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Mastering digital transformation in workforce management

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ABSTRACT

Digital technologies are transforming workforce management and impacting practically every aspect of organisations. The need for digital transformation (DT), that is, the ability to develop digital capabilities aligned with workforce needs, is high on the agenda to tackle volatile, uncertain, complex and ambiguous challenges in operations research. Surprisingly, little is known about digital transformation in this context that creates and captures value. Thus, this study shows how mapping workforce management opportunities and challenges within the DT environment can help operations thrive in the digital world.

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1. Introduction

Digital transformation (DT) in workforce management has profoundly impacted organisations through cutting-edge digital technologies (e.g. artificial intelligence [AI], blockchain, Internet of Things, cloud computing and big data) in the form of enhanced operational efficiencies, reduced costs, greater firm performance, robust organisational design and future-proofing for tomorrow's high-performing organisations. Vial (2019, 121) defines DT as 'a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies'. The most critical strategic partnership in the context of DT is the coupling of the workforce and digital platforms to tackle the organisation-wide challenge of DT (Caldwell et al. 2023). Since 70% of DT efforts fail, it is critical to align digital strategy with workforce management strategy, the organisation's growth and innovation potential and overall firm performance initiatives (Deloitte 2023). Recent research shows that there is only a 31% increase in revenue and 25% expected cost savings, while 89% of large companies worldwide have adopted DT (Lamarre et al. 2023). These results indicate the necessity of robust workforce management in the DT environment to create and capture value through the pairing of workforce and technology in performance management, employee engagement and embracing diversity, equity and inclusion. According to Schrage et al. (2023, 1), 'Even as machine learning algorithms and generative AI transform enterprise capabilities, human judgment remains the

overwhelmingly dominant approach to KPI enhancement'. Thus, this paper aims to identify the opportunities and challenges of DT through the lens of workforce management in post-COVID production planning and develop future research guidelines. It also aims to enhance our understanding of DT and workforce management practices in operations by showcasing recent evidence-based insights and proposing a more integrated and nuanced understanding of the concept.

2. Opportunities of digital transformation in workforce management

DT integrates evolving digital tools and technologies, such as mobile apps, software, big data, social media, cloud computing, analytics, artificial intelligence, and machine learning algorithms, and emerging embedded services to streamline business operations, improve diverse stakeholders' user experience, and confirm business continuity growth (Bansal et al. 2023). Like all other sectors, DT has revolutionised how human resource professionals manage workforces in modern organisations. DT in workforce management (DTWM) leverages digital tools and analytics to innovate the entire work management process and how works are performed on-site and remotely in the most efficient and effective means (Nicolás-Agustín, Jiménez-Jiménez, and Maeso-Fernandez 2022; Bansal et al. 2023). We conceptualise DTWM as the process of leveraging digital tools and technologies to create new or modify existing business processes, structures, and cultures to optimise and streamline the organisation's people management systems, resulting in operational efficiency and

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better engagement of people contributing to innovative products and services, leading to enhanced individual and organisational competitiveness. It improves operational efficiency, engagement, productivity, and overall organisational performance in the competitive dynamic environment (Nadkarni and Prügl 2021). The OECD estimates that 1.1 billion jobs will be radically transformed by technology in the next decade (Tupper and Ellis 2022). To cope with this changing trend, Unilever implemented a project in 2016 to equip their 155,000 staff members for the evolving nature of work, i.e. a 'future-fit plan' for each employee. This project articulated individual goals, anticipating potential changes or obsolescence of their current roles and determining the required skills for adapting to future positions. The program yielded positive results, for example, an estimated 49% increase in intrinsic motivation among employees who participated in purpose workshops (Harvard Business School 2020). According to Gartner's 2018 Digital Dexterity Survey cited in Kropp, Smith, and Cain (2021), 90% of corporate executives consider digitalisation a paramount concern, representing a significant and comprehensive challenge for them to transform the beliefs, mindsets, and behaviours of leaders and employees throughout the entire organisation, extending beyond the realm of information technology. Below are examples of how digital transformation can improve efficiency and streamline HR processes to create more agile and engaged workforce management.

2.1. Streamlining employee recruitment, onboarding and talent management process

DTWM can streamline traditional recruitment, onboarding, and talent management processes to optimise the HRM functions, accelerating the organisation's innovation capability and competitiveness in the age of the talent war (Bondarouk, Parry, and Furtmueller 2017; Frankiewicz and Chamorro-Premuzic 2020). By leveraging AI and machine learning algorithms, organisations can optimise the recruitment and selection process by automating resume screening and identifying top-talented candidates who can help achieve the organisation's strategic goals (Guerra, Danviladel-Valle, and Méndez-Suárez 2023; Berkelaar 2017). For instance, the HR department can leverage AI-powered applicant tracking systems, advanced analytics, and automated screening tools to efficiently source, screen, and assess candidates (Van Esch, Black, and Ferolie 2019). Furthermore, digital platforms enable businesses to engage in cyber-vetting to streamline the recruitment process, such as job postings, reaching a wider talent pool, resulting in reduced time-to-fill and improved quality of hires (Berkelaar 2017). To minimise the subjective, inefficient, and biased hiring process, an AI-powered hiring platform, 'Pymetrics', can objectively assess existing skills against the criteria set out in the job descriptions and specifications. Furthermore, this platform can direct unsuccessful 'silver medalist' candidates towards alternative job opportunities that best match their qualifications, skills, and expertise (Lewis 2018). Johnson & Johnson used the 'Textio' platform to streamline the hiring process by

eliminating gender-biased language in their digitally enabled recruiting system, resulting in 90,000 more women per year applying for its science and technology positions (Klahre 2023).

Similarly, DTWM can streamline onboarding using online platforms, interactive training modules, and virtual mentoring programs. Through digital transformation, HR professionals can deliver personalised onboarding experiences, facilitate knowledge transfer, and ensure new hires quickly become productive team members (Landers and Sanchez 2022; Babic et al. 2021). They can use gamification and the company's products or services to onboard new hires and familiarise them with the brand, values, and culture (Silic et al. 2020). For instance, Deloitte created an onboarding game called 'Zombie Apocalypse' for new analysts. This game simulates some crisis situations where newly hired analysts must collaborate to solve problems, learn about Deloitte's culture and values, and earn badges and rewards (Kim 2015).

Over the last decade, DT has empowered HR to have real-time visibility into talent data and analytics to adopt employee-centric talent management strategies. DT has streamlined the entire talent management process for HR professionals by adopting and implementing employee-centric talent management strategies, ensuring agile people are in the right place and in real-time (Frankiewicz and Chamorro-Premuzic 2020; Wiblen and Marler 2021). For example, the Oracle Talent Management Cloud suite assists the HR department in recruiting, developing, and retaining their top talents by setting and measuring KPIs, employee engagement, career planning, and succession planning (Wilkins 2012). Therefore, HR professionals need to continuously familiarise themselves with the evolving digital landscape to optimise the full potential of their talents (Kim-Schmid and Raveendhran 2022).

2.2. Enabling data-driven workforce planning and decision-making

By leveraging digital tools and technologies, HR professionals can replace gut-feel decision-making with a more data-driven approach to optimise workforce planning and employee engagement, leading the firm to remain competitive (Waller 2020). Using data and analytics, HR managers gain insights into critical employee metrics such as workforce trends, employee engagement, turnover, and productivity, thus allowing them to identify trends, predict future HR needs, and develop targeted strategies for talent management, retention, and succession planning (Akter et al. 2019; Shet et al. 2021; Margherita 2022). Digital transformation was instrumental in ensuring a smooth transition to remote work during the Covid-19 pandemic. The COVID-19 pandemic played a critical role in organisations adopting digital technologies faster than anticipated before the pandemic in early 2019 to engage better and manage the remote workforce, maintain productivity, and support employee well-being (LaBerge et al. 2020). For example, SAP SuccessFactors Talent is a comprehensive cloud-based platform that is used for onboarding, workforce planning management systems, recruiting, analytics, and compensation and analytics to

attract, develop and retain talent by storing and managing talent information in real-time from anywhere in the world (Traynor et al. 2021).

2.3. Performance management and career development

The future of performance management is becoming more data-driven, flexible, continuous, and development-oriented (Schrage et al. 2019). DT offers HR professionals state-of-the-art technologies capable of real-time monitoring of employees' engagement and job performance against key performance indicators while identifying skill gaps and suggesting relevant training and development opportunities for career advancement (Jaiswal, Arun, and Varma 2022; Li, Rao, and Wan 2023). This fosters a double-loop learning culture of continuous improvement, boosts employee engagement, and supports timely recognition and development opportunities (Smith 2019; Nicolás-Agustín, Jiménez-Jiménez, and Maeso-Fernandez 2022). Digital platforms provide extensive employee learning and development opportunities, granting access to various training courses, webinars, and educational resources. Platforms like virtual reality (VR) and augmented reality (AR) enable employees to learn at their own pace, customise their learning paths, and acquire new skills relevant to achieving the organisation's strategic goals (Farshid et al. 2018). For instance, Deloitte utilises a digital tool called 'ConnectMe' to streamline its performance management process. The tool enables employees to create performance profiles, set goals, receive feedback, rate their skills and competencies, and view performance ratings (Buckingham and Goodall 2015). Similarly, Accenture leverages its digital learning platform, MyLearning, to offer employees access to thousands of courses, podcasts, videos, and books on various topics and skills, along with personalised learning paths based on their goals and interests (Accenture 2016).

2.4. Employee engagement and retention

Tupper and Ellis (2022) cited Gartner's prediction, stating that employee turnover rates in the coming years may reach 50–75% higher than historical rates in the pre-COVID-19 era. This supports the scholarly concern known as the 'great resignation'. Additionally, the situation has been further exacerbated as filling vacant roles now takes 18% more time than before the pandemic. In the current talent war, employee engagement has been a crucial mechanism for retaining top talents (Bhatnagar 2007). Effective workforce management strategies have increased employee satisfaction and retention (Morgan 2017). Digitally enabled workforce management systems provide HR professionals with real-time reporting and analytics on performance trends, training effectiveness, and workforce planning (Angrave et al. 2016). Consequently, digital workforce transformation can enhance employee engagement and retention through personalised learning experiences, ongoing double-loop feedback mechanisms, recognition programs, and career development opportunities with market-based compensation and fringe benefits (Wang et al. 2021). For instance, IBM utilises data analytics to identify skill gaps, predict turnover, and optimise talent acquisition and retention.

IBM's AI-enabled 'predictive attrition program', Watson, can predict the likelihood of an employee's turnover within the next six months with a 95% accuracy rate (McLaren 2019). Similarly, Microsoft's Viva Glint, an employee experience platform, analyses employees' sentiment and collaboration data to gauge employee engagement and well-being, enabling organisations to understand the voice of employees better and improve employee engagement and performance, ultimately contributing to higher productivity (Kim-Schmid and Raveendhran 2022).

2.5. Employee well-being and mental health

Workforce management strategies now prioritise creating and maintaining a more supportive work environment by offering wellness programs, providing mental health resources, and promoting work-life balance due to their proven positive effects on workplace outcomes (Guest 2017). DT can expedite employee well-being programs by providing genuine technologies and resources to uplift mental health, reduce stress, and ensure work-life balance. As part of targeted interventions to promote employee well-being and mental health, HR departments have been offering employee assistance programs, wellness apps, and virtual wellness activities to ensure a healthier and happier workforce (Wasil et al. 2022). For example, AI-enabled machine learning devices can monitor the health and wellness of employees using sensors, wearables, and biometrics (De Keyser et al. 2021). Microsoft is developing a smartwatch-based system to collect employees' heart rate and blood pressure data. This gathered information can create individualised 'anxiety scores' used to offer personalised wellness recommendations to improve their health habits, such as required sleep, exercise, and nutrition (Thiel et al., 2022). Furthermore, virtual assistants and AI-powered chatbots can provide real-time support and guidance to manage stress, anxiety, and burnout. These technologies played a crucial role in identifying possible COVID-19 exposures, implementing preventive actions, and ensuring a safer work environment for employees (Li and Guo 2020). Remote team collaboration, social interaction, and access to mental health resources have become more accessible than ever before through virtual employee engagement platforms, wellness apps, and communication tools. Headspace is an app that offers guided meditation, mindfulness exercises, and sleep stories to assist employees in managing their anxiety, depression, and insomnia (Wasil et al. 2022).

2.6. Diversity, equity, and inclusion

DT has enabled HR professionals to collect, analyse, and report on DEI metrics using AI-powered digital technologies and proactively address DEI-related challenges to create a more inclusive workplace. Digital tools and technologies can enhance data-driven HR decisions and address unconscious biases in talent acquisition and retention by eliminating machine learning algorithms related data, model, and deployment biases (Akter et al. 2022; Pinkett 2023). For example, the pervasive underrepresentation of women in

Table 1. Future research avenues.

Research area	Research avenues
Streamlining the recruitment and selection process	<ul style="list-style-type: none"> • How and to what extent does digitalisation impact the quality and diversity of the candidate pool in the recruitment process? • How does using artificial intelligence and machine learning algorithms enhance the talent acquisition 'process's accuracy and objectivity that mitigates key 'stakeholders' fairness concerns, e.g. job seekers and regulators? • How do 'candidates' behaviours and expectations evolve due to the digitalisation of the recruitment and selection process, and how can organisations adapt to meet these ethical and changing demands?
Performance management and employee engagement	<ul style="list-style-type: none"> • How does digitalisation impact the performance evaluation system's accuracy, objectivity, and effectiveness in fostering 'employees' sense of cooperation and belonging, particularly in a globally dispersed workforce? • How does digitalisation impact the fairness perception of employees about measurement and assessment of their engagement and emotional well-being?
Health and well-being	<ul style="list-style-type: none"> • How can digital technologies and applications be leveraged to promote employee health, well-being, and workplace dignity? • What are the emerging challenges and opportunities of leveraging digital technologies and biometrics devices for monitoring and improving employee mental health and stress management? • How does digitalisation impact measuring and evaluating 'employees' mental health and well-being outcomes and their relationship to productivity, job satisfaction and work-life balance?
Diversity, equity, and inclusion	<ul style="list-style-type: none"> • How can digital transformation advance diversity, equity, and inclusion practices to mitigate growing concerns about fairness and inclusion of classified groups? • How can organisations ensure digital technologies help eliminate bias and promote fairness in providing equal learning and career advancement opportunities? • How does digitalisation impact the representation, engagement, and advancement of underrepresented groups within the organisation?
Surveillance and monitoring	<ul style="list-style-type: none"> • How does digital transformation enable surveillance and monitoring of employees in the workplace, and what are the implications for employee privacy and trust? • How can organisations reshape traditional attitudes and perceptions of employees towards workplace surveillance and monitoring technologies? • What are the ethical and legal considerations and consequences of implementing and using surveillance and monitoring tools in workforce management, and how can organisations balance productivity and employee privacy?
Workforce analytics-based decision-making	<ul style="list-style-type: none"> • What challenges and opportunities are associated with using workforce analytics to support strategic resource allocation, training and succession planning? • How can organisations ensure the ethical and responsible use of workforce analytics to avoid unintended consequences or biases in decision-making processes? • How can organisations establish trust among stakeholders about acceptance of decisions generated by workforce analytics for distributive and procedural justice in workforce management decisions?

senior positions worldwide leads to inadequate training data for machine learning algorithms, resulting in unconscious biases that impact the promotion of women and widen the gender pay gap (Benjamin 2021; Akter et al. 2022). To address unconscious biases in HR practices, AI-driven technologies can establish more consistent and objective criteria for hiring, performance evaluation, and promotion (Köchling and Wehner 2020; Cachat-Rosset and Klarsfeld 2023). For example, AI-powered machine learning algorithms can remove biased words from job descriptions and reduce biases in resume screening and interviewing by focusing on the skills and qualifications of the candidates rather than their demographic characteristics, leading to a more diverse and inclusive work environment (Daugherty, Wilson, and Chowdhury 2018). One exemplary case is Terex Corporation, a global industrial machinery and components manufacturer, which has employed technology to attract more women, veterans, and under-represented communities into their workforce (Benjamin 2021).

3. Challenges of digital transformation in workforce management

DT in workforce management allows organisations to create an agile, productive, and employee-centred HR system to attract, retain, and nurture top talents, enhancing organisational performance in a highly competitive environment. Despite these benefits, DT poses considerable challenges for

workforce management in various stages, such as planning, organising, leading, and controlling human resources. Following are some examples of challenges and how to systematically mitigate those emerging challenges.

3.1. Algorithmic bias in talent acquisition

Algorithmic bias occurs when an algorithm consistently generates unfair or discriminatory outcomes towards a specific group of individuals based on their demographic and socio-economic cultural characteristics, such as gender, income, ethnicity, or age (Lavanchy et al. 2023; Meijerink et al. 2021). Algorithmic bias can perpetuate biases in recruitment and selection practices by replicating and amplifying existing disparities and discriminatory patterns (Bogen 2019). For example, Amazon's recruiting AI algorithm was built using existing hiring data as the training set, and it filtered out women who had anything on their resume indicative of their gender, such as mentioning women's colleges or having female names (Lavanchy 2018). Addressing such algorithm biases is essential, and this can be achieved by scrutinising the dataset used to train algorithms, employing fairness-auditing, incorporating human oversight, and continuously monitoring and auditing the algorithm's performance to ensure equitable and unbiased recruitment and selection practices (Akter et al. 2022; Hunkenschroer and Luetge 2022). The data used to train and evaluate algorithms for talent acquisition must be representative, diverse, and unbiased

(Raghavan et al. 2020). Interestingly, the algorithm can also detect and mitigate bias in existing hiring practices by identifying patterns of discrimination, providing feedback to recruiters and managers, or suggesting alternative candidates (Logg 2019). Addressing algorithmic bias in recruitment and selection is crucial for fostering a fair and inclusive hiring process, leading to a more diverse and innovative workforce. Achieving this goal requires a combination of regular algorithm audits, monitoring, organisational commitment to diversity and inclusion, and ongoing vigilance to ensure fairness in hiring practices (Akter et al. 2021).

3.2. Data privacy and security concerns

Due to digital transformation, HR decisions are more data-driven than ever before. Data privacy and security emerge as significant challenges for implementing a digital workforce management process as it involves collecting and analysing employee data. This raises privacy concerns, especially if sensitive personal information is accessed or shared without proper consent or security measures (Bhave, Teo, and Dalal 2020). For instance, machine learning-enabled HRIS systems leverage personal data to monitor employees' performance, engagement, and well-being in a digital environment (Vrontis et al. 2022; Bhave, Teo, and Dalal 2020). A growing number of data breach events and unethical employee data access and use have been raising privacy and security concerns. Many employees perceive that their right to privacy is threatened, which may result in reduced work autonomy, motivation, job loss, and productivity (Alge and Hansen 2014). For example, integrating cloud-based HR management systems entails storing and managing sensitive employee data, heightening the potential for data breaches without adequate security measures. Organisations must prioritise data privacy and security by implementing robust security protocols, encrypting data, and complying with relevant data protection regulations (Vrontis et al. 2022; Rahnama and Pentland 2022), such as the General Data Protection Regulation (GDPR) in the European Union or the California Consumer Privacy Act (CCPA) in the United States.

3.3. Surveillance and monitoring

Workforce management technologies recurrently use algorithm-based systems to monitor employee actions, such as tracking working hours, internet usage, or location using webcam, screenshots, keystrokes, location tracking, facial recognition, biometric sensors, and wearable devices (De Keyser et al. 2021; Blanco-Gonzalo et al. 2018, Leicht-Deobald et al. 2019). Surveillance and monitoring help organisations enhance employees' performance by providing real-time feedback, identifying problems, and optimising resources to facilitate learning, development, and collaboration (Kensbock and Stöckmann 2021; Tursunbayeva et al. 2022). In addition to ethical and legal hurdles, continuous performance monitoring and digital reporting can lead to stress, burnout, and a lack of trust culture within the workplace. These factors can significantly affect employees' work-life balance (Kensbock and

Stöckmann 2021). To mitigate the adverse impacts of surveillance and monitoring on employees' well-being, it is crucial to establish clear and up-to-date regulatory frameworks that encourage social dialogue, employee consultation, and good governance practices at the organisational level (Thiel et al., 2022; Tursunbayeva et al. 2022).

To tackle these significant challenges, organisations need to employ a mix of strategic planning, efficient change management, comprehensive employee training and support, strong security measures, seamless system integration, and cultural transformation initiatives. By proactively addressing these issues, organisations can optimise their workforce management processes and fully harness the potential of digital transformation.

4. Conclusion and future research directions

DT in workforce management presents vast opportunities for HR professionals to efficiently carry out HR functions, aiming to attract, retain, and effectively manage top talents capable of contributing to the organisation's strategic goals in a dynamic environment. Consequently, embracing DT is no longer a choice exclusive to forward-thinking large companies seeking improved efficiency; it has become essential for all organisations to thrive and grow in the competitive business world. By embracing emerging technologies in the digital transformation era, organisations can streamline recruitment processes, enhance employee experiences, and drive overall performance. To fully harness the benefits of DT, businesses must invest in robust HR technology infrastructure, ensure data security and privacy, and prioritise the upskilling of HR professionals. By seizing these opportunities, organisations can build agile and future-ready workforce management ecosystems, contributing to long-term success. The emerging trends in workforce management and operations reflect the evolving nature of work, the impact of technology, and the changing expectations of employees (see Table 1). Organisations that successfully adapt to these trends can create a competitive advantage by attracting and retaining top talent, optimising operations, and fostering a culture of innovation and agility in the competitive business environment.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Shahriar Akter is a Professor of Marketing and Associate Dean of Research at the Faculty of Business & Law at UOW, Australia. He earned his PhD from UNSW Business School, Australia, with a fellowship in research methods from the University of Oxford. In 2021 and 2022, the Australian Newspaper's Research Magazine recognised him as one of the Top Australian Business Researchers. In 2022, he was also featured as one of the leading

academic data leaders in the world by CDO magazine, led by MIT Sloan Management School. He has published in leading business and management journals with over 100 publications, including 70+ A or A* ranked articles in the ABDC list. He is among the top 1% of scholars worldwide, according to Clarivate's 2022 list, with an h-Index of 48 and over 15,000 citations. In recognition of his excellence in teaching and contributions to global strategy and research, he has received the UOW Vice Chancellor's Awards and several prestigious research awards. Additionally, he holds editorial roles in several prominent academic journals and has served as a visiting Professor at the University of Michigan, Shanghai Jiao Tong University Joint Institute in China, and Toulouse Business School in France.



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