issues surrounding AI by achieving an effective and successful implementation that makes it possible for everyone to benefit (Marria, 2019). A report in MIT Technology Review (2021) mentions that many specialist jobs can benefit from AI, and these include specialist medical roles. Historically, whenever jobs get destroyed by new technology, other jobs get created (Walsh, 2015).

Strategic human resources management

A strategic human resources management (SHRM) approach aligns the organisation's strategic vision with the HR strategy to enhance competitive advantage. The introduction of new technology that disrupts organisations and established business models therefore has a profound effect on the HR function and impacts every aspect within its value chain (Armstrong & Lee, 2021). For HR to align with the new business model and strategy initiated due to the disruption of new technology, HR managers must, firstly, understand the new business model and nature of the disruption both inside (employees) and outside (customers, stakeholders) the organisation (Ulrich, 2019). Secondly, the influence of disruptive technology on HR systems and processes throughout the HR value chain must be adapted, utilising the latest 4IR technology, commensurate with employee expectations. Rathi (2018) advocates that tech-trends AI and ML be accepted for decision-making and effective people management, but cautions that HR has complex data analytical and management requirements.

Introducing new technology and analytics within the HR value chain requires a carefully navigated change process in the way people interact with technology. Change should commence with a shift in culture where both HR teams and HR leaders embrace a data-driven approach themselves (Green, 2023). Existing human resource information systems (HRIS) providing integrated computerised HR modules covering all HR functions must be adapted to incorporate the latest advances in AI technologies (Kaur, 2023). Human resources disruption driven by a gig economy and more flexible work arrangements requiring a more flexible and agile workforce, demands a different approach to how HR is delivered (Armstrong & Lee, 2021). With increased implementation of AI and RPA-driven human resource solutions, a new HR model capable of delivering on employee expectations is required.

Research design

Research approach

The aim of the study was to obtain insights into the adoption of AI and RPA and its impact on the South African workforce by collecting qualitative data from senior HR managers working for national and international organisations in South Africa. The inclusion criteria required respondents to have knowledge of and/or experience with the introduction and use of AI and RPA technologies in the workplace. The research study followed an interpretivist research philosophy and the approach was deductive, exploratory and qualitative.

Research method

Participants and sample

Purposeful and convenience samplings were used in the study to identify knowledgeable and experienced professionals and managers with knowledge of AI technologies and AI and RPA implementations in South Africa. The respondents were identified from a list of participants who attended and participated in the Institute of IT Professionals of South Africa (IITPSA) webinar in 2021 on the topic 'AI in Africa'. Twenty-seven knowledgeable respondents who participated in the 2017 study (Calitz et al., 2017) were also approached to participate in the study (Robinson, 2021).

The respondents were contacted via email and requested to complete the survey. A questionnaire with open-ended questions was distributed to participants via Questionpro. The survey URL link was emailed to the respondents and they were requested to complete the survey. A data corpus comprising 30 responses were obtained after two calls for participation over a 4-week period, which included 11 responses from HR managers. The data set comprising the 11 responses was separately analysed using content analysis and reported in this article.

The measuring instrument

The questionnaire was compiled from literature and based on a similar study (Calitz et al., 2017). The university statistical consultant and two other academics participated in a pilot study to ensure the face validity of the research instrument (Ernst et al., 2018). The structure of the questionnaire was as follows: Section 1 covered demographic information, such as gender, industry, current position, education, city and knowledge of and experience with the implementation of AI and RPA applications in the workplace (Robinson, 2021). Section 2 contained questions relating to:

- the use of AI and RPA in business processes;
- the challenges that South African organisations face in implementing AI and RPA;
- the workforce training needs required for the use of AI and RPA in an organisation;
- the demands placed on employees interacting with an AI application or being part of a RPA process;
- the ideal employee traits and characteristics;
- the ethical considerations of implementing AI and RPA in the workplace;
- how HR managers should manage the use of AI and RPA applications in an organisation.

The following are examples of the questions respondents were asked (Robinson, 2021):

- What do you consider are the challenges for South African businesses that implement AI and RPA?
- In your opinion, what are the workforce training needs required for the use of AI and RPA in an organisation?
- What in your opinion are the ethical considerations of implementing AI and RPA in the workplace?

Statistical analysis

The responses were analysed using content analysis and the results were visually presented using Theme Frequency and Association Diagrams (TFAD). Theme Frequency and Association Diagrams show the presence of certain words or themes, the number of respondents that mentioned the words or theme, and the associated words or themes. The association highlights the fact that respondents mentioned more than one word or theme in their responses (Robinson, 2021).

Ethical considerations

Ethical clearance to conduct this study was obtained from the Nelson Mandela University Research Ethics Committee (REC): H21-BES-BUS-039. The study was considered low-risk following a comprehensive review of all materials and procedures by the REC. Participants were then invited to participate voluntarily and informed that they could withdraw from the study at any stage without consequence. Participants were also informed that their responses would be kept confidential and that no names would be used in the data analysis.

Results and discussion

The respondents included four female and seven male HR managers (Table 1). Six respondents worked in the manufacturing industry, three in education and consulting, one in an international IT organisation, and one in an international finance and auditing organisation. All respondents had either a diploma, degree or post-graduate degree (PG degree). Five were based in Port Elizabeth, four in Johannesburg, one in Pretoria and one in Vietnam.

All participants had knowledge of and researched AI-related topics, and one attended AI training courses. Three had no AI technology implementation experience, four had limited implementation experience and four had experience in the implementation of AI-related technologies.

Human resources managers' experiences with artificial intelligence and robotic process automation

The AI and RPA software used by the organisations the HR managers represent included UIPath, Chatbots, IBM Intelligent Workflow, Neptune (Talent acquisition), Crunchr, RPA Blue Prism and Recruiter Mobile, one worker stated that:

> 'Our Human Resources processes are automated using UiPath.' (P1, Female, Global Workforce Operations Director)

> 'We are making use of automated services, especially when it comes to telephonic communication and applicants applying for vacant positions.' (P5, Male, HR Director)

Six respondents indicated that they use chatbots in their organisations.

TABLE 1: Respondents and experience with artificial intelligence implementation.

Participant	Qualification	Gender	City	Industry	Position	Knowledge and implementation of AI
P1	PG degree	Female	Ho Chi Vietnam	Manufacturing	Global Workforce Operations Director	Knowledge of AI and no implementation experience
P2	PG degree	Female	JHB	Manufacturing	Executive: Head of Talent	Knowledge of AI and limited implementation experience
P3	PG degree	Male	P.E.	Education	HR Professor and HR consultant	Researched AI topics, Organisations implemented RPA
P4	Degree	Male	Pretoria	IT	Head Operations and HR	Knowledge of AI and implemented AI and RPA technologies
P5	Degree	Male	JHB	Manufacturing	HR Director	Knowledge of AI and no implementation experience
P6	PG degree	Male	P.E	Education	HR Academic	Researched AI topics, limited implementation experience with RPA
P7	PG degree	Female	P.E	Education	HR Academic and HR consultant	Researched and implemented AI and RPA technologies
P8	PG degree	Female	P.E	Manufacturing	HR Manager	Attended AI training courses and researched AI topics. Limited implementation experience
P9	PG degree	Male	JHB	Manufacturing	HR Manager	Researched and implemented AI and RPA technologies
P10	PG degree	Male	JHB	Finance and Auditing	HR Manager	Researched AI topics. Limited implementation experience
P11	Diploma	Male	P.E	Manufacturing	HR Director	Knowledge of AI and no implementation experience

AI, artificial intelligence; RPA, robotic process automation; HR, human resources; IT, Information Technology; JHB, Johannesburg; PE, Port Elizabeth.

A respondent indicated they use an:

> 'Application called Neptune for Talent Acquisition - used for shortlisting and regretting of candidates.' (P2, Female, Executive: Head of Talent)

Another respondent said:

> '[*W*]e use Crunchr HR, an integrated platform for HR Dashboards, People Analytics and Strategic Workforce Planning.' (P6, Male, HR Academic)

The respondents (Table 1) indicated that they all had knowledge of AI and RPA and three had no implementation experience, four limited experience and four had experience with the new technologies. A respondent indicated that they are:

> '[*I*]mplementing the technology for clients.' (P4, Male, Head Operations and HR)

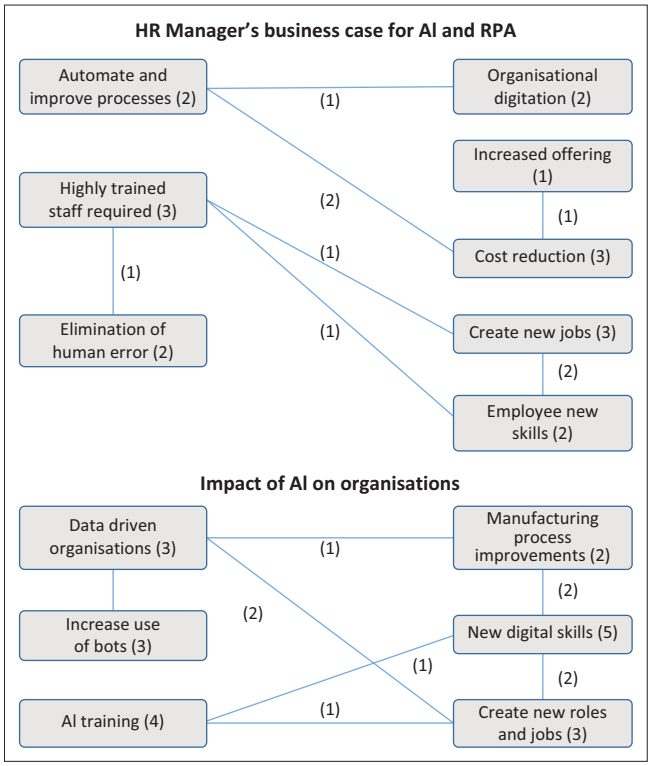
> 'I have done basic proof of concepts of AI and RPA projects.' (P5, Male, HR Academic)

P7, Female, HR Manager and P9, Male, HR Manager obtained 'Theoretical and practical' knowledge and experience and another respondent said:

> 'AI and RPA have increasingly reshaped the new world of work. Modes of communication, smart technologies, AI and LLMs have resulted in companies needing to adapt their existing business operating models in order to compete in top-tier markets.' (P10, Male, HR Manager)

Human resources managers' business case for artificial intelligence and robotic process automation

All HR managers confirmed the significance of adopting AI and RPA as effective strategies to enhance global competitiveness and improve existing business and HR processes (Figure 1). Three respondents emphasised the importance of requiring highly trained staff, creating new positions and reducing costs. Respondent (P1, Female, Global Workforce Operations Director) indicated that 'We need to become more competitive in the global economy. The Smart Technology era and related tools like AI and ChatGPT will



Note: Figures in parentheses = number of respondents that mentioned the theme, and the associated themes.

AI, artificial intelligence; HR, human resources; RPA, robotic process automation.

FIGURE 1: Human resources manager's business case for artificial intelligence and their perceptions on the impact of artificial intelligence on organisations.

enable this'. (P3, Male, HR Professor and HR Consultant) said 'We need to stay abreast of the rest of the world and to ensure excellent customer and employee experience', said:

> 'Absolutely. Using computers [*AI and bots*] to do what they are good at doing, frees up human capacity to deal with exceptions. This ultimately provides a more responsive customer experience in the standard workflow, and a more personalised experience in the non-standard workflow.' (P4, Male, Operations and HR)

A respondent indicated:

> 'SA and Africa as emerging economies need to incorporate AI and RPA in order to remain relevant and to compete with global economies [*and/or*] markets.' (P5, Male, HR Director)

And another respondent asserted:

> 'Especially with Industry 4.0 being present and the world never going back to not using technology and South Africa being earmarked as one of the countries having the best potential to leapfrog Industry 4.0 due to its richness of resources which include high potential citizens that can use their skills in meaningful occupations to assist the country to reap the fruits of its resources.' (P6, Male, HR Academic)

> 'They streamline interactions between people and services, enhancing customer experience. At the same time, they offer companies new opportunities to improve the customers engagement process and operational efficiency by reducing the typical cost of customer service.' (P7, Female, HR Academic and HR Consultant)

A respondent said:

> 'AI and RPA will provide improved HR services and avoid mistakes and human error save time and money by automating and optimising routine HR processes and tasks use insight to predict employee behaviours and offer them better HR services.' (P9, Male, HR Manager)

The impact of artificial intelligence on organisations

Artificial intelligence training (n = 4), new digital skills development and acquisition (n = 5), organisations undergoing digital transformation and becoming data-driven organisations impacted the future world of work, according to the senior HR managers (Figure 1):

> 'Data driven information as well as real time data would allow for better decision.' (P2, Female, Executive Head of Talent)

And another respondent said:

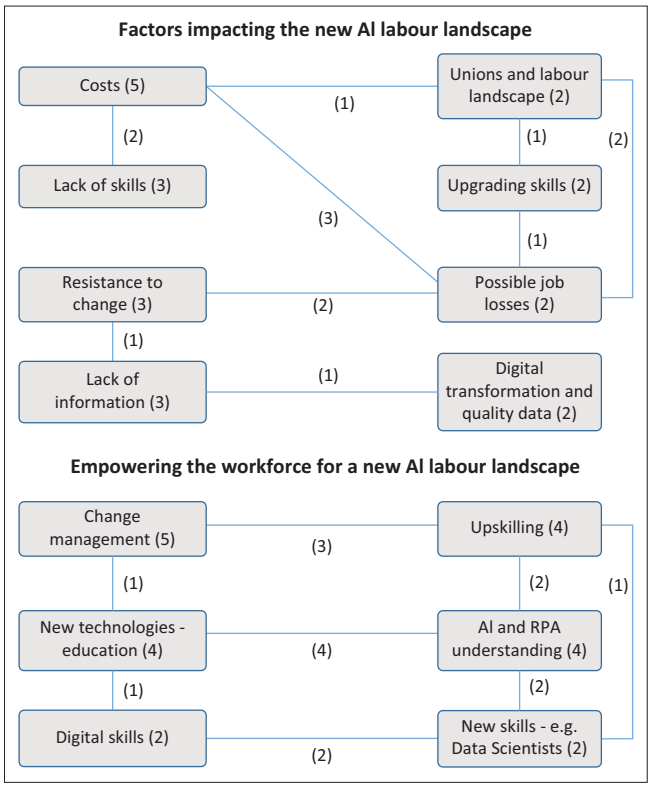
> 'Humans will spend more time doing qualitative tasks where a bot [and/or] AI would be unsuitable. Standard business processes will be handled in the background by worker bots.' (P3, Male, HR Professor and Consultant)

> 'While many of today's occupations will still exist in the future, they will indefinitely transform, and in many cases, occupational categories will overlap with one another to form new roles.' (P7, Female, HR Academic and HR Consultant)

> 'It will allow people from traditionally disadvantaged countries in Africa to acquire the skills and knowledge of AI and Robotics to compete for jobs on an equal footing with their [*developed world*] counterparts.' (P11, Male, HR Director)

Human resources managers' factors impacting the new artificial intelligence labour landscape

This sub-theme identifies key financial, managerial and employee factors impacting the new AI workforce landscape (Figure 2). Human resources managers identified cost (n = 5) as a key factor influencing the labour landscape in adopting new technologies, such as AI and RPA as well as the cost of upskilling the labour force (Figure 2). Three respondents indicated that resistance to change and specifically the lack of information at the managerial level and by employees were seen as major factors impacting the new AI labour landscape.



Note: Figures in parentheses = number of respondents that mentioned the theme, and the associated themes.

AI, artificial intelligence; RPA, robotic process automation.

FIGURE 2: Human resources managers' perceptions on factors impacting the new artificial intelligence labour landscape and empowering the workforce for a new artificial intelligence labour landscape.

Obtaining new skills, such as data science skills, including digital skills and implementing new business strategies were seen as major challenges facing HR managers and businesses. a respondent said:

> 'Resistance to change; slow to adopt; education; incorrect impression that it increases unemployment when it actually increases employment of higher-level skills.' (P2, Female, Executive: Head of Talent)

> 'Union resistance, skills, possible job losses at low skill levels.' (P3, Male, HR professor and Consultant)

> 'Closed-minded attitude and unwillingness to embrace new opportunities, the skills shortage and the availability of technical staff.' (P7, Female, HR Academic and HR Consultant)

> 'Shortage of quality data, the cost of implementing AI and automation in workplace processes and the lack of skills to implement both.' (P11, Male, HR Director)

Empowering the workforce for a new artificial intelligence labour landscape

Human resources managers' views on how to empower the workforce included new technologies education (n = 4), upskilling opportunities (n = 4), improved AI and RPA understanding and five respondents indicated 'change management' (Figure 2) A respondent indicated that the training needs included:

> 'Change management and upskilling in the use of AI.' (P3, Male, HR Professor and HR Consultant)

'In depth understanding of the business process and platform specific training for the tool being used.' (P4, Male, Head Operations and HR)

'Hybrid skills training so that employees who do not foresee a future in AI and RPA can utilise their untapped soft skills in other functions in the organisation.' (P7, Female, HR Academic and HR Consultant)

'[*O*]rganisations must anticipate and quickly identify and implement upskilling programmes to support this, provide access to digital platforms and technologies and not just talk about it.' (P10, Male, HR Manager)

'Employees would need to receive targeted training in the use of RPA and AI in the workplace. Organisations may need to consider hiring employees who have studied Robotics and AI at tertiary level.' (P11, Male, HR Director)

New artificial intelligence and robotic process automation demands placed on employees

The new demands placed on employees include the understanding of new technologies (n = 7), the upskilling of employees and understanding of data and RPA processes (Figure 3):

'Embracing change and transformation. Adopting a mindset that accepts and appreciates the benefits of AI and RPA. Possessing the required skills to interact with AI and RPA processes.' (P5, Male, HR Director)

'[*T*]o upskill on a continuous basis, will need to be innovated, employees will need to ensure that they have a career plan with development interventions.' (P8, Female, HR Manager)

'[*T*]he requisite digital/IT skills to engage with, understand, design and implement such processes.' (P10, Male, HR Manager)

Ideal employee traits to work in an artificial intelligence-assisted work environment

The ideal employee traits to be able to work in an AI-assisted work environment the HR managers identified (Figure 3) were employees having a hybrid skill-set (n = 6) and employees having the willingness to learn new skills and using modern technologies (n = 5). (P2, Female, Executive: Head of Talent) indicated employees must have an 'understanding AI and how it works' and another respondent said:

'Employees must have 'flexible, technical skills, innovative, critical thinking, good communication and decision making skills.' (P3, Male, HR Professor and HR Consultant)

'Being Tech savvy. A sense of inquisitiveness - thinking ahead [*and/or*] how to enhance the use of AI and RPA.' (P5, Male, HR Director)

'A hybrid skills set as although technical skills are important but employees more importantly need soft skills to be employable in the future workplace.' (P6, Male, HR Academic)

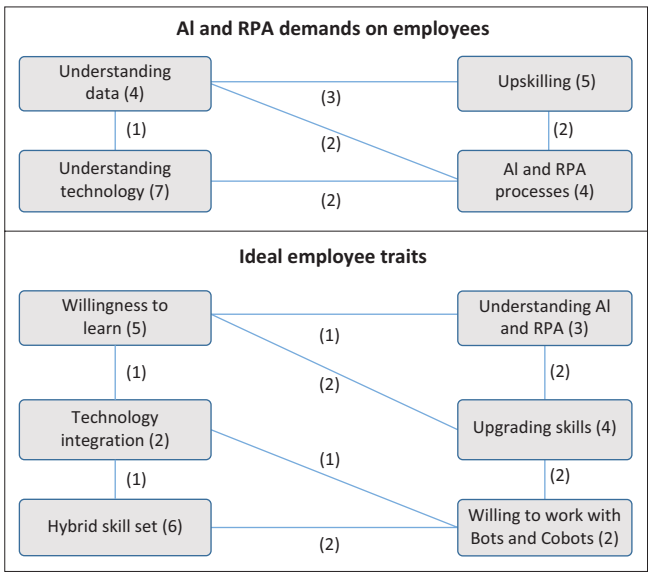
'[*F*]lexible, willingness to learn and change, analytical, creative, interpersonal skills.' (P8, Female, HR Manager)

'Analytical thinking, deductive reasoning, problem solving ability, logical [*and/or*] sequential thinking or reasoning, innovative thinking.' (P10, Male, HR Manager)

Employee culture in the future world of work

The employee culture required to work in the future world of work is shown in Figure 4. The responses mainly focussed on the management, training and education of employees (n = 5) in the use and adoption of new technologies and the employees' personal culture, that is, taking responsibility for their further education and re-skilling. A respondent said:

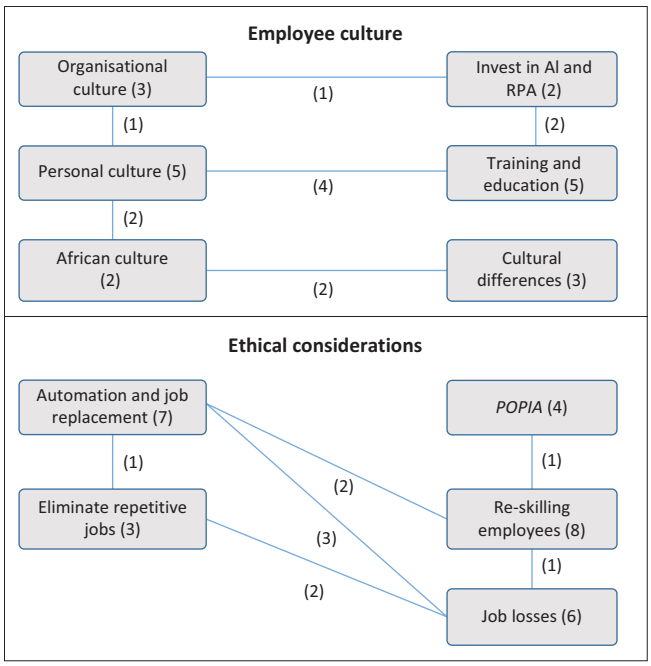
'AI and RPA and business process automation are inherently culturally agnostic. If anything, it removes the cultural element and potential for misunderstanding due to cultural differences.'



Note: Figures in parentheses = number of respondents that mentioned the theme, and the associated themes.

AI, artificial intelligence; RPA, robotic process automation.

FIGURE 3: New artificial intelligence and robotic process automation demands placed on employees and ideal employee traits to work with artificial intelligence and robotic process automation applications.



Note: Figures in parentheses = number of respondents that mentioned the theme, and the associated themes.

AI, artificial intelligence; RPA, robotic process automation; POPIA, Protection of Personal Information Act.

FIGURE 4: Employee culture in the new world of work and ethical considerations in implementing artificial intelligence and robotic process automation in a business.

'Different African cultures are influenced by their respective societal, economic, environmental and political realities.' (P5, Male, HR Director)

'Leading African cultures with more sophisticated education systems might be more influential in the use and application of AI and RPA.' (P5, Male, HR Director)

'African cultures are perceived as being rigid, thus they are not comfortable with uncertainty.' (P9, Male, HR Manager)

'[*Non-developed*] societies and less educated societies will likely resist.' (P10, Male, HR Manager)

And (P11, Male, HR Director) said:

'Unless African cultures are exposed to Robotics and AI at secondary schooling level and preferably at tertiary level they will not be able to adapt to dealing with both in the workplace.' (P11, Male, HR Director)

Ethical considerations of implementing artificial intelligence and robotic process automation in a business

The major themes (Figure 4) that emerged regarding the ethical implications of implementing AI and RPA in an organisation, focussed on the ethical considerations regarding the re-skilling of employees ($n = 8$), the automation of business processes and replacing jobs ($n = 7$) and possible job losses ($n = 6$).

Another respondent indicated as four other respondents did:

'POPIA and the use of personal information is a concern.' (P2, Female, Executive: Head of Talent)

A respondent indicated that AI and RPA:

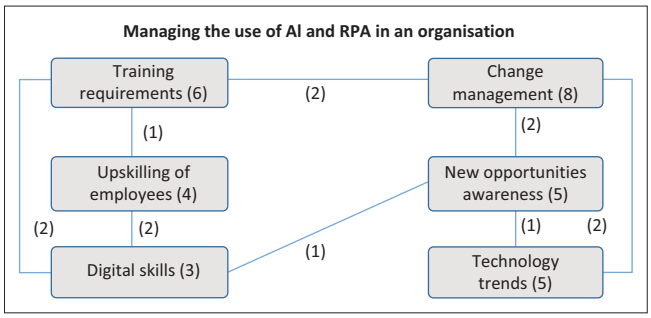
'[*S*]hould not be seen [*as*] a head-count reducer, but rather as acapacity creator. By using bots and AI to handle routine, repetitive jobs, humans do not have to spend their time on it. This creates capacity.' (P4, Male, Head Operations and HR)

One manager emphasised management's ethical responsibility to:

'Redeploy or retrain employees to keep them in jobs.' (P9, Male, HR Manager)

Managing the use of artificial intelligence and robotic process automation in an organisation

In Figure 5, HR managers offer advice on how to manage the use of AI and RPA in an organisation. The main emphasis for HR managers is to manage the change management process effectively ($n = 8$) and introduce upskilling and training opportunities for employees ($n = 6$). Human resource managers must also constantly study new technological trends and evaluate the impact and benefits for the organisation and its employees. The respondents highlighted the importance of organisations adopting new and modern digital technologies; however, they highlighted that this must be performed ethically with limited retrenchments (Robinson, 2021):



Note: Figures in parentheses = number of respondents that mentioned the theme, and the associated themes.

AI, artificial intelligence; RPA, robotic process automation.

FIGURE 5: Managing the use of artificial intelligence and robotic process automation in an organisation.

'Develop effective change management programmes and rethink workforce planning and Workplace Skills Plans.' (P5, Male, HR Director)

'[*P*]repare the organisation for change, ensure that there are career plans for each employee linked to a development plan, continuous communication with stakeholders so that uncertainty is reduced.' (P8, Female, HR Manager)

'Become key agents for change, assist in creating opportunities for upskilling and learning, assist in identification of talent to meet future business needs, manage relationships with stakeholders to ensure all employees have an opportunity to upskill or to be accommodated.' (P10, Male, HR Manager)

Finally, one director said:

'HR must acquire an understanding of both the benefits and any disadvantages of the application of AI and Robotics in the workplace. This should also include an appreciation that the application of both should never be at the expense of the consideration of the human element in the workplace.' (P11, Male, HR Director)

Managerial implications

Digitisation and automation change the way people work and can be a positive change (Gomez et al., 2019). Organisations will have to make significant changes in addition to addressing required skills shifts (Bughin et al., 2018). New technology education was identified as a training need. Management must provide weekly timeslots for employees to watch videos on new technologies (such as the Google Duplex video) and other AI-related educational material, expert talks and training courses. Human resource practices and a learning-oriented culture must be developed to influence human capital (Singh & Rao, 2017).

The literature (Verlinden, 2024; Rathi, 2018) on the disruption and competitiveness themes identified in this study, indicated the importance of AI adoption and organisations remaining competitive (Figure 1). The Global Workforce Operations Director (P1, Female, Global Workforce Operations Director) indicated that 'We need to become more competitive in the global economy. The Smart Technology era and related tools like AI and RPA will enable this'. Artificial intelligence and RPA have the potential to

provide a competitive advantage to organisations at every stage of the value chain (Czarnecki & Auth, 2024; Armstrong & Lee, 2021; Malek et al., 2016).

Resistance to change and the lack of information at the managerial level and by employees were seen as major challenges in this study (Figure 2). In addition, employees' cultural differences and propensity for the adoption and implementation of new technologies must be considered (Lapinska et al., 2021; Zirar et al., 2023). This process should be accompanied by an organisational change process aligned to a new business model, digital business strategy and 'renewed/sensitised' employee mindset and cultural development. Change and change management skills are essential. Lakhani (2023) proposes that organisations need to understand how change can become a skill and be incorporated into the culture of the organisation.

The ideal employee traits and skills required for the future world of work the HR managers identified (Figure 3) included analytical thinking, deductive reasoning, problem-solving ability, logical and/or sequential thinking or reasoning, innovative thinking, willingness to learn and change, analytical, creative and interpersonal skills and being digitally literate. The Internet lowered the cost of information transmission and now AI will lower the cost of cognition (Lakhani, 2023).

Conclusion

Artificial intelligence and RPA are some of today's most important trends affecting business applications and processes, including HR practices. Artificial intelligence and RPA are becoming more apparent in the workplace and changing the future of the workforce (Arlitt et al., 2023). Artificial intelligence technologies are changing the way processes are completed in every industry, and the future of the human resources management (HRM) is the use of AI and human services, which is constantly changing due to the rapid developments in machine-learning technology (Kaur, 2023).

The future of work must be managed by HR, specifically the adoption of digital HR management (Chapano et al., 2023). New technologies enable HR managers to manage and measure employee effectiveness, efficiency and employee experience by analysing hiring decisions, personal development, and overall team experience and effectiveness (Kaur, 2023). Human resource managers can now manage the entire employee life cycle with flexible AI-driven HR software (Sage, 2024). Artificial intelligence technologies and RPA can significantly support the HR processes of searching and hiring employees, as well as improve their well-being, skills and education, and increasing retention (Vijai & Mariyappan, 2023).

The HR managers agreed that AI and RPA are viable solutions for South African organisations. They emphasised continuous training, upskilling and becoming a technological and data-driven workforce. A respondent in this study indicated:

> 'Key to the future of the workforce and AI and RPA technology is how humans get to utilise the capacity that has been created.' (P4, Male, Head Operations and HR)

With its advanced capabilities, ChatGPT has the potential to revolutionise fields such as writing, translation, coding and comprehension, pushing aspirant human professionals to raise the bar and hone their skills and unique value add (ChatGPT, 2023). The future of AI-powered HR will only be successful through the integration of humans and machines. The latest versions of ChatGPT and Claude, for example include voice synthesis and voice recognition and the analysis of images.

New generative AI technologies, such as ChatGPT, Claude and Gemini are prime examples of how technology is continuously pushing the boundaries and shaping the future (Kaur, 2023). New positions are created by these technologies. Mishcon de Reya LLP is an international law firm and in February 2023 advertised for a ChatGPT Legal Prompt Engineer (Mishcon, 2023). The position will require the employee to investigate how generative AI can be used within a law firm and to revolutionise the way lawyers work and deliver legal services to their clients. Artificial intelligence and ChatGPT offer multiple application opportunities for HR across recruitment, onboarding, training, HR chatbots, performance management and employee relations (Kaur, 2023). Organisations must develop a ChatGPT policy for employees, and digitally advanced organisations have developed and incorporated their own GPT.

Industry 5.0 aims to address the human challenges of Industry 4.0 as a human-centred approach, focussing on the worker's well-being, supported by cobots, AI and cognitive computing technologies. Automation, such as RPA and AI technologies are accelerating the pace at which employees change their skill sets. The three skill sets that will be essential for the future of work are: (1) high-level cognitive skills, for example, creativity and critical thinking, (2) decision-making, including social and emotional skills and (3) technological and advanced digital skills (McKinsey Global Institute, 2021).

Sustained competitive advantage is therefore a key driver for adopting new technology and adjusting to new business models commensurate with technological advances (Nauck et al., 2021). Human resources must continue to evolve and adopt modern technological advancements in HR, such as AI and RPA to improve efficiency and business operations (Sage, 2024). Hamel (2000) coined the term, the Age of Revolution, where change is no longer additive but discontinuous, abrupt and seditious. Human resource practitioners must know what HR practices entail and now need to know how to practise them with AI technologies.

Acknowledgements

The authors are grateful to senior HR Directors and HR Managers who participated in the study.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

P.P., M.C. and A.P.C. contributed equally to the writing of this article.

Funding information

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

Data availability

The data that support the findings of this study are available upon reasonable request from the corresponding author, A.P.C.

Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The authors are responsible for this article's results, findings and content.

References

Alves, J., Lima, T.M., & Gaspar, P. (2023). Is industry 5.0 a human-centred approach? A systematic review. *Processes, 11*(1), 193. https://doi.org/10.3390/pr11010193

Arlitt, M., Coughlin, T., Faraboschi, P., Frachtenberg, E., Laplante, P., Milojicic, D., Patel, N., & Saracco, R. (2023). Future of the workforce. *Computer, 56*(1), 52–63. https://doi.org/10.1109/MC.2022.3203505

Armstrong, B., & Lee, G.J. (2021). *Digital business* (2nd edn.). Silk Route Press.

Arvato. (2019). *Customer service in 2027: How Automation, RPA and AI will transform the way companies deliver customer service over the next decade*. Retrieved from https://www.arvato.co.uk/wp-content/uploads/2019/07/Arvato-CRM-Whitepaper-Customer-service-in-2027.pdf_updated.pdf.

Bossmann, J. (2016). *Top 9 ethical issues in artificial intelligence*. World Economic Forum, Emerging Technologies. Retrieved from https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/.

Bouquet, C. (2020). *How COVID-19 caused the future of work to arrive early*. IMD Research and Knowledge. Retrieved from https://www.imd.org/research-knowledge/articles/how-covid-19-caused-the-future-of-work-to-arrive-early/.

Bughin, J., Hazan, E., Lund, S., Dahlstrom, P., Wiesinger, A., & Subramaniam, A. (2018). *Skill shift: Automation and the future of the workforce*. McKinsey Global Institute. Retrieved from https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce.

Calitz, A.P., Poisat, P., & Cullen, M. (2017). The future African workplace: The use of collaborative robots in manufacturing. *SA Journal of Human Resource Management, 15*, 1–11. https://doi.org/10.4102/sajhrm.v15i0.901

Chapano, M., Mey, M., & Werner, A. (2023). Perceived challenges: Unfounded reasons for not forging ahead with digital human resource management practices. *SA Journal of Human Resource Management,* 21, a2085. https://doi.org/10.4102/sajhrm.v21i0.2085

ChatGTP. (2023). *ChatGPT: Examples, capabilities and limitations*. Retrieved from https://chat.openai.com/chat.

Copeland, B.J. (1993). *Artificial intelligence: A philosophical introduction*. Retrieved from https://www.britannica.com/technology/artificial-intelligence/additional-info#history.

Czarnecki, C., & Auth, G. (2024). Process digitalization through robotic process automation. In T. Barton, C. Müller, & C. Seel (Eds.), *Digitalization in companies* (pp. 101–120). Springer.

Dondi, M., Klier, J., Panier, F., & Schubert, J. (2021). Defining the skills citizens will need in the future world of work. *McKinsey & Company*. Retrieved from https://www.mckinsey.com/industries/public-and-social-sector/our-insights/defining-the-skills-citizens-will-need-in-the-future-world-of-work.

Druker, E. (2018). Robotic process automation: Revolutionizing workplace culture. Retrieved from https://www.boozallen.com/s/insight/blog/robotic-process-automation-revolutionizing-workplace-culture.html.

Ernst, E., Merola, R., & Samaan, D. (2018). *The economics of artificial intelligence: Implications for the future of work*. ILO Future of Work, Research Paper, Series 5. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_647306.pdf.

Gomez, J.G., Hernandez, P., & Ocejo, R. (2019). Four success factors for workforce automation. *McKinsey & Company*. Retrieved from https://www.mckinsey.com/capabilities/operations/our-insights/four-success-factors-for-workforce-automation.

Green, D. (2023). *The top HR trends that are set to disrupt the Workplace in 2023*. Retrieved from https://www.myhrfuture.com/digital-hr-leaders-podcast/the-top-hr-trends-that-are-set-to-disrupt-the-workplace-in-2023.

Hamel, G. (2000). *Leading the revolution*. Harvard Business School Press.

Hupfer, S. (2020). *Talent and workforce effects in the age of AI*. Deloitte Insights. Retrieved from https://www2.deloitte.com/content/dam/insights/us/articles/6546_talent-and-workforce-effects-in-the-age-of-ai/DI_Talent-and-workforce-effects-in-the-age-of-AI.pdf.

Ivančić, L., Suša Vugec, D., & Bosilj Vukšić, V. (2019). Robotic Process Automation: Systematic Literature Review. in: C. Di Ciccio, C., R. Gabryelczyk, L. García-Bañuelos, T. Hernaus, R. Hull, R., M.I. Štemberger, A. Kő, & M. Staples, (Eds)., *Business Process Management: Blockchain and Central and Eastern Europe Forum. BPM 2019. Lecture Notes in Business Information Processing*, vol 361. Springer, Cham.

Jatoba, M., Stantos, J., Gutierriz, I., Moscon, D., Fernandes, P.O., & Teixeira, J.P. (2019). Evolution of artificial intelligence research in human resources. *Procedia Computer Science, 164*, 137–142. https://doi.org/10.1016/j.procs.2019.12.165

Kagermann, H., Helbig, J., Hellinger, A., & Wahlster, W. (2013). *Recommendations for implementing the strategic initiative industrie 4.0: Securing the future of German manufacturing industry*. Final Report of the Industrie 4.0 Working Group. Forschungsunion. Retrieved from https://www.din.de/blob/76902/e8cac883f42bf28536e7e8165993f1fd/recommendations-for-implementing-industry-4-0-data.pdf.

Kan, M. (2023). *Microsoft researchers are using ChatGPT to control robots, Drones*. Retrieved from https://www.pcmag.com/news/microsoft-researchers-are-using-chatgpt-to-control-robots-drones.

Karczewski, D. (2020). *Six amazing AI applications in HR departments (With Examples!)*. Ideamotive. Retrieved from https://www.ideamotive.co/blog/amazing-ai-applications-in-hr-departments.

Kaur, M. (2023). Exploring the use of chatbots and AI in human resource management: A focus on ChatGPT and its impact of ChatGPT on human resource management practices. *International Journal of Research Publication and Reviews, 4*(10), 2442–2445.

Kergroach, S. (2019). Industry 4.0: New challenges and opportunities for the labour market. *Foresight and STI Governance, 11*(4), 6–8. https://doi.org/10.17323/2500-2597.2017.4.6.8

Lakhani, K.R. (2023). AI won't replace humans – But humans with AI will replace humans without AI. *Harvard Business Review.* Retrieved from https://hbr.org/2023/08/ai-wont-replace-humans-but-humans-with-ai-will-replace-humans-without-i?utm_medium=paidsearch&utm_source=google&utm_campaign=intlcontent_bussoc&utm_term=Non-Brand&tpcc=intlcontent_bussoc&gad_source=1&gclid=CjwKCAjwi_exBhA8EiwA_kU1MIlkVg7IxynTFMr0m4D0uRaD37VzevVn1LeTP.

Lapinska, J., Escher, I., Gorka, J., Sudolska, A., & Brzustewicz, P. (2021). Employees' trust in artificial intelligence in companies: The case of energy and chemical industries in Poland. *Energies, 14*(7), 1942. https://doi.org/10.3390/en14071942

Macpherson, W., Werner, A., & Mey, M.R. (2022). Industry 4.0: Emerging job categories and associated competencies in the automotive industry in South Africa. *SA Journal of Human Resource Management, 20*, 1–10. https://doi.org/10.4102/sajhrm.v20i0.1916

Madakam, S., Holmukhe, R.M., & Jaiswal, D.K. (2019). The future digital work force: Robotic Process Automation (RPA). *Journal of Information Systems and Technology Management – Jistem USP, 16*, 1–17. https://doi.org/10.4301/S1807-1775201916001

Malek, M.S.B.A., Ahmadon, M.A.B., Yamaguchi, S., & Gupta, B.B. (2016). On privacy verification in the IoT service based on PN2. In *IEEE 5th global conference on consumer electronics* (pp. 1–4), Kyoto.

Marria, V. (2019). The future of artificial intelligence in the workplace. *Forbes*. Retrieved from https://www.forbes.com/sites/vishalmarria/2019/01/11/the-future-of-artificial-intelligence-in-the-workplace/?sh=4bc7deaa73d4.

Mathur, S. (2019). Artificial intelligence: Redesigning human resource management, functions and practices. In *Human resource: People, process and technology.* Bharti Publishers.

McKinsey Global Institute. (2021). *The future of work after COVID-19*. Retrieved from https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19.

Meister, J. (2019). Ten HR trends in the age of artificial intelligence. *Forbes*. Retrieved from https://www.forbes.com/sites/jeannemeister/2019/01/08/ten-hr-trends-in-the-age-of-artificial-intelligence/?sh=218b62c33219.

Mishcon. (2023). *GPT legal prompt engineer*. Retrieved from https://fsr.cvmailuk.com/mishcon/main.cfm?page=jobSpecific&jobId=66276&rcd=34453&queryString=srxksl%3D1.

MIT Technology Review. (2021). COVID-19 and the workforce. Critical workers, productivity and the future of AI. *The Global AI Agenda series*. Retrieved from https://mittrinsights.s3.amazonaws.com/AIagenda2020/Covid19workforce.pdf.

Murugesan, U., Subramanian, P., Srivastava, S., & Dwivedi, A. (2023). A study of artificial intelligence impacts on human resource digitalization in industry 4.0. *Decision Analytics Journal, 7*. https://doi.org/10.1016/j.dajour.2023.100249

Nauck, F., Pancaldi, L., Poppensieker, T., & White, O. (2021). *The resilience imperative: Succeeding in uncertain times*. McKinsey & Company. Retrieved from https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/the-resilience-imperative-succeeding-in-uncertain-times.

Neeley, T., & Leonardi, P. (2022). Developing a digital mindset. *Harvard Business Review.*

Oracle. (2019). *Global research highlights how AI is changing the relationship between people and technology at work*. Retrieved from https://www.oracle.com/corporate/pressrelease/robots-at-work-101519.html.

Patel, B., & Goplani, H. (2024). A conceptual model for Ai-driven efficiency in human resource management. *International Journal of Creative Research Thoughts, 12*(4), 868–873.

PEGA. (2020). *Organizations turning to intelligent automation to guard against impact of future pandemics, research finds*. Retrieved from https://www.pega.com/about/news/press-releases/organizations-turning-intelligent-automation-guard-against-impact-future.

Peretz-Andersson, E., Tabares, S., Mikalef, P., & Parida, V. (2024). Artificial intelligence implementation in manufacturing SMEs: A resource orchestration approach. *International Journal of Information Management, 77*, 102781. https://doi.org/10.1016/j.ijinfomgt.2024.102781

PWC. (2020). *An introduction to implementing AI in manufacturing. PWC Global and Manufacturing Summit*. Price Waterhouse Coopers.

Rathi, R.A. (2018). Artificial intelligence and the future of HR practices. *International Journal of Applied Research, 4*(6), 113–116.

Robinson, B. (2021). *20th Annual BEN-Africa Conference: Inclusive and principled business: Ethical values: African Stakeholders 4–5 November 2021 Swakopmund, Namibia*. Retrieved from https://www.benafrica.org/wp-content/uploads/2022/02/Conference-proceedings.pdf.

Rodriguez-Bustelo, C., Batista-Foguet, J.M., & Servalos, R. (2020). Debating the future of work: The perception and reaction of the Spanish workforce to digitisation and automation technologies. *Frontiers in Psychology, 11*, 1965. https://doi.org/10.3389/fpsyg.2020.01965

Ross, S. (2023). *What is human capital theory and how is it used?*. Retrieved from https://www.investopedia.com/ask/answers/032715/what-human-capital-and-how-it-used.asp.

Sage. (2024). *The changing face of HR in 2024*. Retrieved from https://www.sage.com/en-gb/sage-business-cloud/people/resources/research-analyst-reports/the-changing-face-of-hr-research-report/.

Shukla, M. (2019). Organisations must address these five challenges when adopting AI and automation. *Forbes*. Retrieved from https://www.forbes.com/sites/forbestechcouncil/2019/07/08/organizations-must-address-these-five-challenges-when-adopting-ai-and-automation/?sh=7eae970b1266.

Singh, P., & Rao, M. (2017). HR practices, learning culture and human capital: A study on Indian Business and professional service sector. *Global Business Review, 18*(3), 678–690. https://doi.org/10.1177/0972150917692178

Tambe, P., Cappelli, P., & Yakubovich, V. (2019). Artificial intelligence in human resources management: Challenges and a path forward. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3263878

Tillemann, L., & McCormick, C. (2017). *Road mapping A U.S.-German agenda for artificial intelligence*. Retrieved from https://www.newamerica.org/new-america/policy-papers/roadmapping-us-german-agenda-artificial-intelligence/.

Ulrich, D. (2019). *The outside-in view of HR. Think: Act Magazine*. Retrieved https://www.rolandberger.com/en/Insights/Publications/Dave-Ulrich-on-the-outside-in-view-of-fromHR.html.

U.N. (2019). *Take action for the sustainable development goals*. Retrieved from https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

Van der Aalst, W., Bichler, M., & Heinzl, A. (2018). Robotic process automation. *Business & Information Systems Engineering, 60*, 269–272. https://doi.org/10.1007/s12599-018-0542-4

Vanisree, D., & Vijaya Shree, D. (2024). Role of AI in human resource management. *International Journal of Scientific Research in Engineering and Management, 8*(4), 1–4. https://doi.org/10.55041/IJSREM31361

Vaughan, K., & Carroll, K. (2020). *The case to increase workforce training for artificial intelligence*. Retrieved from https://www.nextgov.com/ideas/2020/08/case-increase-workforce-training-artificial-intelligence/167782/.

Verlinden, N. (2024). *ChatGPT for HR (in 2024): What Can ChatGPT Do?*. Retrieved from https://www.aihr.com/blog/chatgpt-for-hr-guide/.

Vijai, C., & Mariyappan, M.s.R. (2023). Robotic Process Automation (RPA) in human resource functions. *Advances In Management, 16*(3), 30–37. https://doi.org/10.25303/1603aim030037

Walsh, T. (2015). More STEM education won't protect our jobs from robots. *The Conversation*. Retrieved from https://theconversation.com/more-stem-education-wont-protect-our-jobs-from-robots-41365.

WEF. (2016). *The future of jobs. Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*. World Economic Forum. Global Challenge Insight report. Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf.

Zirar, A., Ali, S.I., & Islam, N. (2023). Worker and workplace Artificial Intelligence (AI) coexistence: Emerging themes and research agenda. *Technovation, 124*, 102747. https://doi.org/10.1016/j.technovation.2023.102747