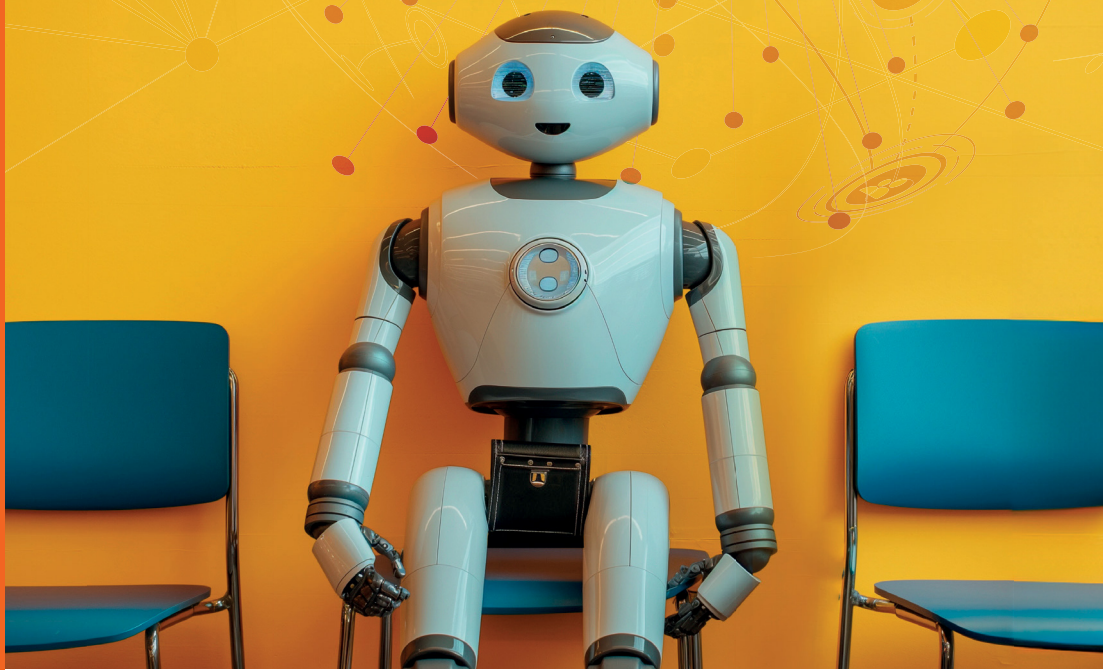
Artificial Intelligence AND THE New World of Work



Deseré Kokt & Laetus O.K. Lategan [Eds]

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Artificial Intelligence and the New World of Work

Deseré Kokt & Laetus O.K. Lategan (Editors)

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Laetus O.K. Lategan & Deseré Kokt

Orientation

Artificial Intelligence and the New World of Work

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The pervasive influence of artificial intelligence (AI) is an undeniable reality in the modern world, affecting governments, organisations, and individuals. AI is transforming our environment through applications such as natural language processing (NLP), machine learning, and expert systems, enabling organisations to operate with greater efficiency and effectiveness.

This book contributes to the discussion on the benefits and implications of AI by examining it within the context of the workplace. The authors offer a critical perspective on AI in what can be regarded as the new world of work. They are evaluating and reflecting on current and future technological developments that are already reshaping industries and the way in which modern humans interact with their jobs and the concept of "work".

Three lenses have been identified for examining AI and the workplace.

The **foundational lens** explores the evolving landscape of the modern workforce, emphasising the transformative shifts that are redefining our understanding of work and how AI and emerging technologies influence the world of work. Topics such as talent management and work design, affective computing, consumer behaviour and sustainable development are analysed to comprehend their contributions to shaping the new world of work.

The **strategic lens** highlights the essential role that human resources and education play in equipping individuals

with the skills and knowledge required to succeed in this new era of work, preparing employees to navigate the demands of an ever-changing job market. In this lens, the focus is on how professors, as academic leaders, and scholarship, as the hallmark of academic endeavour, are preparing future employees for the requirements of the new world of work.

The **operational lens** provides deeper insights into various industries, analysing how they are shaped by emerging AI workplace dynamics. The identified industries encompass both those recognised for their use of AI, such as the healthcare, auditing, tourism, and hospitality sectors, as well as those less associated with AI, such as faith-based organisations.

These lenses emphasise the necessity for professional ethics in the increasingly AI-driven workplace. Professional ethics, rightfully, straddles the three lenses. Each lens should be mindful of motive, duties and consequences.

Twelve chapters, authored by 30 contributors from six national, four international universities and one society offer diverse perspectives. The authors bring together insights from different disciplines that play a crucial role in enhancing employment readiness, which fits primarily in human resources studies. Each lens concludes with a brief discussion piece on an aspect of AI and the world of work. These pieces aim to enrich the dialogue rather than present primary research findings.

In the **foundation lens**, Deseré Kokt investigates how the evolving new world of work has reshaped our understanding of work, and the competencies required for success in the contemporary workplace. Mothepane Seqhobane and Deseré Kokt continue to outline the benefits of AI for the workplace by showing how the use of AI in talent management will become increasingly crucial to foster a high-performing, diverse, and satisfied workforce. Laura Ilg and Deseré Kokt return to the value that AI adds to the workplace by arguing how affective computing is increasingly being used by businesses and marketers to better understand consumers' decisions, which are often shaped by unconscious emotional responses. Dennis Bader presents a case that AI should be increasingly regarded as a tool that can promote sustainable development. He argues his viewpoint from three

perspectives, namely economic, social and ecological. Undoubtedly, the growing capabilities of the interplay between AI and sustainable development hold not only benefits but also challenges.

In the **strategic lens**, Eli Bitzer, Ulrich Holzbaur, Laetus Lategan, Corli Witthuhn, Herkulaas Combrink, and Ketshepileone Matlhoko outline the role of professors, as the academic leaders, should contribute towards AI in educating and training future employees. Initial scepticism towards AI / GenAI is gradually being replaced by incremental steps to integrate AI / GenAI systems and tools into essential academic activities, including teaching, learning, assessment, research practices, and community engagement within universities. Their perspectives are complemented by Ben Kotze, Mark Frederiks, Deseré Kokt, Laetus Lategan, Wanda Odendaal and André van der Merwe, who positively identify AI's role in enhancing scholarship. They highlight AI's capacity to personalise education, automate research processes, and support inclusive, lifelong learning.

In the **operational lens**, the focus is on five different industries, which contribute to our understanding of the AI-based and informed workplace. Moira Lewitt, Laetus Lategan, Antonio Lentoor, and Gert van Zyl discuss the challenges of preparing patients and healthcare workers for a changing AI-based and informed healthcare industry, particularly regarding its impact on the patient-doctor relationship and the implications for practising ethics and educating healthcare workers. Eben Proos and Bianca de Klerk offer a comprehensive exploration of the future of AI in the tourism industry and how AI is poised to revolutionise tourism. Jaydee Snyman and Deseré Kokt examine the hospitality industry and explore how automation is becoming increasingly prevalent in this sector. Their focus is on the impact of AI and digital technologies on service delivery, customer experiences, and employee roles. Léandi Steenkamp and Nandi O'Connell demonstrate how the rapid advancement of AI, along with digital transformation and remote work, has fundamentally transformed the operational landscape of internal auditing by analysing how internal auditors are adapting to these changes. Kobus Schoeman, Jan-Albert van den Berg, and Laetus Lategan argue that although technology and digitalisation are not new to congregations, these

faith-based institutions are still navigating the relationship between congregational culture and a world influenced by AI. As workplaces, congregations cannot ignore the realities of AI. Simultaneously, they should prepare their members to succeed in an AI-informed environment. Petronella Jonck, Laetus Lategan, Ben Marx, and Hannelie Jansen reflect on the role of ethics prompted by AI in the world of work. While existing ethical guidelines are useful for directing ethical behaviour, additional considerations, such as an ethical governance framework aligned with human-centric values, are also necessary.

Olivier Guyottot, Nqobile Mbhele and Philina Wittke contributed to the discussion pieces, focusing on universities' training relevant to communities and networks, innovation and creativity and the role of humans versus machines in an AI-based working environment.

In conclusion, Laetus Lategan and Deseré Kokt provide an overview of the implications and consequences of AI in the workplace. While AI is transforming the workplace, hence the reference to the new world of work, it also highlights the unique and irreplaceable role of humans. The specific roles of humans within the workplace are clear: *critical thinking, accountability, responsibility, compassion, ethical behaviour, and networking.*

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Part 1

The Foundational Lens

The Fourth Industrial Revolution (4IR) is characterised by the integration of digital, physical, and biological technologies, with artificial intelligence (AI) playing a vital role in reshaping the contemporary workplace. From a human resources standpoint, AI significantly enhances organisational productivity and effectiveness by improving quality, ensuring worker safety, and facilitating data-driven decision-making. This transformation marks a fundamental shift in how organisations manage talent, design work, and structure their operational frameworks.

Despite the advancements brought about by AI, the workplace faces significant challenges, including climate change and global social upheaval, which continue to influence labour dynamics and organisational strategies. Therefore, it is crucial to consider AI in the context of these societal issues and the growing demand for sustainable development goals (SDGs), planetary health, and global peace.

When applied thoughtfully, AI can help to foster better work environments, enhance trustworthiness, and support societal well-being in alignment with the SDGs. This approach invites a deeper examination of the changes in human resources driven by AI, seeking solutions to address challenges associated with AI implementation in the workplace, all while promoting growth and development.

Furthermore, the collaboration between AI, talent management, and work design is poised to transform the workplace, bolster employee well-being, and maintain organisational

competitiveness in a rapidly evolving environment. A promising area in this context is affective computing, which businesses and marketers are increasingly using to gain insights into consumer behaviour, often driven by unconscious emotional responses.

Chapter 1

Artificial Intelligence as a Driver for the New World of Work

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Abstract

The world has witnessed massive technological expansion and development since the 1970s. Notable technological advancements for this period, known as the Third Industrial Revolution (3IR), included computer technology, mobile technology, partial automation technology and the Internet. These developments enabled the evolution of more advanced technologies, which heralded the Fourth Industrial Revolution (4IR). The 4IR is about the fusion of the digital, physical, and biological world using artificial intelligence (AI) as the lynchpin. AI enables machine learning, automation, cloud computing, robotics, Internet of Things (IoT), biotechnology, augmented reality and the like. The 4IR is aimed at making organisations more effective and efficient by enhancing production, increasing quality, improving worker safety, and using data-based tools for better decision-making. The main objectives of the chapter are to conceptualise AI, to examine the challenges that shape the new world of work, and to make a case for the adoption of growth mindsets in advancing learning and development on both individual and organisational levels. The chapter also contextualises the importance of global competencies for the new world of work.

Introduction

Incessant globalisation and the evolving Fourth Industrial Revolution (4IR) technologies created a competitive new world of work that requires organisations to be innovative and for employees to work in a digitally interconnected workplace, performing jobs that are more psychologically and emotionally demanding than ever before. Information and Communication Technology (ICTs) and the Internet have also created a mobile workforce that is increasingly connected to the workplace. This has pronounced implications for employee wellness, motivation, and work-life balance. Humans play a vital role in designing and implementing current and future technologies; thus, humans cannot be separated from technological advancement in the digital age. This notion is supported by Deloitte (2024), which refers to 4IR as being "human-powered", accentuating the critical importance of humans driving the processes.

The evolving new world of work has reshaped our understanding of work and the competencies needed for success in the contemporary workplace. According to Rüth and Netzer (2020), the new world of work is characterised by digital technologies, increased workforce diversity, changing organisational structures, evolving work methods, heightened business innovation, increased competition within markets and flexible work arrangements. These forces have collectively created the "new world of work", increasing the challenges placed on both individual employees and organisations. The disruptions caused by globalisation and ICTs resulted in organisations reconsidering their competitive advantage globally (Barcelos, 2018; Raskovich *et al.,* 2024). Attaining a competitive advantage is often linked to technology adoption, which can have dire consequences if neglected. Notable examples of companies that failed to adopt innovative technologies and became obsolete are Blackberry and Kodak.

AI as an area of computer science enables the performance of complex tasks such as reasoning, decision-making and problem-solving based on massive amounts of structured and unstructured data (big data). AI has and will continue to impact all industries and the ways in which humans live, work, and interact with one another (Raskovich *et al.,* 2024). This is likely to pose

massive challenges for organisations that need to upskill and reskill employees. Gaining insight into the competencies needed for the AI-enabled future should elicit informed responses from management and human resource professionals in navigating the future world of work (Jesuthasan & Boudreau, 2018).

Artificial intelligence explained

The term "artificial intelligence" or "AI" was coined in the 1950s (Korteling *et al.*, 2021). AI simulates human intelligence by using algorithms for speech recognition, decision-making, problem-solving, learning and understanding natural language. Algorithms were first created by the Arab mathematician Abu Abdullah Muhammad ibn Musa al-Khwarizmi, also known as Al-Khwarizmi, in the ninth century. Algorithms are sequential mathematical instructions to complete tasks or solve problems (Gorodin, 2022).

AI can be classified into two types, namely (a) narrow (or weak) AI, designed to perform a specific task like voice assistants or recommendation systems, and 2) general (or strong) AI, which can understand, learn, and apply knowledge in a wide range of contexts, emulating human cognitive abilities (Fjelland, 2020). It can also perform tasks like detecting irregularities, recognising patterns, and making fact-based decisions and predictions. AI uses machine learning algorithms and data analytics to perform tasks that typically require human intelligence (Khan & Alotaibi, 2020).

Generative AI (GenAI), notably ChatGPT, can produce new content, designs, provide responses, compose emails, articles, and essays; it can also perform simulations, compose music, videos and code (Budhwar *et al.*, 2023). The first version of ChatGPT was launched in 2022 by OpenAI, and the latest version, ChatGPT5, was launched in August 2025.

Challenges shaping the new world of work

The World Economic Forum - WEF (2024) notes that around 23% of jobs are likely to change in the next five years, with around 69 million jobs being created and around 83 million likely to be eliminated. This elevates the need for upskilling and reskilling a future workforce.

The following challenges are likely to shape the foreseeable future of work (The Future of Jobs Report, 2023).

The lingering effects of the coronavirus disease 2019 (COVID-19) pandemic and the cost-of-living crisis. Although both developed and developing countries are confronted with the persistent economic effects of the COVID-19 pandemic, developing countries are more at risk. This is because of rising global interest rates, exacerbated debt and poor growth (Patterson *et al.,* 2021).

Environmental degradation remains a great concern. Environmental issues take centre-stage as there is an ongoing need to manage climate change, the use of fossil fuels, governance, food wastage, loss of biodiversity, deforestation, air pollution, the melting ice caps and rising sea levels, the acidification of the oceans, agriculture, food and water security, fast fashion and textile waste, overfishing, cobalt mining and soil degradation. These challenges need unified efforts from all countries and industries to be addressed (WEF, 2024).

Continued technological adoption will drive business and industry (Nyagadza *et al.,* 2022). This requires a new approach to talent management and the training and development of employees. The fastest growing jobs or roles are technology-related, with a prominent focus on AI and machine learning specialists, agricultural specialists, digital technology developers and educational experts. The fastest declining roles are clerical and secretarial.

The continuous training and development of management is a main imperative in an increasingly complex world of work. Managers need to navigate uncertainty, deal with technological change and development, adopt and integrate new processes and systems, understand and manage human behaviour and drive continuous technological transformation. This requires vision, strategic acumen and people-centred competencies. Managers also need to manage and navigate alternative work arrangements such as digital workplaces, remote and hybrid work, and changing organisational structures.

Employee wellness remains a concern for organisations as more emphasis is placed on job performance and digital integration in a highly complex workplace. Because of the

proliferation of ICTs, individuals are more connected to their jobs than ever before. This has implications for the overall health and well-being of employees.

These challenges persist within a work environment that necessitates employees' continuous upskilling and reskilling. As this is a major undertaking, it will require collaboration between the public and the private sector, and higher education and other training institutions.

Theoretical framework for technology adoption

As technology adoption happens on an individual level, it is imperative to ask the question of what makes people adopt new technologies. The Technology Acceptance Model is widely used to conceptualise technology adoption and was postulated by Davis in 1989. The Technology Adoption Model supports the notion that technologies that are beneficial and user-friendly are more likely to be adopted and integrated into the workflows of prospective users. This view accentuates the attitudes of users as crucial in adopting new technology. This is detailed in Figure 1.1 (Natasia *et al.*, 2022).

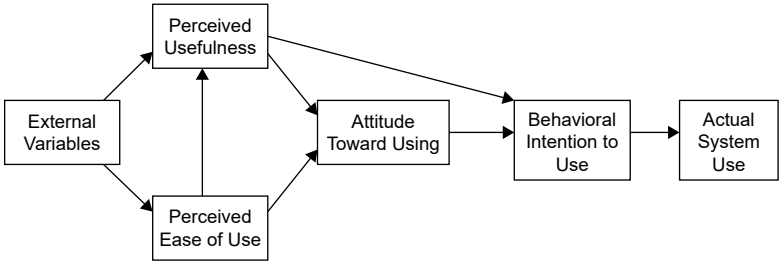


Figure 1.1: Technology Acceptance Model (Natasia *et al.*, 2022)

Another view of technology adoption is the Resource-based View proposed by Ali and Anwar (2021). This view emphasises the strategic importance of a firm's resources and capabilities in achieving competitive advantage. The theory posits that resources must be valuable, rare, inimitable, and non-substitutable to provide sustained competitive advantage. In the context of technology adoption, the Resource-based View focuses on the unique resources that organisations possess, such as advanced technological infrastructure and skilled staff.

The Technology Adoption Model and the Resource-based View, thus, postulate that technology adoption depends on the attitude of prospective users and the resources that organisations have available, both plausible scenarios. However, the willingness to learn something new, i.e. AI adoption, happens on an individual level, necessitating a mindset conducive to continuous learning and development. Creating a learning organisation is crucial given the challenges of the new world of work, especially new learning related to the rapidly evolving technological landscape. Learning organisations emphasise continuous learning, and by creating conducive organisational cultures, they can reinvent themselves (Griffin *et al.,* 2019).

According to Dweck, students' tacit assumptions about the essence of knowledge build a basis for inspiration and academic achievement. Dweck notes that the assumptions that people hold about themselves can be labelled as tacit theories of intelligence (Dweck & Molden, 2005). In later endeavours, Dweck changed the term "self-beliefs" to "mindsets", informed by subsequent experiments (Almeida *et al.,* 2017). According to the concept of "mindsets," implicit assumptions form divergent structures that affect motivation and achievement in different ways. For Dweck (1999), individual mindsets fall into two categories: fixed mindsets and fully developed mindsets. Individuals generally have tacit assumptions about the essence of intelligence, either believing that intelligence is a static trait or that wisdom and knowledge can be acquired through hard work and learning (Dweck, 2016; Dweck & Molden, 2005; Aditomo, 2015). The latter denotes a growth mindset, which implies that individuals are likely to persist in challenging situations and learn from setbacks and criticism.

These opposing mindsets shape how individuals perceive and respond in learning environments. Individuals with a growth mindset assume that their talents can be nurtured, improved, or created (Dweck, 2016). As a result, they outperform those with fixed mindsets. Individuals with a growth mindset generally put more effort into learning new concepts, honing their skills, and gaining more knowledge (Aditomo, 2015). Richardson, Bledsoe and Cortez (2020) used Dweck's mindsets theory to examine

the motivational behaviours of instructors teaching science, technology, engineering and mathematics (STEM) courses. The study aimed to evaluate fixed versus growth mindsets, engagement levels, and teaching methods. Findings showed that mastery orientation mediates the interaction between instructor mentality and teaching habits, meaning that a growth-mindset allows for reflection and improvement of teaching practices (Richardson *et al.*, 2020).

Tuoq's study expanded on Dweck's growth mindsets and suggests an extension to growth systems in organisations - adopted by several organisations in the United Arab Emirates (UAE, 2016), most notably, the Cabinet Secretariat. The growth system idea was inspired by Microsoft's restructuring success story, which was central to its success (Shibu & Lebowitz, 2019). Tuoq (2020) identified six factors geared at building a growth system, namely development mindsets, growth journeys, growth assignments, growth experiments, growth councils, and growth management. The growth system is displayed in Figure 1.2.

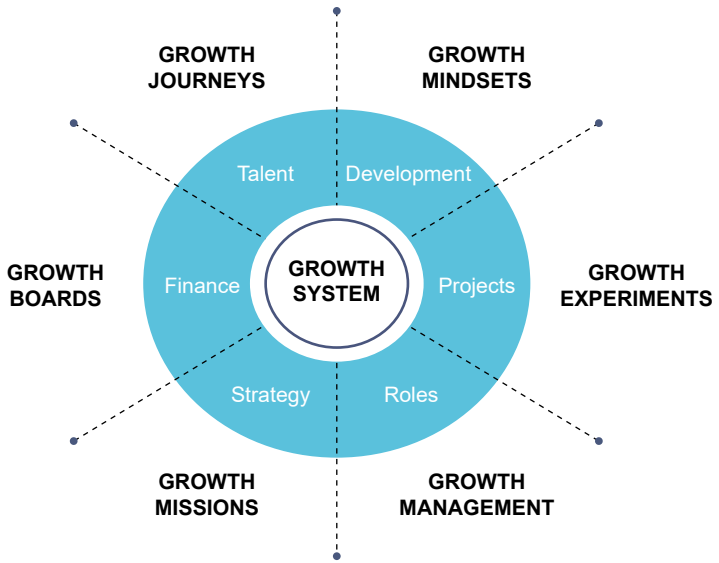


Figure 1.2: Six elements of growth systems
Source: Tuoq (2020)

Growth systems can potentially transform performance evaluations into growth journeys that call for continuous feedback and performance improvement. Traditional performance evaluations are generally ineffective in fostering job development, and employees often view performance evaluations as tedious annual traditions (Tuoq, 2020). The UAE Cabinet Secretariat again serves as an example where key growth indicators (KGIs) were introduced as opposed to key performance indicators (KPIs), thus emphasising a shift towards inspiring growth journeys.

Instilling growth systems thus proposes a shift from measuring performance to empowering growth. Growth systems can enhance learning and development, which can transform organisations. Learning and development should garner new insights, habits, and competencies that can help to achieve organisational goals (Cappelli & Tavis, 2016). Growth systems are not a departure from the growth mindset, as they identify the need for improvements in organisational systems to improve productivity and performance. Individual growth mindsets and ensuing growth systems for organisations can support learning and development, thus enhancing the upskilling and reskilling endeavours of organisations.

Global competencies for the future world of work

Continuous learning and development are essential for instilling a growth mindset, not just from a national but also from a global perspective. Developing global competencies can support the lifelong learning imperatives of organisations as they enable individuals to understand national and global intercultural issues with an appreciation for differing values and worldviews, being respectful in multicultural engagements and taking responsibility for collective well-being and sustainable development (UNESCO, 2014). This is detailed in Figure 1.3.

Competencies can be explained by considering four components. Knowledge (the basic understanding of truths, facts and principles of a specific field/topic), skills (mental or physical proficiencies acquired through specialised learning, like communication skills), attributes (the talents and characteristics

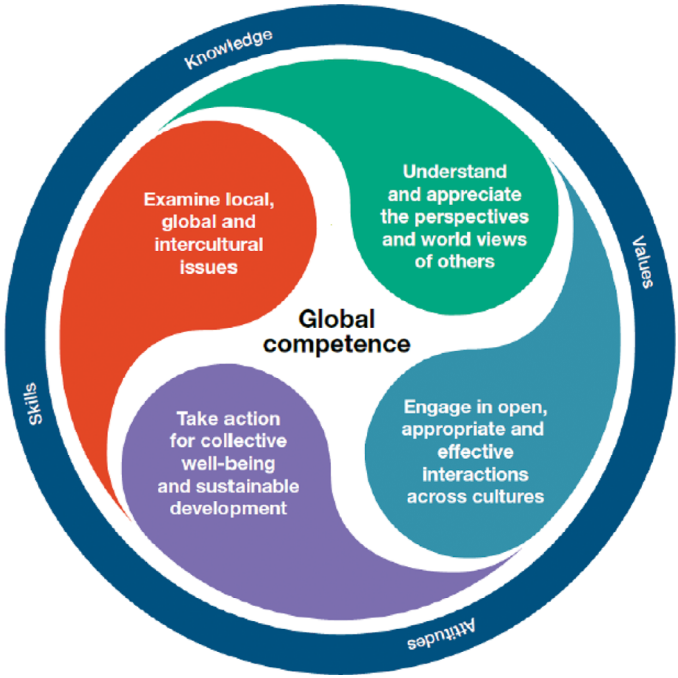


Figure 1.3: The dimensions of global competence
Source: PISA (2018)

of individuals, like flexibility and adaptability), and abilities (the capacity to perform certain mental or physical activities, such as informed decision-making). Because of an interconnected and technologically evolving new world of work, hard and soft competencies are required by employees.

Hard competencies can be acquired through education, training, hands-on experience and/or professional development. Hard competencies are needed to perform a job, as it involves the ability to source and apply appropriate solutions to problems (Marr, 2022). Examples include learning a foreign language, programming a computer, operating a machine, etc. Hard competencies for managers include knowing and implementing technical and managerial processes, understanding the digital systems that the organisation uses, knowing and applying appropriate policies and procedures, keeping to budgets, etc.

Soft competencies relate to getting along with and understanding people and their behaviour in the work context, irrespective of the hard competencies needed for the job (Marr, 2022). For employees to acquire and develop soft competencies, they need to be self-aware and reflect on their behaviours and actions, thus showing insight into their own behaviour and developmental areas. This forms part of what is termed "emotional intelligence" (EI) that also includes knowing and understanding oneself, being able to organise one's environment, to understand one's own emotions and the emotions of others (Goleman, 1995). EI and emotional quotient (EQ) should also be distinguished. EI is the ability to understand, manage, and use one's own emotions and those of others to communicate, empathise, and reduce stress. The EQ is the measurement of this intelligence. High EQ is linked to better leadership, workplace success, and strong interpersonal relationships

Another component of EI is social intelligence (SI), which is the ability to read and understand social cues and being able to understand and effectively communicate with others (Goleman, 1995).

Although these skills are already developed during childhood based on the inputs of parents, caregivers and the wider community, they can be honed and advanced through learning and development and by maintaining a growth mindset.

As EI enables individuals to know and understand themselves and others better, it forms the basis for developing the soft competencies. This includes effective communication, which implies the ability to listen, analyse and respond to requests and/or problems either online or in face-to-face interactions. Being a good communicator enables better problem-solving and negotiation. Critical and analytical thinking is another area that needs to be constantly developed, as it can enhance objectivity, which can also facilitate better problem-solving and decision-making (Marr, 2022). Flexibility and adaptability are also crucial in an ever-evolving workplace, as the workplace can be daunting and ever-changing. As reskilling and upskilling will remain a focus in the future world of work, employees must build and maintain constructive interpersonal relationships and interactions.

Summary

The chapter conceptualised AI adoption within the challenges shaping the new world of work. These challenges include globalisation, environmental sustainability, incessant technological development and the need for constant innovation and learning in a highly complex and competitive work environment. As AI and its ensuing technologies are here to stay, it is imperative that upskilling and reskilling remain a top priority, as well as instilling growth mindsets to support continuous learning and development. The chapter also emphasises the need for global competencies to enable employees to navigate the new world of work.

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Chapter 2

Talent Management and Work Design in an Artificial Intelligence-Enabled Future

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Abstract

The advancement of 4IR technologies, notably artificial Intelligence (AI), has contributed to shaping the new world of work. The contemporary workplace is characterised by various forms of digital technology that enable employees to work from anywhere and at any time. The convergence of talent management, work design, and AI signifies a vital change in how organisations approach their operational frameworks and workforce strategies. Talent management refers to the systematic process of attracting, developing, and retaining skilled and high-potential employees within an organisation. Work design is the process of organising and structuring tasks, activities, and responsibilities within a job or a workplace. This chapter examines how AI, talent management, and work design may work together to alter the workplace, improve employee well-being, and help organisations to remain competitive in an increasingly complex and fast-paced world of work.

Introduction

The application of artificial intelligence (AI) to various fields has become a game-changer as organisations aim for effectiveness, agility, and innovation in a rapidly evolving environment. AI-powered solutions are changing not only standard Human Resources (HR) duties such as recruitment or performance management but also the fundamental basis of how work is planned, carried out, and perceived by employees. AI is empowering HR professionals to make more data-driven, individualised, and strategic decisions that propel organisational success in a variety of areas (Momtazian, 2023).

AI has transformed talent management by offering technologies that improve each phase of the employment lifecycle. This aids organisations in identifying and attracting top talent by automating the recruitment process, while predictive analytics ensure that applicants are suitable for the position and company culture. Beyond recruiting, AI makes it possible for employees to grow while supporting the strategic objectives of the organisation through performance monitoring, skills evaluations, and customised development activities. Additionally, AI-powered solutions can forecast retention risks and provide information about employee engagement and satisfaction, enabling HR to proactively solve problems before they result in staff turnover. The use of AI in talent management will become increasingly crucial to foster a high-performing, diverse, and satisfied workforce.

AI is revolutionising work design by changing how organisations define roles and streamline processes. Conventional work design models often emphasise fixed processes and static roles, but AI enables dynamic, adaptable workplaces that can react to the demands of employees and the organisation. AI solutions also enrich jobs by empowering and engaging employees through continuous feedback and individualised task assignments. Furthermore, AI facilitates the design of flexible work arrangements, including remote and hybrid models, by improving teamwork and ensuring that employees have access to resources and support (Mir, 2024). The integration of AI into both talent management and work design is not only improving operational efficiency but also creating a more employee-centric workplace. Organisations can optimise AI systems and maximise organisational outcomes while also providing employees with more personalised, fulfilling, and flexible

work experiences (Jarrahi, 2018). This chapter is a thematic study to identify emerging trends and current realities related to talent management and work design in the new world of work.

Artificial intelligence and talent management

Talent management ensures that an organisation has the right people with the right skills in the right positions to achieve its business objectives. Talent management encompasses a range of tasks, including recruitment, onboarding, performance management, learning and development, succession planning, and employee retention. AI can revolutionise talent management by facilitating data-driven decisions, efficiency, and personalisation at every stage of the employee lifecycle. AI can help organisations to develop a flexible and dynamic talent management system that not only meets current business needs but also predicts future trends in the workforce, guaranteeing long-term success. Efficient talent management ensures that employees are not only capable of handling current business needs but are also ready for prospects within the organisation (Charlwood, 2021).

Talent management promotes a culture of ongoing innovation and growth by coordinating workforce planning with business objectives. This empowers employees to reach their full potential and contribute to the organisation's long-term objectives. Effective talent management techniques, such as attracting the right talent, are crucial for maintaining growth and gaining a competitive edge in a dynamic and increasingly competitive environment. In the dynamic world of modern businesses, the introduction of AI into various aspects of daily operations is ushering in a new era. Notably, talent management has become a groundbreaking domain for AI revolutionising conventional HR practices. AI is visibly transforming talent management, especially the automation of recruitment procedures. For instance, AI uses data analytics, machine learning, and natural language processing to increase productivity, accuracy, and applicant experience. Organisations such as IBM® and Unilever have fully adopted AI-driven recruitment systems, offering a glance to a future in which recruitment procedures are smoothly streamlined, allowing HR professionals to concentrate on the more strategic aspects of talent acquisition (Khan, 2024).

AI can significantly influence talent management through enhancing decision-making and personalising employee experiences. The section below details the potential influence of AI on the talent management cycle. This includes automated recruitment and onboarding, employee engagement, employee retention, succession planning, workforce planning, employee well-being, performance management and training and development.

Automated recruitment and onboarding

Recruitment is about finding new potential employees, attracting their attention and employing them as members of the organisation, whereas onboarding is the process of integrating new employees into the organisation, helping them to acclimate to their roles, teams, and overall organisation culture. In this process, AI-powered systems scan through lengthy resumes, recognising critical competencies and forecasting candidate success based on past performance. Through historical data, AI predicts a candidate's success in a position or the feasibility of extended tenure. AI can also streamline onboarding by generating documentation, offering training materials, and using chatbots to respond to frequently asked questions (Said, 2023).

Employee engagement

Employee engagement denotes the commitment and dedication that employees feel towards their jobs, the organisation, and its objectives (Turner, 2019). According to Rao *et al.*, (2020), organisations can use AI to analyse employee communications, surveys, emails, chat messages, and feedback to assess sentiment and mood. These technologies provide information on how employees feel by using natural language processing (NLP) to comprehend and analyse emotional tone and keywords. Additionally, AI can provide managers with up-to-date information on employee engagement levels, which facilitates the early detection of disengagement. For instance, AI tools may create engagement dashboards that provide managers with important metrics, trends, and indicators of possible disengagement or areas that require attention. AI also has the potential to identify which employees are most likely to become disengaged or leave

the organisation by examining trends in their work habits, behaviour, and general level of satisfaction (Rožman *et al.*, 2023). This is identified through AI models that forecast turnover risk by examining employee tenure, performance, communication styles, and engagement levels, allowing organisations to intervene early and avoid possible employee turnover (Dutta *et al.*, 2023).

Employee retention

Employee retention is used to describe an organisation's ability to retain employees and reduce turnover through the provision of competitive benefits, a positive work environment, and attention to employee needs (Hom *et al.*, 2019). AI can create customised recognition and incentive programmes that align with each employee's preferences, boosting their sense of fulfilment and dedication to the organisation. This means that AI can automatically recognise and celebrate employee accomplishments, such as meeting performance goals or acting constructively. AI can also monitor what motivates each employee, such as monetary incentives, opportunities for professional growth, or flexible work schedules, ensuring that rewards are tailored to each employee's preferences. This is likely to prevent the loss of talent, especially high-performance employees (Benaboua & Touhami, 2025).

Succession planning

Succession planning is explained as having the right people in the right place at the right time. To be more precise, succession planning is a continuous process that identifies and prepares future leaders for key positions such as senior management, technical experts, project managers and chief executive officers within an organisation. AI can identify high-potential employees suitable for leadership positions by analysing employee data, including skills sets, career advancement, performance reports, and other pertinent metrics. To identify employees with comparable potential, machine learning algorithms can be used to identify patterns in the career trajectory of successful leaders and apply those insights to future predictions. Moreover, AI can evaluate employees' strengths and skills gaps, creating

individualised development plans to prepare them for senior positions. Depending on the employee's development needs and professional goals, AI can recommend stretch assignments, mentorship possibilities, and a focused learning programme (Anuradha & Rani, 2024).

Workforce planning

Workforce planning is the process of analysing, forecasting, and planning workforce supply and demand, assessing gaps, and determining targeted talent management interventions to fulfil the organisation's mandate and strategic objectives (Elugbaju *et al.*, 2024). AI can facilitate the identification of skills surpluses or shortages in the organisation, allowing for improved workforce planning and reskilling programmes. Moreover, AI can identify internal candidates for vacant positions based on an employee's prior performance, skills and aspirations. HR may prepare for future challenges by using AI models to predict workforce needs (Benaboua & Touhami, 2025).

Employee well-being

Employee well-being refers to employees' general state of physical, mental, emotional, and social well-being in the workplace. It includes elements that support their happiness, satisfaction, and capacity to carry out their jobs effectively (Farley *et al.*, 2023). AI can help monitor patterns in absenteeism, workload, and communication to identify burnout risks and recommend interventions. It can use employee preferences to tailor wellness programmes, such as exercise challenges or psychological health services and improve work-life balance by recommending options like remote work or flexible work hours. For example, **face recognition AI tools** can identify facial expressions for signs of stress or exhaustion, and attendance patterns to identify employees who are struggling at work (Nyathani, 2023).

Performance management

Performance management aims to evaluate employee and team performance and provide feedback regularly. It establishes clear performance standards and goals for employees and implements performance improvement plans when necessary.

AI can gather and examine real-time performance data from a variety of sources, including peer assessments, to produce actionable insights. This minimises potential biases in conventional evaluation techniques by guaranteeing that performance reviews concentrate only on objective indicators. AI can ensure that employees strive towards the same goals by coordinating their aspirations with those of the organisation (Nyathani, 2023).

Training and development

Training and development focus on improving employees' performance and fostering professional advancement by improving their skills, knowledge, and abilities (Rodriguez & Walters, 2017). AI has the potential to customise training programmes for each employee according to their learning preferences, career objectives, and skills gaps. Based on this, AI can recommend individual training as well as monitor the effectiveness of training and development. Moreover, chatbots or virtual assistants powered by AI can offer real-time assistance to employees during training. These AI tools can respond to enquiries, provide clarifications, or direct employees to supplementary resources. This offers employees instant support and improves the learning process, particularly in a remote or self-paced training environment (Wang *et al.*, 2024).

Benefits of talent management

According to Momtazian (2023), talent management provides a range of benefits for employees, such as personal growth, clear expectations, job satisfaction, leadership and an inclusive work environment. These benefits are discussed below:

Personal growth: Talent management grants employees' access to opportunities for continuous learning, skills development, and career progression. This is imperative for contemporary employees, as career management and progression are driven by individuals themselves.

Clear expectations: Frequent performance evaluations and feedback promote a culture of continuous improvement, providing employees with a comprehensive understanding of expectations. As performance-driven AI escalates, it will enable managers to

provide real-time feedback to employees, thus dealing more effectively with performance deficits (Momtazian, 2023).

Job satisfaction: Talent management ensures that employees' skills and interests align with their roles, increasing job satisfaction and engagement. Effective talent management ensures that employees feel appreciated, included, and encouraged to grow, which boosts morale, improves retention rates, and increases job satisfaction.

Leadership: Employees who have been identified as highly qualified through talent management have access to leadership development opportunities. The role of leadership in the new world of work cannot be overemphasised. Leaders need an array of competencies enabling organisations to tap into a new world of work. This especially relates to understanding human behaviour and motivation, interpersonal and intercultural acumen, understanding the technology that drives modern organisations and having the ability to utilise human capital to reach organisational goals (Pushpa & Uttamkumar, 2020).

Artificial intelligence and work design

Work design involves determining how work is allocated, how different tasks are related to one another, and the overall structure of jobs within an organisation. The goal of work design is to optimise efficiency, productivity, and employee satisfaction by creating a work environment that aligns with the goals and objectives of the organisation. Work design is an essential component of organisational management that affects how teams collaborate, how tasks are completed, and how productive and satisfied employees are in their jobs. Work design becomes especially crucial in the context of remote and hybrid work because it entails modifying conventional job structures to accommodate the unique challenges and opportunities presented by remote and hybrid work arrangements. It is important to understand what role work design plays within remote and hybrid work arrangements. AI can influence work design by reshaping how tasks, roles, and workflows are structured to improve efficiency, effectiveness, and employee satisfaction (Parker & Grote, 2022).

Below are ways in which AI can influence work design.

Collaboration enhancement

Collaboration enhancement refers to the process of enhancing how people or groups collaborate to accomplish common objectives. It entails utilising tactics, strategies, and technologies to expedite coordination, communication, and collaboration. Collaboration enhancement aims to increase output, encourage creativity, and establish a more harmonious and effective team environment (Kim & Lee, 2024). Through collaboration, organisations can improve efficiency, reduce misunderstandings, and form stronger team synergy, ultimately driving better outcomes. AI can assist teams in managing work by automatically allocating tasks, establishing due dates, and monitoring progress, ensuring that each team member agrees. This minimises misunderstandings. By analysing team dynamics and work habits, AI can recommend the best collaboration partners, tools, or techniques based on employees' abilities, preferences, and previous interactions, subsequently promoting improved teamwork (Gawlik-Kobylińska, 2024).

Safety and well-being

Safety and well-being refer to the psychological, emotional, and physical states that enable people to flourish in a safe and nurturing environment. It entails developing procedures, regulations, and work environments that protect employees from harm and encourage their general well-being. Safety and well-being are foundational for a thriving workplace, benefiting both employees and organisations by creating a culture of care and mutual success (Okros & Virga, 2023). AI can provide mental health services, including stress management applications, virtual therapy, and customised well-being initiatives. AI chatbots can offer coping mechanisms to employees, prompt assistance, and guidance (D'Alfonso, 2020). AI can monitor potential dangers in the workplace, including dangerous conditions, changes in the quality of the air, and malfunctioning machinery. This makes it possible to react to potentially hazardous circumstances more quickly. Furthermore, virtual reality platforms and AI simulations can offer employees immersive safety training by allowing them to experience and respond to risky situations in a safe, regulated environment (Davila-Gonzalez & Martin, 2024).

Personalised work experiences

According to Horváth and Csapó (2023), personalised work experience refers to adjusting employees' activities, work environment, and opportunities for growth to suit their unique requirements, interests, strengths, and professional objectives. This approach prioritises customisation to improve employee engagement, productivity, and satisfaction. AI can use data-driven insights, automation, and intelligent systems to help organisations to offer personalised work experience. For instance, intelligent task allocation ensures that employees receive tasks that correspond with their workload and level of expertise. Moreover, AI can increase engagement and productivity by customising work processes to each person's preferences and strengths. This can enhance the autonomy of employees, enabling remote work, flexible scheduling, and on-demand resource access (Christian *et al.*, 2023).

Role redefinition

Role redefinition is the process of redefining an employee's job responsibilities, expectations, or scope to better suit changing organisational needs, individual strengths, and external factors like market demands or technological advancements. This process aids in maintaining role effectiveness, relevance, and engagement (Ebbers & Wijnberg, 2017). Through the provision of enhanced tools, decision assistance, and real-time information, AI can improve employee capacities and transform roles into more strategic functions. AI can examine employee data to find inefficiencies, eliminate ambiguity and redundancy, and recommend the best team structures by ensuring consistent role definitions across departments (Hancock *et al.*, 2020).

Work design is based on the characteristics of jobs. Job characteristics in work design encompass a broad range of elements that collectively shape the work environment and influence employee experience to create a framework that fosters efficiency, innovation, and employee well-being (Tursunbayeva & Renkema, 2022). AI is transforming job characteristics by changing the way that roles are defined, tasks are carried out and work environments are organised. In the workplace, AI can boost productivity, creativity, and adaptability by automating

monotonous processes, improving decision-making, and offering real-time insights. In addition to promoting skills development and individualised work experiences, AI allows employees to focus on higher-value, significant tasks (Verma & Singh, 2022).

AI integration, however, necessitates striking a balance between human-centred approaches and technological advancements to guarantee employee satisfaction and long-term success (Soulami *et al.*, 2024). Therefore, organisations must comprehend and integrate key characteristics, including skills variety, feedback, task identity, autonomy and task significance into the design of work processes to improve productivity, foster a positive workplace culture, and adeptly navigate through the constantly evolving world of work. In this, the job characteristics model of Hackman and Oldham (1976) can provide guidance (Adiarani, 2019). Although the model dates from the 1970s, it still provides valuable insight into employee motivation. This can also be applied to an AI-enabled environment.

According to Hackman and Oldham (1976), the variety of skills needed to perform a job, the identity and significance of the job, can lead to meaningfulness. Having autonomy leads to taking responsibility, and receiving feedback provides insight into the progression of the individual. Combined, the psychological states of meaningfulness, responsibility and knowledge of results can elicit a higher individual motivation, job effectiveness, job growth and satisfaction. This will be elaborated on below.

Skills variety: Skills variety refers to the extent to which a job requires the use of multiple skills to perform tasks. As AI can automate monotonous, repetitive work, it can allow employees to focus on more interesting and creative parts of their work (Florijn, 2022). In this sense, AI can be used to create data sets and useable information that enhances skills variety. AI can help organisations to find, manage, and maximise a variety of abilities in their workforce, ensuring that the right employees are assigned to the right positions. Because of this, AI can provide personalised training plans to assist employees in acquiring new and related skills. Jobs with a wider range of skills are more likely to positively challenge employees and encourage them to advance their level of expertise in particular fields (Gawlik-Kobylińska, 2024).

Task identity: Task identity refers to a job completed from beginning to end with a visible outcome. Employees tend to find more meaning in their jobs when they can identify with a completed outcome. Thus, AI solutions help employees to see the broader purpose of their work while breaking down difficult tasks into smaller, more achievable steps. Through analysing data, AI can classify tasks, find patterns in data, and recommend the best ways to approach them. It can assist organisations in establishing distinct job responsibilities, monitoring advancement, and streamlining processes to ensure that tasks are handled by the right individuals or departments. This minimises human error, boosts productivity, and assists in coordinating tasks with the overall organisational objectives (Verma & Singh, 2022).

Task significance: Task significance refers to the degree to which the job has an impact on individuals both internally and externally. Individuals who value significance always want to know whether their job matters to other people, because, for them, recognition comes from others (Allan, 2017). In this, AI can help organisations to determine the importance of tasks by evaluating data to determine how each task affects the broader organisational goals and objectives. AI can rank jobs according to their strategic importance by evaluating variables such as outcomes, resource needs, and urgency. This means that AI makes it possible for employees to concentrate on high-impact jobs, maximising output and aligning efforts with the organisation's top priorities (Verma & Singh, 2022).

Autonomy: Autonomy refers to the freedom and control that a job offers and enhances greater personal responsibility and meaningfulness on an individual level (Florijn, 2022). AI can help organisations to become more autonomous by allowing systems and processes to function on their own without constant human supervision. Automation enables AI to manage monotonous tasks, make data-driven decisions, and adjust to changing circumstances. This enables organisations to streamline processes and boost productivity, ultimately fostering greater organisational autonomy (Calvo *et al.*, 2020).

Feedback: Feedback refers to the process of providing individuals with constructive information about the effectiveness

of the task or job completed. This not only motivates them but also boosts their self-esteem and increases engagement (Ling & Soon, 2019). In this, AI can help organisations with feedback by automating the collection, evaluation, and interpretation of feedback from stakeholders, including consumers and employees. AI can analyse vast amounts of data from reviews, surveys, and social media to identify patterns, opinions, and areas for improvement. This gives organisations access to real-time, actionable insights that can be used to improve organisational products or services, make better decisions, and increase employee satisfaction (Shi & Aryadoust, 2024).

It is, thus, clear that AI can enhance workflows and match employee talents with organisational goals. Organisations can utilise AI technologies to implement strategic techniques for work design and improve efficiency, productivity and employee engagement. Job enlargement, job enrichment, job rotation, job simplification and job crafting are essential work design techniques aimed at enhancing employee engagement, work efficiency and productivity (Gawlik-Kobylińska, 2024).

Job enlargement: Job enlargement is a work design strategy that entails broadening the scope of an employee's duties and responsibilities within the same job role. This strategy aims to increase job satisfaction and motivation by reducing monotony, fostering skills development, and giving employees a wider range of duties (Kurniawati & Dayamanti, 2020). AI can significantly increase job enlargement by automating monotonous tasks, giving employees advanced tools to handle increasingly complex tasks while also boosting employee engagement. AI can also allow employees to focus on more impactful job responsibilities, subsequently increasing organisational efficiency, job satisfaction and skills development (Cimini *et al.*, 2024).

Job enrichment: Job enrichment is a work design strategy that involves enhancing the depth and complexity of a job by adding responsibilities, challenges, and opportunities for skills development (Mac-Ozigbo & Daniel, 2020). AI can amplify job enrichment by automating repetitive tasks, giving advanced decision support, and enabling opportunities for creativity and personal development. In this, AI can grant employees

a more fulfilling and meaningful work experience, promoting greater autonomy, decision-making authority, and a sense of accomplishment within their roles (Cimini *et al.*, 2024).

Job rotation: Job rotation is a strategic approach to work design where employees move between various positions and responsibilities within an organisation. The purpose of this approach is to give employees a broader skills set, a more comprehensive understanding of the organisation, and increased adaptability (Kampkötter *et al.*, 2018). AI can improve job rotation by assigning employees to suitable positions, monitoring their skills development, streamlining timetables, and offering customised learning opportunities, ultimately contributing to a more efficient and engaging rotation process (Ayough *et al.*, 2021).

Job simplification: Job simplification is a work design strategy that involves reducing the complexity of a job by breaking it down into easier-to-perform tasks to maximise efficiency, minimise skills requirements and streamlining work processes. While job simplification can enhance productivity and facilitate job training, it may also lead to monotony and reduced job satisfaction (Ling & Soon, 2019). In this, AI can potentially facilitate quicker data processing, reduce manual errors, and allow employees to focus on more strategic and innovative work. This can ultimately lead to increased productivity, efficiency, and job satisfaction (Tschang & Almirall, 2021).

Job crafting: Job crafting refers to intentional adjustments that employees make to their tasks, relationships, and perceptions of their work to create a more meaningful and satisfying job experience (Kampkötter *et al.*, 2018). In this, AI can improve job satisfaction and performance by empowering employees to redesign their tasks for increased engagement, innovation, and efficiency. Job crafting can include tasks such as seeking new challenges or strengthening relations with colleagues (Mac-Ozigbo & Daniel, 2020).

Benefits of a strategic work design

According to Werner and Balkin (2021), strategic work design offers a myriad of benefits that extend to both employees and the organisation, fostering a work environment where employees feel

engaged, satisfied and motivated. Through continuous feedback, AI ensures that roles remain relevant in an evolving business environment, promoting resilience and adaptability. AI-powered strategic work design boosts organisational agility and enhances individual and team performance, enabling businesses to stay competitive in a rapidly changing world. The advantages of a strategic work design are enhanced by AI's ability to dynamically modify and improve jobs. One major benefit of using AI is increased productivity, reduced inefficiencies and streamlined procedures. Other benefits include employee engagement, improved work quality, employee satisfaction, employee well-being and reduced absenteeism (Shi & Aryadoust, 2024).

Enhanced productivity: When employees have distinct and well-defined roles, they can focus their efforts on tasks that align with their strengths and expertise. This approach enhances productivity, as individuals can optimise their skills to accomplish their assigned responsibilities efficiently (Naqbi *et al.*, 2024).

Employee engagement: Well-designed jobs promote employee engagement by aligning responsibilities to individual abilities and providing career advancement opportunities. This provides employees with a sense of ownership over their jobs, encourages teamwork and creates a positive work environment (Werner & Balkin, 2021).

Improved work quality: A well-designed job highlights the importance of high-quality work outcomes. Matching employees' skills and abilities with the right tasks enables individuals to perform at their best. Consequently, the overall quality of work improves, leading to greater customer satisfaction and organisational success (Dixon-Woods & Martin, 2016).

Employee satisfaction: A work design that considers employees' preferences, strengths, and interests leads to higher job satisfaction. When individuals find their work meaningful and fulfilling, they are more likely to feel satisfied and motivated, which, in turn, can positively impact their overall well-being (Wang *et al.*, 2020).

Improved well-being: A well-designed job that prioritises employee well-being reduces stress and enhances mental health, which improves general well-being.

Reduced absenteeism: Absenteeism can be reduced by designing jobs with flexible work schedules and a recognition of the importance of work-life balance. Employees are more likely to consistently attend work when they feel that their personal lives are supported (Werner & Balkin, 2021).

Summary

In the evolving world of work, AI has become a critical component that guides organisational success. The strategic emphasis on cultivating digital skills, fostering adaptability, and prioritising employee well-being within talent management ensures that teams thrive in virtual environments. Simultaneously, work design plays an important role in structuring roles, communication channels, and task distribution to maximise efficiency and job satisfaction in the changing world of work. As organisations navigate these transformative changes, those investing in sound talent management strategies can promote resilience and leadership in technology-advanced settings, along with work designs that prioritise flexibility, technology integration, and employee engagement.

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Chapter 3

Emotion as a Driving Force: Affective Computing and Its Application in Consumer Behaviour

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Abstract

Affective computing involves not only the artificial intelligence (AI)-driven analysis of facial expressions, body language, voice, and other physiological signals but also the development of intelligent systems capable of recognising, interpreting, and responding to emotional cues. Advances in deep learning or natural language processing have expanded the precision and application possibilities of this technology. Affective computing is increasingly being used by businesses and marketers to better understand consumers' decisions, which are often shaped by unconscious emotional responses. Despite its potential, there is a dearth of research in addressing the applications, trends and ethical concerns associated with affective computing in consumer behaviour. This explorative, systematic literature review seeks to fill this gap by analysing and summarising the recent applications, trends and ethical challenges of affective computing described in the literature over the past five years. By systematically reviewing 1,274 articles, of which 31 were included in the analysis, this chapter provides an overview of recent advances and offers insights into future trends and ethical challenges.

Introduction

TV series such as *Cassandra* (Gutsche, 2025) and *Better Than Us* (Junkovsky *et al.,* 2018) offer fascinating yet unsettling scenarios in which affective computing technologies play a central role. They show how these technologies have the potential to both enrich our future and raise ethical questions. Affective computing describes artificial intelligence-driven systems that recognise, interpret and respond to or even simulate human emotions (Smith *et al.,* 2021). These technologies rely on the AI-driven analysis of expressions, such as text, facial expressions, or gestures, as well as psychophysiological signals, such as brain activity or heart rate, which reflect emotional states (Richardson, 2020).

Because human behaviour and many decisions are strongly influenced by emotions, often unconsciously and quickly (Kahneman & Tversky, 1979; Tversky & Kahneman, 1974; Lerner *et al.,* 2014), affective computing opens new opportunities. Companies and marketers are increasingly using the targeted application of affective computing to recognise the emotional reactions of consumers in real time and understand their decisions and behaviour (Bault & Rusconi, 2020). The ability to understand consumers' emotions and create tailored experiences on this basis not only offers new opportunities but also raises new questions around consumer behaviour (Sharma *et al.,* 2023).

Building on this, the following research questions will be addressed:

RQ1: Which consumer-related affective computing applications exist?

RQ2: What trends can be observed in the field of affective computing and consumer behaviour in the years 2020 to 2025?

RQ3: What ethical challenges can be derived from the applications and trends?

Despite the increased use of affective computing technologies in the consumer space, a comprehensive overview of current applications, future trends and ethical challenges are still lacking. The objective of the chapter is to provide an overview of these topics using an in-depth literature review based on literature from 2020 to 2025.

Basic Theories of Emotion

Although emotions are experienced by all people, it is often complex to define (Fehr & Russell, 1984). Most individuals can intuitively recognise, describe, and feel emotions, attesting to the nuanced nature of the term (Ortony, 2021). Emotions can be described as physiological arousal, feelings, cognitive processes or behavioural reactions in response to situations and/or challenges (Gerrig & Zimbardo, 2008; Stanojlovic *et al.,* 2021). They can be understood as thoughts that manifest in diverse forms of expression (Ekman, 1973; Ekman & Friesen, 1978; Gray & McNaughton, 2003), which can include words, gestures, facial expressions, behaviours, or even abstract media such as music.

Regardless of the definition of emotions, there are various approaches for categorising emotions. Two types of models can be distinguished: categorial emotion models and dimensional emotion models. Categorial emotion models categorise emotions individually, such as Ekman's model of basic emotions, which identified six, later seven, basic emotions of happiness, sadness, anger, disgust, surprise, fear and contempt based on facial expressions (Ekman, 1973; Ekman & Friesen, 1978). Categorical approaches are often less precise because they divide emotions into fixed, separate categories, which do not fully capture the complex and overlapping nature of emotions.

Dimensional emotion models have been developed to be able to capture and differentiate finer nuances of emotions. Dimensional emotion models describe emotional states as multidimensional vectors in a continuous, affective space. Examples are the two-dimensional valence-arousal model (Russell, 1980) or the three-dimensional pleasure-arousal-dominance model (Russell & Mehrabian, 1977). Dimensional models are highly numerical and use continuous values to represent emotional states. Therefore, they are suitable for analysing changes in emotions over time. Both categorical and dimensional approaches are used in affective computing technologies, with dimensional approaches being more difficult to integrate because of their complexity.

Affective Computing

Emotional expressions can be conscious and intentional, such as a voluntary smile to demonstrate joy, or unconscious and involuntary actions, such as the slight trembling of a hand signalling nervousness or tension (Ekman *et al.*, 1981; Gibbs & Van Orden, 2003). In the physical world, affective communication occurs through sensory modalities (senses like vision, hearing, touch, taste, and smell), allowing emotions to be shared and understood (Poerio *et al.*, 2024).

These emotional expressions (e.g. facial expressions, gestures, heart rate, etc.) can also be understood as information patterns that can be analysed and represented computationally (Picard, 1997). This ability to recognise and represent emotional expressions as information patterns, forms the basis for the field of affective computing. The term "affective computing" was first shaped in the 1990s by Rosalind Picard and represents a research discipline that builds on findings from computer science, psychology and cognitive science (Scherer *et al.*, 2010). This diversity of disciplines relevant to affective computing reflects the complexity of describing, understanding and simulating emotions. Affective computing describes "[...] computing that relates to, arises from or deliberately influences emotions." (Picard, 1997:1). The term, therefore, not only refers to the recognition, measurement and processing of emotional signals, but also the reaction that it evokes. Affective computing aims to enrich artificial intelligence with emotional intelligence to make human-machine interaction more empathetic (Picard, 1997).

Affective computing can be segmented into emotion recognition and sentiment analysis (Rouast *et al.*, 2019; Shoumy *et al.*, 2019). While emotion recognition focuses on the detection of the emotional state via visual cues like facial expressions and gestures, audio signals such as speech, and physiological signals like electroencephalogram (EEG) (Joy *et al.*, 2021; Saxena *et al.*, 2020), sentiment analysis is a technique used to evaluate textual data and extract opinions, categorising them as positive, negative, or neutral (Vig *et al.*, 2022; Haroon *et al.*, 2021). To maintain focus, only emotion recognition technologies are considered and analysed in this literature review to ensure relevance.

The terms "affective computing" and "emotion AI" are often used synonymously. While affective computing encompasses a broader, inter-disciplinary field, emotion AI focuses specifically on the AI and technological side of emotion recognition and simulation (Lee *et al.*, 2022; Lirio & Plusquellec, 2023). In the literature review, both terms are considered because of their frequently overlapping use. An affective computing system uses sensors to capture data from various sources such as facial expressions, voice tone and body language. AI algorithms, such as machine learning or deep learning, are used to analyse this information to conclude the user's emotional state (Moreno-Armendáriz *et al.*, 2022). Based on this process, four categories of affective computing can be distinguished (Ma & Yarosh, 2021; Holden & Szuhaj, 2024):

- Acquisition of emotion data involves collecting physiological and behavioural data, such as eye movements, skin conductivity, heart rate, brain activity and vocal changes (Larradet *et al.*, 2020).
- Analysing the emotion data to identify emotional patterns and interpret the person's current emotional state (Sykora *et al.*, 2022).
- Emulating emotional responses includes systems that use the emotional insights gained to respond dynamically to the user's emotions, enabling more empathetic interaction (Sönmez *et al.*, 2022).

Emotion simulation technologies are designed to mimic human emotions to create natural and believable forms of communication (Lee *et al.*, 2022; Dey & Chakraborty, 2021).

Figure 3.1 provides an overview of the described affective computing stages and their relationships.

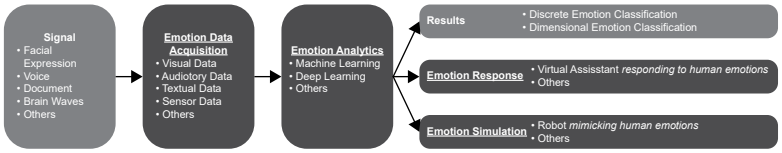


Figure 3.1: Affective Computing Stages

State of the Art: Key Emotion Recognition Technologies

Various technologies can assess people's emotional state by measuring and analysing specific signals such as heartbeat, skin conductance, facial expression or speech patterns. These technologies can be categorised according to the type of data collected: biopsychological (objective data), visual or acoustic (non-verbal cues such as facial expressions, gestures or voice) and linguistic or text-based (sentiment analysis, analysis of content and language). This section provides an overview of the most important technologies for recognising emotions in biopsychological (involving the interaction between the brain, body, and emotions) and visual or auditory emotion recognition. Sentiment analysis is not considered, as it is based on the interpretation of text and does not directly capture physiological or behavioural signals.

Biopsychological Emotion Recognition Technologies

As physical processes play a central role in the emergence of emotions, biopsychological methods are used to conclude emotional states based on physical reactions. In biopsychological research, there are numerous methods for visualising physical processes related to the nervous system. These physiological measures capture and reflect the bodily responses to psychological states.

Electroencephalography

Electroencephalography (EEG) is a non-invasive method that captures the electrical activity of the brain by placing several electrodes on the surface of the head (Attar, 2022). EEG signals are categorised into frequency bands, notably delta, theta, alpha, beta, and gamma, each associated with different mental states (Attar, 2022). The EEG not only provides insights into a person's general state of arousal, but also reactions to specific stimuli, such as sounds or images, through event-related potentials (McInnes *et al.*, 2022; Johnston *et al.*, 2022). Event-related potentials are particularly useful for examining specific neural responses to stimuli (Zsoldos *et al.*, 2022). The computer-assisted analysis of EEG waves has improved emotion research and makes it possible

to associate certain characteristics of EEG waves with specific emotions (Kim *et al.*, 2013; Mashrur *et al.*, 2022).

In addition to EEG, there are other methods for measuring brain activity in the context of emotional states, such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), which analyse the activation of specific brain regions through blood metabolism and oxygen supply (von Georgi & Starcke, 2021; Heurling *et al.*, 2017). Magnetoencephalography, a non-invasive brain activity measurement using magnetic fields (Abadi *et al.*, 2015) or electrocorticography, an invasive method based on EEG technology (Leuthardt *et al.*, 2006), are also applied in the field of affective computing to record rapid neuronal reactions.

Electrocardiography

Electrocardiography (ECG) records the electrical activity pattern of the heart. The cardiac cycle, which describes the flow of blood through the body, is made possible by the automatic contraction of the heart muscle cells. The measurement uses the electrical voltage difference between contracted and uncontracted areas of the heart muscle. The heart rate, which indicates how often the heart beats per minute, varies and increases with emotional arousal, activated by the sympathetic nervous system (Hasnul *et al.*, 2021). This leads to a faster crossing of the threshold for action potentials and thus to an increased heart rate as a sign of emotional arousal (Candia-Rivera *et al.*, 2022). Measurements of the heart rate and the variations between heartbeats can indicate certain emotional states (Hachenberger *et al.*, 2023).

Heart Rate Variability

Heart rate variability (HRV) is closely linked to EGC. While the ECG measures the electrical activity of the heart directly, HRV analysis focuses on changes in the intervals between heartbeats to conclude the autonomic nervous system, various emotions, stress levels and pain responses (Ishaque *et al.*, 2021; Forte *et al.*, 2022).

Electrodermal Activity

Electrodermal activity, also known as skin conductance or galvanic response, detects changes in skin conductance caused by activation

of the sympathetic nervous system and provides information on emotional and cognitive states (Amin & Faghih, 2022; von Georgi & Starcke, 2021), especially on emotional arousal (Höfling *et al.,* 2020). It results from increased sweat production in response to emotional arousal, whereby the brain sends signals to the sympathetic nervous system, which activates the sweat glands (Amin & Faghih, 2022; Veeranki *et al.,* 2024). Sweat consists of liquid and dissolved salts. Electrodermal activity is measured by attaching two electrodes to the palm or fingers, with a constant voltage applied to detect conductivity changes (Geršak & Drnovšek, 2020). The continuously recorded changes in conductivity provide valuable information about emotional states (von Georgi & Starcke, 2021).

Other technologies for detecting emotions based on biopsychological signals include facial electromyography, which records emotion-specific micro-facial movements, and respiratory rate to analyse breathing patterns, skin temperature as an indicator of stress or arousal, and blood pressure, which can provide information about stress levels or emotional arousal (Shahzad *et al.,* 2021; Höfling *et al.,* 2020).

Visual and Auditory Emotion Recognition Technologies

Visual Emotion Recognition

Visual-based emotion recognition describes the decoding of emotional states from facial expressions and other visual cues. This area uses advances in computer vision and machine learning to develop algorithms that can recognise and classify emotions based on visual input, such as images or videos (Almasoudi *et al.,* 2023; Singh *et al.,* 2024). Facial emotion recognition involves extracting facial features, classifying them into emotional categories, and is applied in various fields such as healthcare, security, and marketing (Nethravathi *et al.,* 2022). Despite its advancements, facial emotion recognition faces challenges related to variability in expressions and environmental factors (Singh *et al.,* 2024; Subathradevi *et al.,* 2024).

Auditory Emotion Recognition

The way that people speak, including tone of voice, speech patterns, word choice and rate of speech, can provide information

about their emotional states. Research shows that people can infer a wide range of information from vocal expressions, including emotional valence and arousal (Elfenbein *et al.*, 2021). Speech analysis in emotion measurement involves using computational methods to analyse various aspects of spoken language to infer emotional states (Davletcharova *et al.*, 2015; Wani *et al.*, 2021). This approach utilises technology, such as Natural Language Processing and machine learning algorithms, to extract patterns and features from speech (Gruetzemacher, 2022).

Methodology

An explorative, systematic literature review was conducted to comprehensively identify technological developments, potential applications, and ethical challenges in the field of affective computing, particularly related to future trends in consumer behaviour. The goal was to highlight emerging trends and advancements. Based on current research, a list of keywords relevant to affective computing was compiled and combined with terms from consumer behaviour to develop a targeted search strategy (Table 3.1).

An extended search query was used in which the keywords from the area of affective computing were combined with 'OR'

Table 3.1: Search Strategy

Topic	Key words
Affective Computing	Affective AI, Affective Computing, Emotion AI, Emotion Recognition
Consumer Behaviour	Consumer Behaviour, Customer Behaviour, Decision Making
Search strategy (TITLE-ABS-KEY (affective AND ai) OR TITLE-ABS-KEY (affective AND computing) OR TITLE-ABS-KEY (emotion AND ai) OR TITLE-ABS-KEY (emotion AND recognition) AND TITLE-ABS-KEY (consumer AND behaviour) OR TITLE-ABS-KEY (customer AND behaviour) OR TITLE-ABS-KEY (decision AND making)) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE, "English"))	

to cover different terms. These were then combined with the keywords from the area of consumer behaviour using 'AND' to enable a precise and comprehensive search. This approach ensured a precise and comprehensive search. Keywords were applied to the abstract, title, and keywords sections of the selected articles. To ensure a broad scope of studies, no additional restrictions were applied, allowing for the inclusion of research from diverse fields, including marketing and other inter-disciplinary areas.

Scopus was used as the primary academic database as it is comprehensive and inter-disciplinary. The search focused on literature published within five years (2020–2025), excluding any publications after 28 January 2025. No type of literature was excluded to maximise the diversity of the overview. Additionally, English was set as the language criterion. This initial search in Scopus resulted in 1,274 articles. To broaden the scope and ensure the inclusion of all relevant literature, the references of all included articles were reviewed to identify further pertinent titles. This process was supplemented by manual searches in Emerald Insight and Google Scholar.

The identified articles were screened in a four-stage process based on the PRISMA flow chart (Figure 3.2). First, a title screening of all retrieved articles was performed, followed by an abstract screening for articles included in the first phase. A full-text screening was then performed to determine the inclusion of the articles. After full-text screening, twenty articles were included in this literature review. The search was extended by a reference screening and a manual search to identify further relevant articles. Articles with a clear focus on current applications and trends of affective computing in the field of consumer behaviour were included. Articles with a prominent focus on ethical considerations of affective computing were added manually.

Results

A total of 1,274 articles were identified using the strategy described. Through the four phases mentioned above, 31 were included in the qualitative literature review. The manual comparison of the content

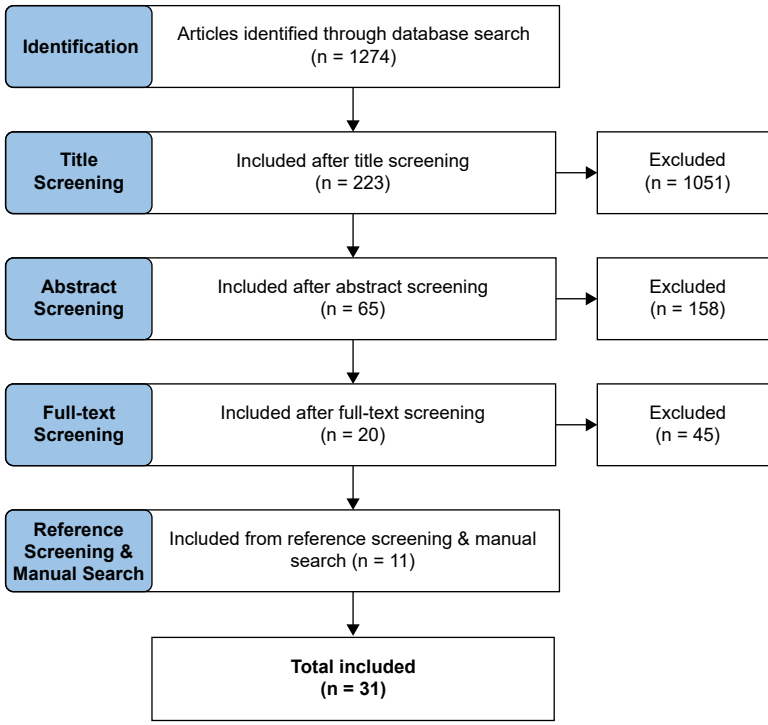


Figure 3.2: Study Selection Process for Affective Computing in English-Language Studies (2020-2025) Using the PRISMA 2020 Guidelines

of the references led to the outcomes below. The report of Hahn and Maier (2018) was reviewed because of its detailed presentation and interesting input, even though it was published in 2018.

Findings

Applications for Affective Computing in Consumer Behaviour

Affective computing is increasingly being used to deepen the understanding of consumer emotions and behaviour. Caruelle *et al.*, (2022) distinguish three categories - empathic, collaborative and interactive affective computing - based on the functionality of the method. This categorisation serves as the basis for the subsequent grouping of applications in the consumer sector.

Empathic Affective Computing

According to Caruelle *et al.,* (2022), empathic affective computing aims to detect consumer emotions expressed through facial expressions, body language or speech. Empathic affective computing is primarily used in market research, where it analyses emotional reactions to advertising, products or services, which leads to improved sales forecasts (Caruelle *et al.,* 2022). Affective computing provides valuable data on the emotional reactions of consumers, which can be used to analyse and optimise advertising campaigns, as it can reveal customers' true preferences (Pei & Li, 2021; Usman *et al.,* 2025).

For instance, EEG-based affective computing can predict psychological responses, aiding in the design of more effective marketing campaigns (Pei & Li, 2021). The integration of multimodal affective data enables more precise emotion analysis and enhances behavioural predictions (César *et al.,* 2024; Alsharif *et al.,* 2024). Platforms that use empathic affective computing enable companies to create better experiences and optimise service. For example, wearable biosensors can measure emotional responses in real-time and provide important data to personalise shopping experiences, customise services and refine advertising campaigns (Pei *et al.,* 2024). Understanding consumer emotional states can inform product design and packaging strategies, making them more appealing and emotionally engaging for consumers (Clark *et al.,* 2020).

Collaborative Affective Computing

Collaborative affective computing is categorised as methods that recognise emotional states and support people in reacting appropriately to them. In service interactions, they record the emotional reactions of consumers and provide employees with targeted information to respond to them individually (Caruelle *et al.,* 2022). In the education sector, affective computing is used to improve learning outcomes and student retention by recognising and responding to students' emotions (Booth *et al.,* 2023; Wang, 2024). In the health sector, emotion tracking helps to treat mental illnesses and personalised therapy (Arya *et al.,* 2021). Affective computing also supports emotional diagnoses and therapeutic

approaches for Alzheimer's disease and post-traumatic stress disorders (Pei *et al.*, 2024).

Interactive Affective Computing

Interactive affective computing refers to methods that equip machines with emotional AI to react to the emotional states of users. Such affective computing methods are used, for example, in service robots that adapt their behaviour to consumer emotions (Mende *et al.*, 2019). Interactive systems based on affective computing open new possibilities for a personalised product experience that reacts to the user's emotions in real time, which promotes the development of innovative products. An example is the neuro headphones from Master & Dynamic and Neurable, which detect the user's brain activity to determine their emotional state and play suitable pieces of music.

The integration of these technologies in immersive technologies such as augmented reality (AR) and virtual reality (VR) leads to a stronger emotional connection to brands and products, which increases brand loyalty and enables an even more personalised and emotional experience (Wang & Sun, 2024; Cachero-Martínez & Vázquez-Casielles, 2021). Affective computing also makes it possible for chatbots to recognise users' emotions and respond to them empathetically, which leads to more human and satisfying communication and improves service (Caruelle *et al.*, 2022). Emotionally engaging campaigns, which interact with the consumer based on their emotional states, fall into the category of interactive affective computing. An example of interactive affective computing is when video games adapt their gameplay to the player's emotions to intensify the gaming experience (Abbasi *et al.*, 2020; Gaudi *et al.*, 2021).

Affective computing plays a key role in improving consumer experience. Through the emotion-based personalisation of advertising, product design, entertainment applications, retail interactions and service, the technology helps to build deeper emotional connections between brands and consumers, strengthen brand loyalty and ensure long-term success in the consumer sector (Carmo *et al.*, 2022).

Future Trends

Multimodal and Real-time Emotion Recognition

Advances in machine learning and AI are expected to enable more accurate predictions of emotions (Pei & Li, 2021; Alsharif *et al.,* 2025). By combining facial, voice and physiological data with situational, cultural and location-based contextual information, emotion recognition systems will become more reliable (Hahn & Maier, 2018; Amin *et al.,* 2020; Pei *et al.,* 2024). Future models will adopt multidimensional approaches of emotion recognition, considering valence and arousal of emotions (Arya *et al.,* 2021). 5G and cloud computing will enable real-time emotion analysis, allowing for more dynamic and responsive emotion recognition in various contexts. Furthermore, advances in neurotechnology, such as micron brain-computer interfaces, will allow even deeper insights into emotional states while reducing health risks (Bernal *et al.,* 2020).

(Hyper-)Personalisation vs. Data Protection

The future of affective computing will also involve maintaining a balance between personalisation and privacy. This will involve addressing consumer concerns while optimising the user experience. Future affective computing applications will create even more personalised experiences (Pei & Li, 2021; Magni *et al.,* 2023; Behera *et al.,* 2021), for example, by adapting advertising content to individual emotional reactions in real time. Advances in VR and AR technologies will further facilitate the creation of immersive environments that adapt to emotional feedback and offer users more engaging and personalised interactions (Wang & Sun, 2024; Luangrath *et al.,* 2021; Pei *et al.,* 2024; Suneeth *et al.,* 2024). As the metaverse evolves into an emotionally intelligent, immersive digital world where physical and virtual realities seamlessly merge (Pervez *et al.,* 2024), the integration of affective computing technologies into the metaverse can enhance user interactions, emotional expression and contextual experiences in various domains (Pervez *et al.,* 2024; Coutinho & Boukerche, 2023).

Affective Computing in Everyday Life and Business

The progressive and increasing integration of low-cost, long-lasting sensors into everyday devices such as smartphones and smart home technologies will promote emotionally intelligent interactions in future, and environments will be able to adapt to our moods (Hahn & Maier, 2018; McStay, 2020). For example, a smart home will be able to respond to our emotions by adjusting the lights or playing music that boosts our mood when it recognises that we are stressed. Another scenario is smartwatches, which are equipped with physiological and environmental sensors and can accurately predict moods, highlighting the potential of dynamic feedback loops to improve user experiences (Araño *et al.,* 2022).

In the modern business world, affective computing is poised to revolutionise communication between companies and customers. In customer service, chatbots or virtual assistants will help to serve customers faster and more effectively by recognising the customer's emotional state and responding empathetically and authentically (Semwal *et al.,* 2024; Afzal *et al.,* 2023). Furthermore, affective computing could help to improve the working environment for employees by recognising emotional stress and supporting companies in responding to the needs of their employees, for example, through customised, optimised working conditions (Magtibay & Umapathy, 2023).

Empathic Human-Machine Interaction

In the future, interaction between machines and humans will run more smoothly through better recognition of emotional signals and an appropriate response to them, leading to empathic dialogues between humans and systems or human-like robots (Spezialetti *et al.,* 2020; Morgante *et al.,* 2024).

A central aspect of empathic human-machine interaction will be mutual adaptivity. Systems will not only recognise emotions, but also dynamically adapt their reactions to enable truly personalised and context-appropriate interaction. This means that affective computing systems learn from past interactions to determine individual preferences and emotional

states more precisely and adapt communication accordingly. This adaptability forms the basis for symbiotic human-robot collaborations and improving task performance (Gervasi *et al.,* 2022). Developments in affective computing can strengthen people's leadership skills in the future, with affective AI contributing to professional development through coaching and targeted support (Bernal *et al.,* 2025). Machines will no longer function merely as tools, but increasingly as collaborative partners that actively shape creative processes and problem-solving (Chignell *et al.,* 2022).

Ethical Challenges

The literature review revealed five main topics of ethical debate: privacy and data security, manipulation and autonomy, bias and fairness, power dynamics, and ethical guidelines and standards. Each of these topics is considered in detail below to illustrate the risks and possible approaches to the responsible use of affective computing concerning consumer behaviour.

Privacy and Data Security

Affective computing relies on extensive data collection, including images, videos, audio, text and physiological signals, to recognise and respond to human emotions (Shoumy *et al.,* 2019). This extensive data collection raises privacy concerns, as sensitive emotional data could be misused or inadequately protected (Pei & Li, 2021; Pei *et al.*, 2024; Arya *et al.,* 2021; McStay, 2020). The integration of affective computing technologies, e.g. brain-computer interfaces (BCI), in the metaverse raises privacy concerns (Bernal *et al.,* 2025). Another problem is that even though affective computing applications identify users' emotions and not people, privacy is still affected. Stakeholders raised concerns about the need to protect privacy and the ethical use of emotional data (McStay, 2020). Microscale BCIs have security vulnerabilities that enable neural cyberattacks (Bernal *et al.,* 2020). These attacks can manipulate brain signals, promote identity theft and compromise mental integrity (Bernal *et al.,* 2025). Integration into cyber-physical systems creates further attack surfaces (Jain *et al.,* 2024), making robust security measures essential.

Manipulation and Autonomy

Affective computing can be used to manipulate user emotions through immersive technologies, which can result in unethical marketing practices (Devillers & Cowie, 2023; Behera *et al.,* 2021; Gaudi *et al.,* 2021; Pei *et al.,* 2024). For example, systems designed to elicit specific emotional responses can exploit consumers' vulnerabilities and promote manipulative advertising strategies (Pei *et al.,* 2024; Wang & Sun, 2024). As effective computer systems are designed to engage consumers emotionally, there is a risk of these systems becoming addictive, which impairs consumers' autonomy (Devillers & Cowie, 2023; Arya *et al.,* 2021). Given the growing dependence of users on emotionally adaptive systems, the risk of emotional (hyper-)stimulation, as well as the potential risk of BCI device cyberattacks, must be considered (Sullins, 2020; Bernal *et al.,* 2025). This could affect users' ability to act authentically in the real world and in interpersonal relationships (Sullins, 2020).

Bias and Fairness

The development of affective computer models is based on training data. This training data must be representative to avoid existing prejudices and ensure fair treatment of all user groups (Arya *et al.,* 2021; Pei & Li, 2021; Khurana *et al.,* 2021; Sáez-Ortuño *et al.,* 2023). This issue is particularly important in vulnerable populations (Katirai, 2023).

Power Dynamics

Those who have control over affective computing technologies and access to the data collected have great power over consumers. Therefore, there is a huge need to regulate this power (Arya *et al.,* 2021; Pei *et al.,* 2024). The EU AI Act and other legislation provide the legal framework for the responsible development and use of AI technologies.

Ethical Guidelines and Standards

Establishing ethical guidelines and standards for affective computing in consumer behaviour is crucial. This includes

establishing codes of ethics, ensuring transparency in data usage and promoting responsible AI practices (McStay, 2020; Kumar *et al.,* 2024; Wang, 2024; Ding *et al.,* 2024). In addition, consumers need to be educated about the implications of affective computing technology (McStay, 2020; Amin *et al.,* 2020). This not only provides information to consumers but can also help to protect them from unethical practices (Wang & Sun, 2024) and needs to be considered, particularly in the context of wearable devices and continuous monitoring (Assabumrungrat *et al.,* 2021).

Limitations

This literature review has several limitations that should be considered. To present a comprehensive overview of affective computing trends, no restrictions were placed on the quality of the articles included in the literature search. As the search included all articles related to the topic, research of varying methodological and scientific rigour was included in the data analysis. Furthermore, the information provided in the literature review was not disaggregated further, which may lead to misinterpretation. A detailed categorisation and evaluation of the articles according to specific criteria such as quality, research design, methodology or sample size could have enabled a more differentiated analysis, thus increasing the validity of the results. In addition, it is difficult to categorise individual applications and trends, as affective computing is an inter-disciplinary field that often addresses several aspects at the same time.

Summary

The literature presented in this chapter highlights the growing application and role of affective computing in consumer behaviour. It outlined potential applications and trends in the consumer space through personalised advertising, product design and services. Affective computing not only enhances experience but also enables technology to better comprehend humans and their emotions. To realise the full potential of affective technologies, they need to be developed and deployed responsibly and ethically, thus contributing to the development of just and inclusive societies (Brand *et al.,* 2024). However, the lack of

scientific consensus on the nature of emotions and their objective recognition through external cues (as challenged by researchers like Barrett, 2023) poses a challenge to the development of reliable affective computing systems.

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Chapter 4

Artificial Intelligence and Sustainable Development in the New World of Work

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'What is it about? It is about ensuring that people remain human in an increasingly technologized world, that the necessary technological progress does not rob us of our freedom, dignity and humanity, that the humanities and natural sciences are brought together in a new humanistic understanding of the world and education.'

(Arnulf Klett, 1905-1974, German politician)

Abstract

The growing importance and performance of artificial intelligence (AI), in conjunction with the need for sustainable development to address current challenges such as climate change and global social upheaval, are already profound and continue to transform the world of work. This chapter highlights the potential and challenges arising from the growing capabilities of the interplay between AI and sustainable development and introduces the central areas of application to the new world of work. Based on current research, policy developments and practical use cases, this chapter examines how AI can support sustainable development while also creating new economic, ecological and social challenges for

organisations and work environments. The analysis focuses on key areas relevant to the future world of work, including economic processes and business models, labour market developments and education systems, energy and resource utilisation, as well as social issues such as fairness, accessibility and responsible AI governance. Based on this analysis, the chapter outlines consequences and requirements for industry, universities and graduates to support a responsible and sustainable integration of AI.

Introduction

Artificial intelligence (AI) technologies affect global economic, social, and ecological systems, making them a crucial lever for sustainable development (Vinuesa *et al.,* 2019). This systemic impact has been empirically documented in cross-sectoral assessments by international organisations such as the Organisation for Economic Co-operation and Development (OECD) and the World Economic Forum (WEF), which identify AI as a general-purpose technology with economy-wide implications for productivity, labour markets, and sustainability transitions (OECD, 2021; WEF, 2023).

From an economic perspective, AI is increasingly regarded as a tool that can promote sustainable development. It can optimise business processes, increase efficiency in areas such as production and logistics, improve the use of resources, and enable new business models and innovation. At a societal level, AI is changing the way in which we understand work and creating opportunities for new occupations and job profiles. For example, it can automate repetitive and risky tasks, thereby helping to make working conditions safer and healthier (Deshpande *et al.,* 2021).

However, the increasing use of AI poses a risk of social inequalities, highlighting the need for ethical standards and a reorganisation of the education system to equip students, managers and employees with the necessary skills for responsible AI use (Vinuesa *et al.,* 2019). Empirical studies confirm that AI adoption can reinforce existing inequalities when access to skills,

data, and digital infrastructure is unevenly distributed (Berg *et al.*, 2024; UNESCO, 2024).

From an ecological standpoint, AI holds considerable potential to enhance natural resource monitoring and reduce environmental impacts, thus, becoming a vital instrument in combating climate change and optimising energy and resource management. Conversely, the use of AI is contributing to an increase in emissions, primarily caused by the storage of substantial data volumes in data centres and the complex training and computing processes.

Although AI is seen as a powerful tool for advancing sustainability initiatives, an IBM® study concludes that a significant number of business leaders (56%) are not yet actively using it for this purpose (Shim, 2024). This indicates a gap between recognising the potential of AI and implementing it in the workplace.

Delineating the terms

The following section provides an overview of the terminologies that apply to this chapter.

Sustainable Development: According to the Brundtland Report of 1987, Sustainable Development is defined by the Brundtland Commission as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'* (Desai & Brundtland, 2007). This concept's objective is to achieve a balance between the economic, environmental and social dimensions. It forms the basis for the Sustainable Development Goals (SDGs), which were adopted by the United Nations in 2015. The SDGs embrace the 17 most pressing challenges in the world, including climate protection, decent work and quality education. These goals require a global effort to improve or solve them and incorporate the responsibility of companies and technologies, including AI (Ciurea, 2024).

Sustainable AI: There are two forms of "sustainable AI": Sustainability in AI and Sustainability through AI. The latter pertains to ways in which AI can contribute to

sustainability-related purposes, also referred to as "AI for Good". This includes technologies that enhance resource efficiency and promote social progress. In contrast, sustainability in AI focuses on the sustainable use of AI itself, also known as "Green AI". This involves reducing emissions and considering ethical considerations during the training and utilisation of AI models (Van Wynsberghe, 2021).

Footprint or handprint: When describing the overall impact of an object or process, the footprint is often referred to as the sum of the negative (environmental) and the handprint as the sum of the positive (sustainability) effects. These handprint effects can be achieved via supply and product chains, systemic effects, communication and role model function.

Responsible AI: Responsible AI, also known as ethical or trustworthy AI, focuses on creating systems that improve our lives while prioritising fairness, accountability, and transparency. This multi-disciplinary field draws insights from computer science, social science, law, and ethics, emphasising the importance of engaging all societal sectors, especially those directly affected by AI, to shape a better future (Gradient Institute, 2024)

A brief look at the current state of research

Emerging research across disciplines such as economics, sustainability science and business informatics increasingly addresses the application of AI in the context of sustainable development, with a focus on the combined consideration of ecological and economic issues. Key research topics and scientific debates include the use of AI to process large amounts of data, to create AI-supported predictions and to optimise the efficiency of systems, products and processes. Other research projects analyse the societal, social and ethical aspects of AI development and use with particular emphasis on the bias of AI models and their impact on social justice, as well as the loss of human control in decision-making processes and the increasing need for regulatory frameworks and governance structures. The effects on the labour market and the education sector are also becoming increasingly important in research.

The following are examples of institutions that deal with the topic of AI and sustainable development:

Table 4.1: Examples of institutions that deal with AI and sustainable development

Institution	Focus
Global Digital Compact of the United Nations (UN) https://unsdg.un.org/latest/announcements/harnessing-artificial-intelligence-sustainable-development-goals-sdgs	A comprehensive framework for global governance of digital technologies and artificial intelligence (...) to harness the immense potential of digital technologies and close the digital divide.
Massachusetts Institute of Technology (MIT) https://earthintelligence.mit.edu/	School of Management 'Sloan' with a focus on research and teaching in the field of AI and its 'Earth Intelligence Lab'
Stanford University HAI Corporate Members Program *et al.*, (2021)	Stanford University is investigating the great potential of human-centred AI technology to be used to the benefit of human workers and is focusing on applications that complement and enhance human capabilities rather than supplanting or replacing them.
AI for Social Good (AI4SG) https://www.nature.com/articles/s41467-020-15871-z	Movement with members from universities (e.g. University College London, University of Freiburg) and industry (e.g. Microsoft Research, Bosch Center for Artificial Intelligence) that aims to build inter-disciplinary partnerships around AI applications to unlock the potential for positive impact.

(*Continued*)

Table 4.1: Examples of institutions that deal with AI and sustainable development (*Continued*)

Institution	Focus
AI for the Planet https://www.aifortheplanet.org/content/ai-for-the-planet-alliance	Alliance founded by Startup Inside, with Boston Consulting Group (BCG) and BCG X as knowledge partners and in collaboration with the AI for Good Foundation; the United Nations Development Programme (UNDP); the United Nations Educational, Scientific and Cultural Organization (UNESCO); and the United Nations Office for Information and Communications Technology (OICT).
Climate Change AI https://www.climatechange.ai/	Non-profit organisation focused on catalysing impactful work at the intersection of climate change and machine learning.
Journals such as *Nature Sustainability*, *AI & Society* and *Journal of Cleaner Production*.	Publications of studies.
Institutions such as the WEF (World Economic Forum), the OECD and the Global Partnership on Artificial Intelligence (GPAI).	Preparation of studies and reports.
Expert and speaker events such as the annual "AI for the Planet" event (www.aifortheplanet.org) or the "Summit of the Future" (https://www.un.org/en/summit-of-the-future).	Keynotes and lectures.

There are still significant gaps in research because of a lack of long-term studies on the societal consequences of AI. This means that we are unaware of the future effects of AI on social structures, the contribution of AI to resilient and culturally diverse societies and the influence of the technology on the labour markets. Additionally, the inequality in access to AI infrastructure and resources globally, particularly between industrialised nations and developing countries, has also not been sufficiently researched yet (Vinuesa *et al.*, 2019). This emphasises the necessity for integrating cultural and regional perspectives into AI development, a field that will probably gain increasing scientific importance.

Despite the increasing emphasis on green AI in the context of resource utilisation and emissions, there is a lack of systematic assessments of its environmental impacts, particularly concerning AI energy consumption, which many studies anticipate will escalate substantially in the ensuing years. Furthermore, inter-disciplinary approaches, such as the integration of AI technologies with insights from other disciplines, must be accorded greater consideration in research in forthcoming years.

(Inter-) national AI regulations

In addition to the scientific debate, (inter-) national regulation is essential for considering, mitigating or avoiding the risks associated with AI. Given the far-reaching impact of AI on the world of work and society, it is not enough to rely solely on the voluntary commitment and necessary knowledge of organisations that develop and use AI. Competitive interests can also hinder a responsible and sustainable approach to AI. In this regard, the European Union (EU) has taken the initiative by becoming the first major regulator worldwide to draft and enact a European regulation, the EU AI Act. This ambitious piece of legislation focuses on the responsible development and use of AI systems and "*brings several benefits to EU citizens, e.g. in terms of protection against discrimination*" (Ciurea, 2024), by promoting "*the uptake of*

human-centric and trustworthy artificial intelligence" (Ruschemeier & Bareis, 2024).

The EU AI Act does not explicitly refer to the SDGs, nor does it formulate explicit regulations on the ethical use of AI. In the absence of clearly defined sustainability benchmarks, there is a risk that national implementations will prioritise economic competitiveness and technological compliance over long-term environmental and social objectives. This is particularly salient in sectors characterised by substantial ecological or social externalities, where the deployment of AI-driven optimisation processes may inadvertently compromise the pursuit of climate neutrality or social justice objectives. A critical examination and consideration of the areas of application is necessary to avoid SDG areas being negatively impacted using AI to promote progress and innovation (Ciurea, 2024*)*. To illustrate this point, consider the potential implications of AI applications in agriculture. While these applications may enhance productivity and efficiency, there is a risk of intensifying resource use or excluding small-scale farmers if sustainability criteria are not explicitly embedded.

In contrast to the EU AI Act, the "AI for Africa" Blueprint explicitly embeds responsible AI development within the framework of the SDGs. This explicit normative orientation provides clearer guidance for aligning technological innovation with sustainable development objectives across different sectors. The blueprint was initiated in 2021 with the aim of addressing the unique conditions and challenges of the African continent. It places a particular emphasis on the utilisation of AI in African contexts, particularly in the domains of agriculture, health, and education, amongst others. The objective is to formulate and implement a successful AI strategy on an intercontinental scale. As posited by Lacina Koné, Director General of the Smart Africa Secretariat, *"the benefits brought by the responsible use of AI can improve the work environment and quality of life and create the potential for attaining a human-centered future society with opportunities for everyone, including women and girls as well as vulnerable groups"* (Sedola *et al.,* 2021).

In addition to international or multinational frameworks, it is necessary to make national efforts in support of sustainable development. Such efforts should regulate the risks and promote the potential of AI systems at a national level, as illustrated by the South African National AI Policy Framework and Germany's national AI strategy. These aim to promote the integration of AI technologies for economic growth, while also emphasising the responsible development and use of AI (DCDT, 2024). Both initiatives aim to foster a robust, competitive and socially, economically and ecologically beneficial AI ecosystem through coordinated efforts in research and development, infrastructure development and labour market enablement (Sedola *et al.,* 2021).

It is imperative to acknowledge the vital function of national and international policy in shaping the regulatory framework for sustainable development. These policies significantly affect the global labour market, covering aspects like education, learning, and the advancement and application of AI, along with the associated data management and decision-making processes. Regulatory frameworks that intentionally include sustainability goals are more effective in guiding AI development in a manner that positively influences the future of work while minimising environmental and social risks.

Delineation of chapter content

AI has a longstanding history, starting from a dual goal: To understand human intelligence by simulating thought processes on computers and to make computers more intelligent and to enable them to solve tasks which are associated with the concept of human intelligence. From the beginning, a huge variety of approaches and paradigms have been followed. Machine learning and neural networks have led to the widespread adoption of black-box-like decision-making, where the reasoning is not based on logic but on the analogy to the data sets provided for learning and on probabilistic relations. These methods *do not explicitly understand or model all underlying causal relationships*' (LeCun *et al.,* 2015).

The study *The role of artificial intelligence in achieving the SDGs* concludes that AI can support the achievement of 128 goals across all SDGs and has identified 108 AI projects that address the SDGs worldwide (Vinuesa *et al.*, 2019). However, the areas of application of AI presented in this book chapter are oriented towards the economic, ecological and social dimensions of sustainability and focus on the issues that arise from the interplay of AI and sustainable development and that have a significant influence on the specific requirements and effects of the world of work.

This chapter does not address technical aspects, such as hardware development, or specific implementations of AI algorithms. It also does not cover pure research approaches to the development of new AI technologies, or very specific technical details, such as the training of AI models and their programming. The following topics, which are related to the world of work, are also not covered in detail in this chapter:

- AI-supported talent acquisition and personalisation of learning paths
- AI-supported workplace safety, workplace organisation and health
- AI in HR management and employee support
- AI-based applications in the healthcare sector
- Robots with AI

Opportunities, challenges and use cases in key areas of the World of Work

The following sections provide a closer look at some of the key areas for the world of work and highlight the opportunities that emerge from the integration of AI models, while concurrently addressing the challenges and risks associated with this integration. It shows existing application examples and outlines the implications for industry, universities and future graduates in every area.

Economy and work processes

It is evident that AI systems are already having a considerable impact on various aspects of working life by supplementing or taking over

tasks previously performed by humans, and this trend is set to accelerate in the future. According to the World Economic Forum's recent "Future of Jobs" survey, "*...generative artificial intelligence (GenAI) is transforming the world of work with GenAI-enabled advancements expected to reshape a substantial number of jobs, potentially affecting up to 40% of total global working hours*" (Brown & Leopold, 2024). Management consulting company McKinsey has also confirmed that this will have a significant impact on costs, with the potential to save up to 30 % of operating costs by 2030. (Hazan *et al.,* 2024). The integration of AI into business processes offers a range of approaches to enhance work and production optimisation, including the distribution of work resources and the planning of workflows to reduce input and increase output. Companies are, therefore, compelled to rethink their business processes in fundamental ways. Empirical evidence supports this assessment. Large-scale surveys and firm-level studies suggest that AI-driven automation can lead to tangible improvements in productivity and resource efficiency, especially when integrated into wider organisational transformation strategies rather than implemented as standalone tools (OECD, 2021; WEF, 2023). However, these studies also emphasise that such gains depend on additional investments in skills, governance structures, and human oversight. From a sustainable development perspective, it makes sense to take a closer look at the areas of automation and decision-making processes, monitoring and predictive maintenance, as well as business models and product development.

Automation and decision-making processes

AI-enabled automated processes and the automated handling of tasks that were previously the responsibility of people can reduce errors across an organisation's entire value chain. This can result in more efficient use of working time and material resources, particularly in areas such as logistics or production. AI can help companies to identify and minimise risks in the supply chain, for example, and, thus, contribute to greater stability and transparency, also regarding suppliers' working conditions.

Table 4.2: Practical examples of optimisation of business processes through AI-enabled automation

Project | Source	Description
UiPath - AI-powered Business Automation Platform. https://www.uipath.com/	UiPath uses AI to automate business processes and relieve employees of repetitive tasks by providing an AI-powered Business Automation Platform so that employees can focus more on creative and value-adding activities.
Blue Prism - Blue Prism® Enterprise AI. https://www.blueprism.com/	Blue Prism® Enterprise AI combines artificial intelligence with automation and orchestration to enable smarter business operations. It helps companies to transform their work processes through digital assistants, AI and automation and thus utilise resources more efficiently.
IBM® - Supply Chain Consulting Services. https://www.ibm.com/consulting/supply-chain	With their consulting services, IBM® strengthened supply chain management by helping clients use AI to empower their workforce and implement proactive, predictive operational strategies.

In addition to low-risk tasks performed by AI systems, important decision-making processes will be increasingly affected, as AI can analyse large amounts of data in real-time, enabling companies and managers to make informed decisions, for example, on sustainable production planning. A key challenge in the integration of AI into various processes is the transparency of the underlying models and data. To ensure the ethical and responsible use of AI, it is essential to clearly define the goals and intentions of these decisions, ensuring that they benefit people and society.

As early as the selection and preparation of training data sets or the choice of an appropriate AI model, the decision-making

process, especially in highly regulated industries such as the financial sector, must be subjected to rigorous scrutiny. The strengths and limitations of the respective technologies must also be considered, because, for example, *"...deep learning (...) is great at learning from large volumes of labelled data, but it's almost impossible to understand how it creates the models it does"* (Davenport & Ronanki, 2018). As AI models and automation of business processes become more sophisticated, and decisions become more critical, the need for human oversight and effective risk management will increase. The EU AI Act, for example, has defined the requirements for "human oversight" on the condition that "*...high-risk AI systems shall be designed and developed in such a way that they can be effectively overseen by natural persons"* (Heidemann *et al.*, 2024).

Monitoring and predictive maintenance

As Falk and van Wynsberghe (2023) have documented: "*... the use of AI in supporting sustainable development goals and their applicable fields has been widely published about, especially in terms of monitoring."* By investing in AI for smarter systems, for example, machine or material problems can be identified at an early stage and ideally rectified, which can extend the lifespan of systems and lead to a reduction in waste and resource consumption (Shim, 2024).

Table 4.3: Examples of monitoring and predictive maintenance

Project | Source	Description
Shell. https://www.shell.com/energy-and-innovation/digitalisation/artificial-intelligence.html	Shell uses AI models to predict maintenance needs and energy consumption and to calculate optimal energy flows in oil refineries, which contributes to a more efficient use of resources and a reduction in emissions.

(*Continued*)

Table 4.3: Examples of monitoring and predictive maintenance (*Continued*)

Project | Source	Description
EnBW - Condition Monitoring for wind turbines. https://www.enbw.com/landingpages/condition-monitoring.html, https://www.h-ka.de/isrg/projects/autodiagcm	German energy supplier EnBW has developed an AI-supported condition monitoring system for wind turbines together with Karlsruhe University of Applied Sciences, which enables more precise diagnoses, shorter downtimes, the avoidance of failures and thus an increase in energy yield.
Downer Group AI-powered fleet management. https://www.ibm.com/case-studies/downer	Downer Group in Australia utilised an AI-powered predictive maintenance platform for its train fleet, resulting in greater efficiency and longer equipment life.
WATER+ from Pluvion for detecting extraneous water in sewers. https://pluvion.de/de/water-plus	WATER+ is an AI-supported system for intelligent and forward-looking water management, which aims to maximise the efficiency and sustainability of water infrastructures by detecting, localising and predicting extraneous water in sewer networks.

In addition to maintenance and diagnostics, the strength of AI in the field of predictive analytics is evident in the definition and adaptation of corporate strategies. By processing large amounts of data, AI models can better predict future developments and, thus, help with long-term strategic planning and the necessary adjustment of goals, strategies and resource deployment.

Business models and product development

There is significant potential for utilising AI in sustainable development, particularly through innovative, data-driven

business models that prioritise sustainability. For example, companies can use AI models to design and develop products and services that consume fewer resources or are more sustainable in their life cycle. In addition, the use of AI enables more individualised adaptation to customer needs and market demand, which can reduce overproduction and overconsumption.

In addition, new cooperation and business models can be developed in the sharing economy. In addition to physical resources, these models can apply to the shared use of data and knowledge and can be used to make resource-saving decisions. The use of AI can enable the matching of companies and institutions via digital platforms, e.g. to identify and share innovative approaches or new potential uses for data sets.

Based on the preceding analysis, the following consequences and requirements for the area of "economy and work processes" are derived as an integrative interpretation of the literature, policy frameworks and practical examples discussed, reflecting the author's analytical perspective.

Labour market and education

Considering the substantial growth in skills and the increased use of AI models in recent years, it is evident that AI will have a considerable impact on the future labour market, influencing existing job profiles. Previous studies indicate that AI can generate new occupational fields, while others are at risk of automation and will be partially displaced. The minister of the German Federal Ministry of Labour, Hubertus Heil, anticipated that "...by 2035, no job will be entirely AI-free" (BMAS, 2023). In an interview from 2023, he stated that, unlike major industrial developments in the past, the transformation of the labour market through AI will not affect "blue collar workers", but will increasingly impact people in traditional office jobs, for example, in retail, banking and insurance, where jobs will be lost. The latest "Future of Work" report by the McKinsey Global Institute also concludes *"...that demand for workers in STEM-related, healthcare, and other high-skill professions would rise while demand for occupations such as office workers, production workers, and customer service representatives would decline, spurred by AI and automation"* (Hazan *et al.*, 2024).

Table 4.4: Consequences and challenges of economic and work processes

Industry	Universities	Graduates
Increased investment in AI systems to increase efficiency in work and production processes, such as automation applications and predictive analytics tools Building public trust through transparency in the use of AI and AI-supported decision-making. Promoting environmentally friendly production methods with the help of AI. Realisation of competitive advantages through the development of sustainable products and services with increased use of data-driven innovations, e.g. resource-saving production. R&D (research and development) investments that build a bridge between technology and environmental disciplines.	Providing a holistic system view through inter-disciplinary and practice-oriented research (e.g. for the development of AI-based solutions). Increased cooperation with industry and public institutions. Promoting systems thinking by teaching technological aspects, in particular algorithmic systems, including AI and machine learning (ML), as well as economic and ecological contexts. Taking more responsibility for preparing and supporting a socially just and sustainable transformation of the increasingly technology-based world of work.	Development of expertise in the field of technological innovations and their practical application, particularly in the areas of automation and sustainable process design. In addition to technical knowledge, the acquisition of skills for critical and ethical handling of AI-based decisions. Acting as an ambassador or change agent for a technological, sustainability-focused future working environment.

Conversely, new or evolving job profiles are emerging, particularly through the upgrading of occupational fields and the promotion of currently underrepresented professions. It is anticipated that the demand for human labour will rise, particularly in social services such as health, education and care. AI is poised to play a substantial role in reducing bureaucracy for care staff and facilitating more personalised healthcare (Yu *et al.,* 2018). In addition to enhancing efficiency in these areas, it is crucial to optimise factors such as job satisfaction, physical health and mental well-being to ensure sustainable development. A recent OECD study projects a future enhancement in these areas and working conditions through the adoption of AI (OECD, n.d.). The increased use of AI technologies also creates employment opportunities through the emergence of new job profiles and the growing demand for technical experts. These opportunities are further bolstered by the convergence of AI and sustainable development, as evidenced by its application in the field of wildlife conservation. Prominent technology company Microsoft has showcased several use cases for this, including wildlife bioacoustics detection and wildlife conflict mitigation, in their publication "AI for Good" (Lavista Ferres & Weeks, 2024).

An AI-driven economy will generate many high-value jobs in AI solutions, such as network engineers, programmers, and robotics experts. These positions will require specialised skills, attracting international investments to address market shortages (Sedola *et al.,* 2021). The possibilities of generative AI (GenAI), for example, in the creation of content such as texts, images or entire videos, also open new opportunities for creative services. In the future, GenAI tools will be able to carry out work that previously required expert knowledge (e.g. image editing, video editing) through the targeted input of prompts.

However, the opportunities presented by this technological advancement are accompanied by significant challenges, particularly regarding the importance of education systems and the necessity for ongoing professional re- and upskilling. In addition to developing fundamental AI knowledge and technical skills, it is imperative to empower managers and employees to

utilise AI responsibly and to incorporate ethical and cultural principles into training and learning programmes. Those who understand and appreciate ethical principles and cultural differences will be better placed to act in an ethically conscious and culturally diverse manner when developing and using AI.

According to an IBM® study, in addition to teaching and developing basic AI skills, the shortage of skilled workers with knowledge of sustainable business strategies and renewable and clean energy must also be addressed. To address these challenges and utilise the potential of AI for sustainability, the study proposes two key recommendations: "*...bridging the perception gap between leadership levels regarding the use and impact of AI for sustainability through data analysis and open dialogue"* and *"...investing in upskilling the workforce to meet the growing demand for digital skills related to climate risk mitigation and AI"* (Shim, 2024). It is crucial to ensure that the possibilities offered by AI do not come at the expense of employees' well-being. For instance, the use of AI for the analysis of employee health data must be balanced with the protection of their privacy.

It is evident that AI has the potential to transform the labour market, and it is essential that "*...individuals and societies use this technology to advance employability and seize the opportunities of new jobs that will be created by AI rather than passively allowing AI to replace jobs"* (UN, 2024a). The OECD also sees member countries on the cusp of an AI revolution, with the employment landscape set to change significantly, and concludes that *"...to navigate this shift, it's critical to prioritise training and education to equip both current and future workers with the necessary skills, and to support displaced workers with adequate social protection,"* on the one hand, while "*...safeguarding workers' rights in the face of AI integration"* on the other (OECD, n.d.).

According to a survey by McKinsey & Company, companies anticipate that they will need to reskill one-third of their current workforce to address the skills gap associated with AI (Hazan *et al.*, 2024). In terms of responsible corporate governance, it will be important not to plan for downsizing because of assumed

Table 4.5: Examples of re- and upskilling

Project | Source	Description
CMA CGM, a leading global shipping and logistics company. https://www.bcg.com/publications/2024/five-must-haves-for-ai-upskilling	CMA CGM has introduced an "AI Skills Accelerator Programme" in which all management levels, including the CEO, actively participate.
Digital Reskilling Lab at Digital Data Design Institute at Harvard. https://d3.harvard.edu/labs/digital-reskilling-lab/	A global research centre that provides research-driven insights, accessible to anyone in the world, on using AI and digital technologies to advance business and society.
Microsoft: Alliance for AI competence. https://news.microsoft.com/de-de/allianz-fuer-ki-kompetenz-in-deutschland-unternehmen-und-verbaende-wollen-deutschlands-arbeitnehmer-gemeinsam-fit-fuer-die-arbeit-mit-kuenstliche-r-intelligenz-machen/	Alliance for AI Expertise in Germany, which has set itself the goal of training employees in AI in companies and thus exploiting the great economic potential that artificial intelligence promises for Germany.

efficiency gains by AI in the future, but to invest in developing the skills of the workforce to exploit and utilise the full potential of AI and to transform the existing business model to meet the challenges and opportunities for growth and innovation.

The education system has a key role to play in integrating the right and important topics into research and teaching to prepare the workforce of the future for the AI age and to enable future managers and experts to use AI responsibly.

Drawing on the analysis above, the following consequences and requirements for the area of "labour market and education" represent a synthesised interpretation of research findings and policy debates, reflecting the author's analytical perspective.

Table 4.6: Implications for labour work and education

Industry	Universities	Graduates
Establishment of comprehensive re- and upskilling programmes to qualify the workforce for the requirements of AI. Maintaining social responsibility and safeguarding jobs despite the impact of automation through long-term investment in innovation and growth. Collaboration with universities to integrate the practical requirements of AI capabilities in an industrial context into research and teaching. Strengthening diversity in the workforce.	Creation of AI-centred study programmes that combine technological, ethical and social dimensions as well as sustainable development. Promotion of vocational learning through further AI training programmes for skilled workers. Securing a qualified workforce through research and identification of future labour market potential, needs and new job profiles.	Acquisition of basic and industry-specific AI skills, e.g. in growth sectors such as education and healthcare. Specialisation in highly qualified professions, e.g. in AI development. Knowledge-building in the field of technology and sustainable development for new professional profiles, e.g. in the areas of AI and sustainability consulting, or "data-driven circular economy management".

Energy, climate and resource utilisation

Historically, economic activity and growth have been associated with high consumption of materials, natural resources, energy and land use. The potential of AI-based systems lies in the various approaches to analysing and optimising resource consumption in the use of energy and raw materials in production. For example, emissions and waste in the production process can be avoided (BMUV, 2024). *"Through AI capabilities like monitoring, analysing, and forecasting based on big data, concrete actions such as responsible and thoughtful use of resources can be made easier and more automated"* (Schneider Electric, 2024). Thanks to their ability to analyse complex data, AI systems can make it possible to predict climatic changes such as future weather events and to create complex climate models, thus making a significant contribution to monitoring the carbon footprint that is partly responsible for (man-made) climate change. According to a Boston Consulting Group study, the use of AI for climate control can help to reduce total greenhouse gas emissions by up to 10% by 2030. (Degot *et al.,* 2021).

There is also great potential to avoid wasting raw materials and achieve greater resource efficiency by optimising recycling

Table 4.7: Examples of circular economy and optimisations in the supply chain

Project | Source	Description
Waste Management and sorting with AMP Robotics. https://www.amprobotics.com/	The company AMP Robotics uses AI to recognise and sort waste in recycling plants. The AI can recognise and sort different types of material, which increases the efficiency of the recycling process and enables more materials to be reused.
Circular Economy with Circularise. https://www.circularise.com/:	The Circularise platform enables companies to use AI to track the origin and composition of their products along the supply chain and collect data on material properties. This facilitates reuse and recycling, including through improved product traceability.

(*Continued*)

Table 4.7: Examples of circular economy and optimisations in the supply chain (*Continued*)

Project | Source	Description
SAP – Nachhaltigkeit und Supply Chain Management. https://www.sap.com/germany/insights/end-to-end-supply-chain-sustainability.html	SAP uses AI to help companies to make their supply chains more sustainable. AI helps to utilise resources efficiently, reduce CO_2 emissions and at the same time improve working conditions within supply chains.
Schneider Electric: EcoStruxure – Energy Efficiency with AI. https://www.se.com/ww/en/work/solutions/artificial-intelligence/solutions.jsp	By using AI capabilities, Schneider Electric sees a long-term opportunity to revolutionise energy management by analysing all variables to formulate an optimal manufacturing setup in terms of sustainability and cost efficiency.

processes and focusing more on designing a circular economy. AI algorithms can help to minimise waste and reuse or recycle raw materials, for example, by using machine learning to identify materials in the first step and sort them in the second (Ellen MacArthur Foundation, 2019).

Deloitte's study *Powering artificial intelligence* highlights the importance of proactive management of AI applications' emissions to minimise their environmental impact, "*...since AI growth could double its electricity consumption in the next two years*" (Deloitte, 2024). Other studies, e.g. by IBM®, also emphasise the need for sustainable AI practices to mitigate the environmental impact, as the study predicts a 160% increase in energy demand by 2030. (Shim, 2024) However, according to the Deloitte study, a reduction in emissions is possible. The analysis estimates that wider use of leading available technologies with advances in hardware can help to reduce data centre electricity demand by more than 350 TWh in 2030 and more than 1,545 TWh in 2050. More efficient processors and new technologies such as quantum computing could also further improve the energy efficiency of AI and high-performance computing (Deloitte, 2024).

However, to optimise the emissions caused by AI and ensure the technology's sustainability, it is essential to establish access to and transparency regarding AI consumption data. The objective is to address the current lack of data on consumption in data centres and to achieve resource savings by optimising IT architecture, software and hardware (ZUG 2024). The Deloitte study mentioned above comes to a similar conclusion: "*Innovations in AI and data centre efficiency will be pivotal in shaping a sustainable energy landscape.*" The study recommends improved IT performance and hardware equipment, as well as the introduction of a comprehensive energy management system to optimise the use of the centre.

According to Emma Strubell, assistant professor at Carnegie Mellon University, Pittsburgh, "it is important to measure not only the energy consumption that arises when using large models, but also the entire life cycle of AI applications in terms of the actual climate and resource footprint." AI practitioners should be mindful of energy sources powering their computers. The exact breakdown of energy sources and, thus, carbon footprint varies widely based on geographic location (ZUG, 2024). She also calls for programmes to promote resource-efficient development and application.

Moreover, the utilisation of clean energy is vital in diminishing energy-related emissions, including CO_2. As stated in Deloitte (2024), "*…achieving 'Green AI' is essential to long-term success.*"

Table 4.8: Examples of optimisation of energy consumption and resource utilisation

Project | Source	Description
Google Data Centres. https://deepmind.google/discover/blog/deepmind-ai-reduces-google-data-centre-cooling-bill-by-40/	Google uses AI to optimise energy consumption in its data centres. The AI monitors the temperature, power supply and other parameters in real time and adjusts the cooling accordingly. According to Google, DeepMind AI has helped to reduce energy consumption for cooling by up to 40%.

(*Continued*)

Table 4.8: Examples of optimisation of energy consumption and resource utilisation (*Continued*)

Project | Source	Description
Precision Agriculture with IBM® Watson. https://www.ibm.com/blog/precision-agriculture-watson-ai/	In agriculture, IBM® Watson helps farmers to optimise the use of water, fertilisers and pesticides. Satellite-based data and AI-supported predictions can be used to irrigate and fertilise fields in a targeted manner, thereby increasing resource efficiency and minimising environmental impact.
Water Corporation in Western Australia – Optimisation of cloud migration. 2024-sustainability-readiness-report	Water Corporation in Western Australia used generative AI to optimise their cloud migration, resulting in significant time and cost savings and helping them achieve their net-zero targets.
Neste, a leading producer of sustainable aviation fuel. 2024-sustainability-readiness-report	Neste deployed AI-driven solutions to optimise its global supply chain and further its commitment to reducing greenhouse gas emissions.

The following consequences and requirements for "energy, climate and resource utilisation" reflect an integrative synthesis of the literature, industry cases and policy frameworks discussed from the author's perspective.

Social issues, value creation and society

This section provides a comprehensive overview of the advantages of AI for society, while also addressing the risks to our social cohesion. In addition to ensuring social justice and safeguarding human rights in an AI-driven world (of work), the responsibility of companies must be considered in this context to develop AI models that are beneficial for society. "*We must ensure*

Table 4.9: Consequences and requirements for energy, climate and resource utilisation

Industry	Universities	Graduates
Investments in AI-based solutions to optimise energy consumption and emissions along the supply and value chains. Management of energy-intensive AI processes across the entire AI value chain (from data management to training and AI application). Use of sustainable technologies and monitoring systems for greater emissions transparency. Responsible and targeted use of AI.	Research and development in the field of resource-saving AI applications, e.g. in energy infrastructure and production systems. Promoting innovation in hardware and software through research into energy-efficient data centres and technologies (e.g. quantum computers). Increased research and teaching on AI-based circular economy and recycling processes.	Development of green (IT) skills with expertise in sustainable and resource-saving (AI) technologies. Building expertise in the field of renewable energies and sustainability measures e.g. in agriculture. Developing an understanding of the use of AI for sustainable applications

that AI is effectively governed, that it is equitable, accessible, and ethical" (UN, 2024a).

It is important to acknowledge that the quality of an AI model is directly influenced by the quality of the dataset on which it is trained. This highlights a significant challenge in achieving fair AI that represents and includes all population groups equally, "*...as its training data is far from representing the diversity of the population of the internet, let alone the planet"* (Mollick, 2024). There are numerous examples of AI models displaying discriminatory results "*...due to bias introduced by the training datasets' majority's features, an issue that could potentially set back*

the world's progress in reducing inequalities" (Ciurea, 2024*)*. These concerns are substantiated by documented cases in recruitment, credit scoring, and facial recognition systems, where biased training data led to systematically unequal outcomes (Bellogín *et al.,* 2024).

In addition to the need for representation of all social groups, there is a requirement to ensure access to AI tools, applications and infrastructures - including high-quality data and computing resources. This is to be considered fair internationally and must lead to a counteraction of the widening of the already existing global digital divide, which must be counteracted. (UN, 2024b) This imbalance can be explained and understood by the fact that most AI models have been or are being developed in industrialised countries, and the training data originates from there. The market power of a few large tech organisations in the USA and China in data ownership and the capital invested in AI training is particularly striking.

The full social impact is yet to be assessed, but the risks of this unequal representation of humanity and the planet are evident. These risks range from disadvantage and discrimination to the complete exclusion of individual (population) groups from the benefits of AI. *"And, of course, we must ensure that artificial intelligence also benefits the world's poorest countries, not just the rich ones"* (Simmank, 2024). One way in which this objective can be realised is through capacity development and technology transfer in all countries (UN, 2024b). Another option is to establish national AI strategies with a focus on domestic AI infrastructure, capabilities and an AI ecosystem (Sedola *et al.,* 2021).

In addition to these aspects and the importance of digital and AI skills outlined above, the aim here is to adopt "*collaborative approaches that align responsible development with solutions that would respect the diversity of cultures, while promoting locally generated data. (...) To help us get there, Governments must invest in digital infrastructure, support new business opportunities, and leverage the data that they have for economic use in their countries. This should go hand in hand with*

training for government officials and re-skilling programs for the broader workforce" (UN, 2024a). Another approach for a fairer distribution and use of data could be the use of blockchain technology, which could be used to enable a sovereign and privacy-compliant data economy (data marketplace) across national borders based on anonymised and parameterised data. This would achieve a decoupling of AI competence and data ownership (Haverland & Beckenbauer, 2024).

In addition to these all-encompassing measures, companies and non-governmental organisations (NGOs) have a special role to play in the development and responsible use of AI as part of their digital responsibility. In Germany, for example, there has been an initiative for corporate digital responsibility for several years, which has developed a code of conduct for companies on handling data, education and employee participation, climate and resource protection and inclusion in the context of digitalisation. Large German companies such as the Otto Group and Telekom have committed themselves to this code. The overall aim of the Corporate Digital Responsibility (CDR) initiative is to make digital responsibility a matter of course for companies in all sectors and to motivate them to shape digitalisation in a way that focuses on people and values (CDR, 2026). It is vital to be mindful of the principles of digital responsibility when utilising AI, as the ethical challenges in this domain are particularly pronounced because of the unevenly distributed database previously referenced. This poses a risk of discrimination and violations of human rights. Consequently, the development and implementation of responsible AI practices is paramount to ensure the application of prejudice-minimising and ethical principles when introducing AI-driven or AI-supported innovations and business models (Schwanke, 2024).

In addition to national initiatives such as the CDR initiative, there are international associations, such as SustainableIT.org, that support companies and managers. It has, therefore, developed a Responsible AI Framework with a focus on ethical use, trustworthy outcomes, AI literacy and a human-first approach (Pastore & SustainableIT.org, 2024). It is vital to

emphasise the human-first approach and the ethical application of AI. If companies prioritise humanity and fundamental rights over the possibilities of technology, AI will be able to add value to society. However, it is important to note that current AI models and datasets still have a high degree of bias and discrimination. Therefore, their use must be examined very carefully and high requirements and principles defined - for the benefit of society ("people-friendly") and the planet ("earth-friendly") (PwC, 2018).

Table 4.10: Examples of ethical and responsible AI development

Project | Source	Description
Microsoft AI for Good. https://www.microsoft.com/en-us/ai/ai-for-good	With its 'AI for Good' initiative, Microsoft promotes the development of AI applications that have a positive impact on society and the world of work. They focus on the ethical use of AI and create solutions that offer both economic and social benefits.
Google - AI and Social Good. https://inthecloud.withgoogle.com/gen-ai-for-social-good/dl-cd.html	Initiative to use AI to help solve society's greatest challenges and improve people's lives, e.g. by opening new opportunities in scientific research
IBM® AI Fairness 360. https://ai-fairness-360.org/	AI Fairness 360 is an extensible open-source toolkit that can help users to investigate, report and mitigate discrimination and bias in ML models throughout the lifecycle of AI applications.

The following consequences and requirements are derived as an integrative interpretation of ethical, social and governance-related debates on AI and sustainable development.

Table 4.11: Consequences and requirements for social affairs, value creation and society

Industry	Universities	Graduates
Creating structures to ensure fairness, transparency and ethical responsibility in the development and use of AI through the introduction and establishment of standards for responsible AI and governance. Strengthening diversity in data sets by supporting the identification and minimisation of bias/discrimination in data. Development of inclusive and socially just AI solutions International partnerships to create global data ecosystems and enable market access in disadvantaged regions. Supporting the development of digital public goods.	Increased promotion of inter-disciplinary approaches that combine technology, ethics and social sciences and humanities, e.g. in the field of "human-centred AI". Expanding curricula with a focus on skills in ethical AI development, responsible data management and social impact and responsibility Improving access to AI education, e.g. by promoting inclusion through the expansion of scholarships and programmes for underrepresented groups. Cooperation with companies and NGOs on practical implementation	Building competencies in the field of responsible AI with an understanding of ethical AI and its social and legal implications. Specialisation in the development and review of AI governance strategies in companies and in the field of AI for the common good Engagement for digital responsibility and integrative digitalisation.

The rapid development of AI is opening new opportunities to promote and support sustainability goals in companies and society. However, it also poses significant risks and challenges to social stability and justice. As Mollick (2024:44) notes, "*...regulations are likely not going to be enough to mitigate the full risks associated with AI.*" When we examine the USA and China, where tech companies are still largely unregulated in their development of AI models, it appears that the companies and nations that are more likely to harm sustainable development worldwide are likely to prevail in the AI race.

To utilise AI technologies sustainably and beneficially, it is essential to implement measures for quality control, monitoring human use of AI, and AI education. Otherwise, the use of AI has the potential to compromise the achievement of the United Nations' sustainability goals and, in the worst case, can be counterproductive, with predominantly negative consequences for humanity and the planet.

Summary

This book addresses the knowledge gap regarding the interactions of AI use in the sustainable development of the economy, society and the education system. It presents current issues in science, regulation and business practice that are relevant to the world of work, derived from the potential, risks and current use cases. The following focus areas for industry, universities and graduates can be summarised and can be understood as recommendations to shape these areas in terms of responsible and sustainable AI development and use:

The synthesis presented in Table 4.12 is the author's integrative interpretation of the literature and policy landscape. The actions and responsibilities outlined for industry, universities, and graduates should not be understood in isolation. Instead, they reinforce each other within a mutually dependent system: industry demand shapes educational curricula; universities foster future-oriented skills and ethical competencies; graduates carry knowledge and values into organisations. A lack of alignment between these groups could undermine the sustainable potential of AI, whereas coordinated action could accelerate the responsible innovation and inclusive transformation of the world of work.

Table 4.12: Recommendations for focus areas

Perspective	Economy and work processes	Labour market and education	Energy, climate and resource utilisation	Social issues, value creation and society
Industry	Resource / process efficiency & automation, transparency & explainability of AI.	Re- / Upskilling, inclusive AI-driven workplaces, leadership purpose and values.	Energy efficiency, circular economy, emissions monitoring, and mineral exploration.	Governance with focus on fairness, equality & accessibility, responsible data management & innovation.
Universities	Practical orientation & systems thinking on technology, ethics & sustainability.	Ensuring long-term skilled labour via curricula and lifelong learning.	Research on resource-efficient processes & energy-saving technologies.	Inter-disciplinarity, AI knowledge, and cooperation with industry.
Graduates	Expertise in AI governance & automation, AI ethics.	Future skills: creativity, abstraction, social competence.	Focus on green IT & AI skills, careers in sustainable sectors.	Responsible AI expertise, social skills.
Legend: **Critical enablers** | supportive enablers				

Human capital management must play a vital role in the strategic planning of the economy and the organisation of higher education and research in the forthcoming years. This is because of the complex challenges, but also opportunities, that the increasing use of AI brings with it. To prepare, shape and manage the technology's massive impact on the world of work in terms of sustainable development, it is essential to adopt a combined approach of educational, regulatory and business-related efforts. This is mainly because of people's need for trust, safety, fairness, ethics and transparency, and to prevent social injustice through bias and discrimination on the one hand and a waste of resources on the other.

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Discussion Piece

The Future is Human

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During the coronavirus disease 2019 (COVID-19) pandemic, technology allowed us to connect to people despite being socially isolated at home. Today, it allows us to participate in meetings and conferences around the world. Or does it? How much participation, mental, emotional, and physical engagement is possible through a screen, without smell, taste and feel? How much can we connect to AI-generated emails, even when AI learns to speak our language?

Artificial intelligence is not new. It was first coined in the 1950s by John McCarthy, and it is here to stay. Similarly, the trope of "*human vs. machine*" is not new. It has accompanied the development of tools throughout human history.

During the Industrial Revolution in the late 18th and early 19th centuries, machines, such as steam engines, dramatically increased productivity but also displaced workers. For the first time, machines were not just perceived as helpers but as competitors.

In the 20th century, the relationship evolved further with the rise of electricity, communication technologies, and computing. The telephone, radio, and television reshaped how people connected across distances. In the 1930s and 1940s, Alan Turing developed machines that could simulate aspects of human thinking. Machines were thus no longer limited to physical tasks but also began to engage cognitively.

In the late 20th and early 21st centuries, the Internet enabled instant global communication, smartphones embedded connectivity into everyday life, and AI systems can learn, analyse

data, and perform tasks that resemble human reasoning. This seems to blur the boundary between "the human" and "the machine" since all of the human contributions, physical tasks, cognitive engagement, emotional responses, are available at the touch of a button.

However, tools and machines have always been only as good as the people creating them. Especially, AI is known to reinforce existing biases and to deepen inequality. It erodes trust. The richness of human presence, the nuance of nonverbal communication, and the depth of real connection cannot – and I claim can never be – replicated in a virtual space and/or through machines in general.

When people meet in the same room, the experience changes in meaningful ways through the shared energy of the group. Engagement in in-person meetings is typically higher. People are more attentive. They multitask less and collaborate more. Physical tools such as paper, pen, chalk, and whiteboards serve as tangible confirmations of processes and progress, facilitating deeper learning and enhancing long-term memorisation.

Furthermore, people can read body language, facial expressions, and other nonverbal cues, which help to clarify meaning and reduce misunderstandings. Eye contact feels more natural; tone is easier to interpret. Informal coffee conversations happen unprompted. All this builds accountability and confidence. These are virtues that cannot be overestimated in today's divided world.

Virtual meetings offer clear advantages intellectually: They save travel time, reduce costs, and make it easy to connect people across different locations. However, these benefits come at the expense of human experience.

AI tools are real, and they increase collaboration. AI can smooth communication, make texts more polite, and reduce conflict in exchanges. However, personal maturity and interpersonal relationships grow through friction, through negotiation, through the development of common ground. In that, AI remains a tool. It requires human skills such as creativity, empathy, and judgement to make meaningful decisions and solve problems.

Thus, in an increasingly digital world, the need for genuine connection, trust, and shared experience remains central. Beyond efficiency and convenience, there is the dimension of human touch and feel that drives understanding, collaboration, and lasting relationships.

Thus, I remain confident: The future is human.

Part 2

The Strategic Lens

In the Strategic Lens, a profound emphasis is placed on the vital role that universities play in shaping and nurturing a workforce that is adept at meeting the rapidly changing demands of an ever-evolving job market. At the core of this crucial mission are the professors, who act not only as academic leaders but also as visionary architects of educational innovation. These dedicated educators significantly influence the trajectory of universities, guiding them towards the continuous enhancement and adaptation of their programmes, ensuring that they complement the contemporary needs of diverse businesses and industries.

Moreover, these professors are instrumental in advancing scholarship, which forms the very foundation of a vibrant and resilient academic framework. Their commitment to research and critical enquiry fuels intellectual growth, fostering an environment where knowledge thrives.

As workplaces, universities should embrace a strategic perspective, recognising that their role extends beyond mere education to encompass the transformation of the academic environment itself. This approach not only highlights the imperative of effectively equipping future employees with the required skills but also emphasises the dynamic and lively nature of these institutions as workplaces. To achieve this, universities must remain agile and attuned to the ever-shifting landscape of work, changes that are profoundly influenced by groundbreaking advancements such as artificial intelligence (AI). By wholeheartedly embracing these innovations, universities can ensure that they not only prepare students to tackle the challenges of today but also equip them with the skills and mindsets to navigate and thrive in the uncharted waters of tomorrow's workforce.

Chapter 5

Artificial Intelligence and the Academic Community: Response from the University Professoriate

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Abstract

Our chapter draws insights from contributors representing three universities and relevant institutional examples regarding the response from the professoriate, being part of the academic community, to the emerging field of artificial intelligence (AI) and generative artificial intelligence (GenAI). Following a period of profound scepticism towards AI/GenAI amongst academics and the professoriate in particular, modest steps have been observed towards integrating AI/GenAI systems and tools into academic work, including teaching, learning and assessment, research practices and community engagement. This is amidst the fact that universities are increasingly investing in promoting the effective and ethical use of AI/GenAI technology. Our chapter refers to examples from universities' responses to AI/GenAI issues, including references to the self-empowerment of the professoriate, the role of the professoriate in AI/GenAI in research, the professoriate and the issue of AI/GenAI ethics, and leadership, governance and policy development related to AI/GenAI. Our exploration revealed that AI/GenAI challenges and responses do not always emerge from or are addressed early by the professoriate. Contrasting with this observation is the desired position that professors must lead universities in dealing with AI/GenAI matters driven by their academic insight, foresight and integrity. It is envisaged that future professorial responsibilities may not only include teaching, research, and community engagement but also be shaped and extended in significant ways by AI/GenAI as part of the world of academic work.

Introduction

In recent decades, particularly since the 1980s, profound changes have emerged regarding the ways that we teach in higher education, how our students learn, how we conduct research and how universities engage with communities. The advent of the Internet in the 1990s greatly facilitated access to information and communication, enabling faster and more effective use of such information and thus enhancing learning, generating new knowledge and communicating with relevant constituents. Efforts towards cooperation in and standardisation of higher education qualifications across nationalities and borders followed, well demonstrated by globalisation, internationalisation and the

launch of the Bologna Process in Europe at the beginning of the current century.

In all these developments, information and communications technology (ICT) helped to shift the focus from "traditional" to "non-traditional" higher education. Shifts were typified by, for instance, from classroom and teacher- or theory-oriented teaching to student-centred strategies, increases in formative learning assessment, widespread research cooperation and working in and with communities for wider social benefit. With the dawn of the coronavirus disease 2019 (COVID-19) pandemic, opportunities for distance and online learning increased as never before in recent history. In research, the complexity and nature of problems have become such that multi-, inter- and cross-disciplinary research swung into prominence – especially in the face of global issues, including climate change, population migration and human conflict and suffering. In addition, trans-disciplinary research, Mode 2 knowledge generation and "citizen science" are increasingly important, serving to benefit society at large and communities nearby higher education institutions. "Citizen science" means ordinary people (non-professional researchers) actively participating in scientific research, usually by collecting, sharing, or analysing data to support professional scientists. It is a collaborative approach that democratises science and expands knowledge through public involvement (see Sauerman *et al.*, 2020).

The recent popularisation of AI and GenAI has also accelerated the process of higher education transformation, including addressing issues of institutional responsibility, inclusivity, equity, affordability, cooperation, creativity and more. One might even point to these developments as a transformational "wave", if not a tsunami, that has hit higher education. Much of the transformational thrust in higher education and elsewhere could be ascribed to the use of AI/GenAI, referring broadly to systems, architectures, algorithms, frameworks and technologies based on AI/GenAI concepts and used for research or other applications. New AI/GenAI tools evolved rapidly, referring to software, libraries, packages or applications based on AI systems or features of AI systems.

For example, ChatGPT and its later versions, as an AI tool, serves to design and generate text, but while AI tools can

be considered AI systems, not all AI systems can be termed AI tools. The term "AI tools" mostly refers to dealing with specific applications of AI systems (Anon, 2024). These tools, which offer rapid answers to complex questions, became highly appealing to university academics and students. However, AI/GenAI usage lacked, and still lacks, full integration into education, studies and research environments (Costa *et al.,* 2024). By mid-2024, an extensive USA survey revealed that, after a period of profound scepticism towards AI/GenAI amongst American academics, at least 75% of participants had taken modest steps towards integrating such systems and tools into their academic work, especially in coursework offerings. This comes with the trend that universities continue to invest largely in promoting the effective and ethical use of AI/GenAI technology (MacGregor, 2024).

Similarly, an Oxford University Press survey (2024) showed that at least 76% of academic researchers around the world were using some form of GenAI in their work by mid-2024, while a national survey of students in the United Kingdom (Freeman, 2024) reported that 53% of respondents had used GenAI to assist with their studies. Many similar findings and recently published sets of guidelines point to the world of academic work as being heavily infused with AI/GenAI. However, this happened with some measure of uncertainty as electronic technologies, AI systems, AI tools, and their use continue to evolve rapidly (Academy of Science of South Africa, 2024; Committee on Publication Ethics, 2024).

This project and chapter

Unequivocally, rapid and continuous developments in AI/GenAI have posed complex challenges to using digital technologies within increasingly diverse working environments (South Africa, 2024). The emerging question was thus: *'What will be those individual and collective competencies needed for an AI-infused world of work?'* - especially within the context of higher education and academic work. Deeper insights and clearer answers may potentially enable better-informed responses from, in our case, the university professoriate. But also from relevant professional staff, university management, university leaders and human resource practitioners in navigating future AI/GenAI-infused academic work at higher education institutions.

This chapter homes in on the academic community and the university as an employer of professional knowledge workers, including the university professoriate as a major contributing, guiding and responsive collective. Through some current examples, we highlight efforts by the university professoriate to respond timely and adequately to AI/GenAI, while at the same time, navigating an array of theoretical and practical questions and implications.

As a brief reminder: The work and responsibilities of university professors are traditionally linked to at least three general university aims or missions, namely

- To create environments conducive to quality teaching, learning and assessment,
- To generate and transfer knowledge, and
- To impact on society at large, and local communities.

Overall, and within the fold of this chapter, professorial responsibilities also include sensitising and steering university management and leadership towards adopting and handling the impact and implications of AI/GenAI. Questions thus arise as to what the role of professors is in helping to steer the university as a responsible institution into an AI/GenAI-infused future. Of much importance, however, is the core and continuous responsibility of the professoriate to promote and maintain academic standards while cementing public universities as a societal good.

Against this background and considering the rapid emergence and traction of AI/GenAI, the focus now shifts to some examples of how the professoriate, within the world of academic work, has responded and continues to respond to AI/GenAI-related issues.

The academic community's response to AI/GenAI – some examples

Our examples, involving the academic community and the professoriate's response to AI/GenAI, relate to both current and continued responses from academic structures and staff complements where professors are prominently represented in different university types and systems. Such structures include university policy committees, programme committees, faculty

boards, senates and other decision-making bodies within the academic community.

The methodology followed for project data generation was participative action research. The authors (as researchers) were directly involved in and observed the actions and contributions of professors conducting discussions and steering policy formation on AI/GenAI at their respective institutions. Such observations were recorded, documented and revised to arrive at relevant conclusions.

Our examples do not claim to be case studies or full descriptions of these responses, nor do they identify any universities by name. Examples include activities at University A (UA), University B (UB) and University C (UC), representing those universities where activities could be experienced or observed firsthand. They also do not refer to the efforts or contributions of any individual, except where pertinently stated.

Areas of professorial response include professorial self-empowerment, policy formation on AI/GenAI, the use of AI/GenAI in research and AI/GenAI-related ethical issues. They also include the integration of AI/GenAI into academic practices, AI/GenAI-related research into sustainable development, promoting internal and external inclusivity, professional staff development directed at AI/GenAI, student development, and promoting AI/GenAI literacy. However, not all these aspects could be addressed, and thus, in this chapter, we focus on four pertinent aspects, namely, professorial self-empowerment, the use of AI/GenAI in research, AI/GenAI-related ethical issues and policy formation on AI/GenAI.

Professorial self-empowerment

University A

At UA, a large public university, the first example of a response to AI/GenAI was noted at the level of the professors themselves. Initially, an identity crisis gripped the professoriate at UA, realising the complexities of AI/GenAI, their relationship with new digital technologies and the challenges faced while adapting to the new digital revolution. Verbal accounts of some initial resistances were recorded, and deep-rooted apprehensions amongst members of the professoriate were observed, including

fears of losing control, worries of job disruption and anxieties about the future. Such fears were voiced in departmental, faculty and committee meetings as the "dangers" of AI/GenAI became a frequent discussion point. What UA professors often mentioned were notions of scepticism about the effectiveness of these new digital technologies and the issue of trust, casting doubt on the unpredictable role of AI/GenAI at UA and higher education in general.

However, what emerged from these critical discussions over the course of about one academic year was a level of acceptance, adaptation to the new challenge of AI-use and self-empowerment as counter-measures. Slowly emerging was professors accepting their role in adapting to digital challenges by viewing AI/GenAI as a help rather than a threat. This acceptance fostered a more conducive collaborative environment by liaising with early adopters of AI, consulting with younger academics on their views, exploring AI/GenAI expertise and discussing new possibilities for using digital technologies in teaching, learning and research.

Currently, and in several respects echoing some findings by Nelson (2024), academic tradition and technological innovation at UA seem to have found a balance, namely addressing the challenge of maintaining core academic values while incorporating AI/GenAI systems and tools responsibly. One example includes a series of seminars and webinars initiated and chaired by professors and offered by AI experts to encourage and equip academic staff and researchers to use AI/GenAI effectively and ethically in their work. Topics included new forms and ways of promoting AI/GenAI-related student learning, the use of AI in finding relevant information, critically assessing AI-generated information, the assessment of student learning via AI/GenAI technology, exploring the use of AI in postgraduate studies and supervising higher degrees, as well as innovative ways of using AI/GenAI in generating and analysing data for large-scale research projects.

One might conclude by saying that the UA professoriate, with notable exceptions, has started responding to AI/GenAI by embracing its challenges and potential, fully realising that future AI/GenAI innovations may drastically alter the traditional and current roles and responsibilities of the academic community.

University B

At UB, discussions on AI/GenAI emerged from Senate Committees and Working Groups on the impact of the Fourth Industrial Revolution (4IR) on teaching, learning, research and innovation. There were different approaches to addressing AI/GenAI in these activities, ranging from seminars / webinars / discussion groups and working papers. Eventually, a Senate document with working guidelines dealing with AI in the academic project was approved (Anon, 2023). These guidelines built onto a larger initiative on data management at UB. The Professors' Forum at this university also discussed technological devices, AI and 4IR as developments impacting higher education, specifically the academic disciplines that the professors are taking responsibility for. From the outset, four observations were evident.

Firstly, programmes within Science, Technology, Engineering and Mathematics (STEM) education moved faster in developing guidelines for their programmes, compared to other programmes. *Secondly,* the professoriate was less active in developing guidelines or discussing these matters compared to those interest groups that have a specific understanding of AI/ Gen AI and supported devices. *Thirdly,* researchers focused on the meaning of AI/Gen AI for postgraduate supervision and how to use AI/GenAI responsibly in scientific writing. An interest group embarked on developing guidelines for using AI/GenAI in publications. *Fourthly,* the discussions were more interest- or expert-based than driven by rank. The latter observation echoes with two general observations in the literature: One is that academic leaders at UB are not always initiating new developments, and the other is that professors focus more on administering or regulating new developments than initiating or driving such developments.

University C

Examples at UC presented with a different set of challenging issues by initially responding with significant concerns regarding AI/GenAI technologies, particularly regarding plagiarism and academic integrity. Staff members were apprehensive that students might misuse AI/GenAI and compromise academic standards. A similar concern is known in the literature, where the integration

of AI/GenAI in education often raises concerns about maintaining academic integrity as well as preventing misuse (Nguyen, 2025).

To approach some of these concerns, the Interdisciplinary Centre for Digital Futures (ICDF) and the Digital Scholarship Centre (DSC) at UC collaborated to establish the AI sandbox workshops, intended to gauge AI/GenAI adoption as well as assess how the academic community may use AI/ GenAI in their practices. By creating these AI sandboxes, academic staff had a controlled space where they could explore and work with AI/GAI hands-on, as opposed to just passively listening to presentations in these environments. During the sandbox sessions, staff members and academic support personnel actively engaged with various GenAI tools. This practical approach allowed participants to experiment with the technologies, understand their applications, and discuss their potential threats and uses in their work. Collaborative learning environments such as these have been shown to enhance creativity and idea-sharing amongst participants (Onaolapo & Onifade, 2020).

One of the most significant insights gained from these sessions was that the potential of AI/GenAI extends far beyond mere tool exploration. It became evident that AI/GenAI could play a crucial role in various academic and administrative functions. Beyond the automation of routine tasks, the consistency of certain logical processes, comparable to low- and medium-order critical thinking, was particularly striking. This realisation led to the inclusion of additional collaborators from various faculties, as the applications of AI/GenAI demonstrated considerable variability across disciplines. In response, a series of online seminars, entitled the AI/GenAI Wayfinder Seminar Series, was offered, inviting expert users and researchers in the field to present their findings.

A predominant theme emerging from AI/GenAI sandbox discussions was the disruptive impact of such technologies on the status quo of conventional academic practices. Another key issue was the exacerbation of pre-existing challenges within the academic community, including concerns related to academic integrity, the design of baseline assessments, and fundamental pedagogical practices. While academia strives to establish baselines, benchmarks, and consistency, the industry does not necessarily operate within the same constraints. This divergence created a compelling paradox: While academics are developing

policies in the face of uncertainty, practitioners in industry actively embrace such uncertainty. This dynamic raises the question of whether the current academic workplace may be hesitant to adopt new ideas and opportunities at the expense of future progress. Despite a rigorous push towards policy formulation and regulatory control, one must consider whether such measures genuinely enhance the value of future graduates. Moreover, what implications does this hold for the future of research and generating knowledge?

What seems promising, however, is the emergence of novel AI/GenAI-infused teaching and learning approaches. A particularly notable example is the use of dialogical agents. Dialogical agents are conversational AI tools designed to facilitate human-like interactions with the specific aim of enhancing knowledge acquisition. These systems allow for real-time learning by structuring scenarios within AI/GenAI frameworks, ensuring that conceptual engagement remains the primary focus. Furthermore, these tools provide immediate feedback, correcting misconceptions and refining understanding if a user's interpretation of a topic is slightly erroneous or misaligned with the core idea. For instance, consider a scenario in which a student engages in a dialogue with an AI/GenAI model about a physics concept. The model simultaneously performs two key functions: engaging in conversation while assessing the student's responses in real time. This dual functionality enables the model to offer clear and direct feedback, allowing the student to identify gaps in their knowledge and enhance their understanding. Such tools present a compelling alternative to lower-order teaching methods, particularly those centred on rote memorisation rather than conceptual engagement.

The use of AI/GenAI in research

University A

At UA, the professoriate's role in promoting the use of AI/GenAI in research across various fields of enquiry at the university is promoted by requiring them to guide research committees and research structures at the institution.

One prominent area of discussion within these structures, as gleaned from the minutes of various relevant meetings, involved providing new ideas for generating, analysing, interpreting and

using data for research and using AI/GenAI tools and applications to facilitate rapid and accurate research decisions. Making research decisions at various stages of research projects often poses fundamental challenges to researchers, sometimes with extreme positive or negative consequences. The argument was thus that, with the availability of powerful AI/GenAI systems and tools, such decision processes should be fundamentally reconsidered and revisited.

What was explored in considerable depth was how research decision-making was to benefit from the multiple options presented by new algorithms, advanced data integration processes, automated learning in data processing, large language models, machine learning and other options. The implications of rule-based and learning-based AI/GenAI systems were highlighted, pointing to data analysis where vast amounts of data are rapidly analysed by AI/GenAI to uncover hidden patterns and trends, which were not possible previously. For example, in healthcare research, huge amounts of patient and incident data may rapidly identify risk patterns that can enable early research and preventative interventions.

For purposes of prediction, new modelling techniques and options to forecast future events, based on vast amounts of historical data, were considered - something not possible before. Such models assist research decision-making in anticipating outcomes and future scenarios. For example, in finance, AI/GenAI algorithms predict market trends and stock performance to more accurately estimate research needed to generate more profitable investment portfolios and provide increasingly accurate financial advice.

Areas of further relevance and concern revolved around the impact of AI/GenAI and its multiple benefits, namely optimisation (algorithms optimise research decision processes by evaluating a range of factors simultaneously to arrive at the best solution), automation (AI/GenAI handles repetitive research tasks and thus reduces error) and risk (AI/GenAI identifies potential research risks and threats by analysing for anomalies and vulnerabilities to mitigate these proactively). Further considerations mentioned were the integration of AI/GenAI with emerging technologies such as blockchain and quantum

computing to strengthen and enhance research capacity and reduce research costs, and, finally, the issue of research ethics, including researcher accountability, participant privacy and non-intended research bias.

What became clear from the deliberations at UA, where several professors took the lead, was that an AI/GenAI-infused future research agenda includes nothing less than revolutionising the ways that academics need to think about their research, especially within the domains of data, decision-making and knowledge integration. The harnessed power of AI/GenAI systems and tools in diverse data modalities such as scientific literature, conceptual frames and models, biological sequences and experimental data offer and uncover patterns and connections as never before.

Such power will enable researchers to extract and connect latent knowledge from a range of fields and disciplines to investigate and solve imminent problems. By combining the analytical capabilities of AI/GenAI with the experience and expertise of researchers and scientists, as well as with the vast amount of current knowledge across disciplines, new frontiers of knowledge and discoveries may soon be within the reach of UA and its research partners.

University B

At UB, research activities are organised around research themes and centres to secure critical mass for research activities and to break a silo approach to research. Multi-, inter-, and trans-disciplinary approaches are encouraged to balance basic and applied research as the latter is the focus of research at this type of university. Coupled with this research approach is incorporating sustainable development goals (SDGs) and collaboration with business and industry. The research centres are extending their thinking on what kind of research to include AI/GenAI and different technological modalities in the research. Here, the professoriate plays a more meaningful role as professors are the leaders / managers of these centres and in many instances the principal investigators around various aspects of the research. The positive observation here is the gradual evolution of AI/GenAI into different academic activities.

On another level, there is an emerging debate from a university-owned scholarly journal on the discussion of what would be an acceptable percentage for using AI in academic work and how should AI be declared and accounted for in research. These developments support an earlier observation that professorial leadership is driven by expertise and interest in a particular area of research or theme. The fact that professors are not always leading mainline discussions does not mean that professors are not considering ways to effectively deal with new developments in higher education.

A response to AI/GenAI ethics

University A

At UA, it is increasingly realised that ethical considerations play a vital role in the responsible use of AI/GenAI in scientific research. Establishing ethics review processes and guidelines are required to ensure that AI technologies are used ethically and to prevent misuse and manipulation. By implementing robust ethical frameworks, AI/GenAI-driven research should uphold the values of integrity, fairness and respect.

However, at UA, it is also realised that ethical challenges linked to AI/GenAI are numerous and can be grouped into at least three categories, namely (a) how research is produced and disseminated, (b) how AI can potentially be misused to harm people and (c) whether the "AI morality" reflects that of their creators. The four baseline rules of ethics are *respect for autonomy, non-maleficence, beneficence, and social justice* (see Beauchamp & Childress, 2013). These rules are grounded in the concepts of *responsible* and *respectful* behaviour, including all AI/GenAI-related or supported research.

University B

Research at UB adds *care ethics* to responsible and respectful academic behaviour. Care ethics embodies the notion of relationship-building around challenging ethical matters in everyday life. Any activity that does not adhere to the four baseline ethics principles reflects irresponsible and disrespectful

behaviour, or cannot effectively manage relationships in everyday life, should be considered unethical.

The idea of a *responsible university* was introduced to the university community, including the professoriate. This has proven to be a powerful concept to address ethical dilemmas related to AI/GenAI by upholding the needs of all stakeholders (Holzbaur & Lategan, 2022). It thus becomes possible to identify key stakeholders and activities that have implications for the university and its professors concerning AI/GenAI. These considerations revolve around:

- Science: Responsible AI research and AI in research.
- Society: Transfer and responsible development of AI.
- Students: AI for and in higher education pedagogy and skills-oriented curriculum development.
- University sustainability, responsibility and governance.

However, there are numerous ways in which UB may be promoted as a *responsible institution* within the context of AI/GenAI ethics (see Table 5.1, which is self-explanatory).

Table 5.1: The responsible university in the context of AI/GenAI

Stakeholder group	**Service / Quality aspect**	**AI impacts on the university**	**AI impact on the professoriate**
Students	Teaching Education Graduation.	New skills demand new tools.	Teach the basics and use of AI. Teach and sensitise for the responsible and ethical use of AI/GenAI.
Society Sustainability	Guidance Transfer Responsible students.	Demand for ethical guidelines.	Ability to ethically reflect on AI/GenAI development and use Transfer.

(*Continued*)

Table 5.1: The responsible university in the context of AI/GenAI (*Continued*)

Stakeholder group	Service / Quality aspect	AI impacts on the university	AI impact on the professoriate
Economy	AI products. Skilled students.	AI research centres.	Ability to ethically reflect on AI/GenAI development and use.
Scientific Community	Contribution to AI-relevant knowledge. Fair publications.	Rules for using AI and AI research centres.	AI research competence Ability to ethically reflect on AI/GenAI development and use.

University C

For UC, one of the most pressing ethical concerns was the potential for AI algorithms to perpetuate and even amplify existing societal biases. AI/GenAI systems learn from data, and if this data reflects historical or systemic biases, the tool is likely to replicate and reinforce these biases in its decision-making processes. This has profound implications for educational and research equity, of which the professoriate needs to be alerted to, including possible unfair treatment of certain groups that may undermine academic credibility.

For instance, AI/GenAI-driven assessment tools might inadvertently favour students from specific socioeconomic backgrounds if the data used to train these tools over-represents or caters to those demographics. If an AI/GenAI grading system, trained primarily on essays from students from affluent contexts, the system may penalise essays from students with less favourable or different backgrounds - not because of any inherent deficiency in their work, but because writing style of writing, their mastery of vocabulary, or inherent cultural references may differ from the norm learned by the AI tool. This creates a cycle of disadvantage,

where already marginalised students face additional barriers because of possible "biased" technology.

To mitigate the risks associated with AI/GenAI in an academic workplace such as UC, academics and the professoriate may need a multifaceted approach. This approach will have to (a) include clear guidelines for the use of AI/GenAI, (b) provide ongoing professional development for academics, and (c) include regular assessments to ensure that AI tools are meeting the required standards. Careful data curation is thus needed to ensure that AI/GenAI systems are trained on diverse, representative, and unbiased data, which may imply actively seeking out data from (under)representative groups and critically evaluating existing datasets.

Additionally, for the knowledge of and actions by the professoriate in particular, algorithmic transparency and explainability are crucial, as AI/GenAI systems must not be unknown "black boxes", and efforts are needed to better understand how algorithms arrive at their decisions and identify potential sources of bias. Ongoing monitoring and evaluation are thus foreseen at UC, with regular audits to assess whether AI/GenAI systems are producing equitable outcomes for all students.

Developing AI/GenAI policy guidelines for teaching, learning and assessment

University A

At UA, the challenge was for the academic community and the professoriate to address at least two policy domains in response to the issue of AI/GenAI in academic work: (a) the domain of undergraduate teaching, learning and assessment, and (b) the domain of academic integrity. What professors have argued for is the need for a framework guided by principles that are key to maintaining UA as a learning-centred university of quality amidst recent challenges posed by AI/GenAI.

Four such principles were highlighted in recent relevant policy documentation:

- Accountability (including the ideas of acknowledgement and attribution),
- authenticity,

- fairness, and
- transparency (including proper acknowledgement and attribution).

With the lines between authentic human work and AI output becoming increasingly blurred, these principles are meant to operate as a framework for guiding current and future AI/GenAI-infused teaching, learning, assessment and research practices.

To elaborate somewhat on UA's views:

Accountability means (i) that human ideas are informed by others and recognised through acknowledgement and referencing; (ii) that it is the responsibility of authors or the creator of a piece, artifact or product to ensure that their work is factually correct and not likely to cause harm such as through spreading false information, misappropriation or sharing of personal information. The point being that AI/GenAI tools and technology in themselves cannot be held accountable, only humans can; (iii) that AI tools use existing datasets to generate information or responses, and thus AI tools cannot be referenced as the content author or creator. Instead, it is the responsibility of users to analyse and verify AI-generated content in assignments and essays and to cite sources as required by referencing conventions.

Authenticity points to (i) validly determining whether students have learned and achieved the outcomes of a module or programme, and that academic staff need to know that the work that they are assessing is a student's own; (ii) that an original contribution to work presented by an individual as part of an academic activity can only be evaluated if distinguishable from the contributions of others or the author's own earlier work; (iii) that where AI tools are used, it should be declared what tools were used and how and where they were used. Students should indicate why the work still qualifies as their own, especially if AI systems were used in drafting the work.

Transparency implies (i) clear instructions to students regarding the assessment requirements against which their

performance will be evaluated for various assessment tasks, including those involving AI/GenAI; (ii) that in the submission of assessment tasks, detailing the process of using AI/GenAI should be used to safeguard students against unintentional wrongdoing, and aid in suspected cases of wrongdoing related to plagiarism or AI-giarism.

Fairness relates to the fact (i) that all students have an equal chance of success, that suspected irregularities be handled carefully and responsibly, given the lack of verifiability in such cases; (ii) and that those students submitting work that is not their own gain an unfair advantage over others, with the potential to influence admission, support and reward processes.

At UA, both university teaching staff and students are required to subscribe to the adopted framework and the professoriate, including heads of departments, deans, academic heads and administrative functionaries, are responsible for its implementation. At the level of practice, UA has taken on board the advice of Gimpel et al., (2023); namely, that students must use declarations that explicitly address their usage of AI/GenAI tools. Such declarations are not to be binary (e.g., "I used ChatGPT") but must highlight which steps in the research and writing process ChatGPT and/or other tools were used for developing an outline or applied for editing or proofreading. UA policy also requires that students keep a record of their interactions (prompts and outputs) with AI/GenAI tools by sharing screenshots of relevant material to submit with their work for assessment. Further, such declarations should include a statement of student responsibility regarding potential errors, copyright violations, or plagiarism that technical tools may have inserted into their work.

University B

In tandem with UA, UB links to guidelines on how to account for using AI/GenAI in publications. For example, the university-owned journal's approach to using AI in publications requires authors to disclose and declare the use of generative AI and AI-assisted technologies. Sample questions that need consideration are typically:

- Which permitted use of generative AI/GenAI are you acknowledging in your work?
- Which generative AI tool did you use (name and version) in your work?
- What prompt(s) did you use to generate material for your work?
- What exactly did you use the AI/GenAI tool for in your work?

Application

Up to this point, this chapter has accounted for how the professoriate may and could be responsive towards the ever-growing influence of AI/GenAI in the academic workplace. In addition, all university academics, including the professoriate, must understand the link between computers and AI systems, how information is processed and demonstrate data awareness. In essence, academics should have a better understanding of matters such as:

- Sensors and actors - without them, computers are blind and lame.
- Decision processes and ethical considerations.
- Human-computer interactions and their underlying mechanisms.
- Principles and mechanisms of self-awareness and consciousness.
- Principles and mechanisms of real-world-perception, modelling and semantics.

The relevance of these matters also pertains to students. While AI/GenAI provides students with valuable learning tools, many also see AI/GenAI as computer-generated creativity or a new way of programming. Programmes are objects (traditionally pieces of text) which can be interpreted and followed by a computer. In this sense, prompting in AI/GenAI is just another way of programming, whereby language understanding makes programming more flexible. Two relevant examples using ChatGPT may suffice.

Example 1: *Tell us about AI and the future of the professoriate in less than 200 words:*

AI is transforming the professoriate by reshaping teaching, research, and academic roles. In education, AI enables personalized learning, automated grading, and 24/7 virtual tutors, allowing professors to focus on mentorship and critical thinking. Research is also evolving as AI accelerates data analysis, automates literature reviews, and supports inter-disciplinary collaboration.

- Professors will increasingly need AI literacy, becoming mentors and collaborators with AI tools rather than traditional lecturers. However, this shift raises challenges, including potential job displacement, concerns about academic integrity, and disparities in access to AI resources. Institutions must provide training and support to help professors adapt.
- AI also redefines the student-professor relationship by emphasizing guidance over rote instruction. Ethical leadership in AI use and development will become a key academic responsibility. While AI may disrupt traditional roles, it presents opportunities for professors to enhance their impact, foster global collaboration, and prepare students for an AI-driven future. Balancing innovation with equity and ethics will be critical for a thriving academic landscape.

Example 2: *Write a short text of about 200 words about the influence of AI on the future of the professoriate. The text should be concise and written in scientific language and must include two literature references. It should consider teaching, research, transfer and governance.*

AI is poised to significantly influence the professoriate, impacting teaching, research, knowledge transfer, and governance. In teaching, AI systems enable personalized learning, adaptive assessments, and automated feedback, freeing professors to focus on fostering critical thinking and inter-disciplinary engagement (Luckin *et al.,* 2016). Virtual tutors and AI-driven analytics can further optimize student outcomes, though they also necessitate rethinking academic integrity practices.

In research, AI accelerates data analysis, hypothesis generation, and literature synthesis, reshaping academic workflows (Jordan & Mitchell, 2015). Professors will increasingly collaborate with AI tools to address complex, data-intensive challenges, requiring new competencies in AI literacy. This shift also highlights the need for ethical frameworks guiding AI's use in research.

AI supports knowledge transfer by bridging academia and industry through innovative applications. AI-enabled platforms enhance dissemination, ensuring research findings reach diverse stakeholders more efficiently. Professors may serve as intermediaries, translating AI-driven insights into actionable solutions.

In governance, AI offers tools for optimizing resource allocation, streamlining administrative processes, and improving decision-making. However, its adoption necessitates critical oversight to ensure transparency, equity, and accountability. While AI presents challenges, such as potential job displacement and digital divides, it also offers opportunities for professors to lead in shaping ethical and inclusive AI applications across academia.

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Observations, summary and implications

Some observations

What was established from our research is that professors at different universities are inevitably responding differently to AI/GenAI. Some are leading the debate, whilst others are developing their own responses related to current trends and developments.

We have learnt that AI/GenAI challenges and responses do not always emerge from or are first addressed by the professoriate. Contrasting with this observation is the desired position that professors must lead universities in dealing with AI/GenAI matters driven by their academic insight, foresight and integrity. In future, and as a developmental matter, professorial responsibilities may not only include teaching, research and community engagement but be shaped and extended in significant ways by AI/GenAI as part of the world of academic work.

One critical observation emerging from contemporary AI/GenAI-related discourse is the evident lack of foresight in addressing the unknown – something no one really needs to be blamed for. However, the academic community or community appears to be increasingly preoccupied with exerting control over uncertain outcomes. This inclination towards regulatory intervention and standardisation reflects an inherent reluctance to embrace unpredictability as an intrinsic aspect of progress and transformation. From such a perspective, one must critically reflect on whether contemporary society is witnessing the culmination of a historical epoch and the nascent emergence of an entirely new paradigm. The acceleration of technological advancements, the proliferation of AI/GenAI, and the reconfiguration of socio-political structures suggest that humanity is on the precipice of profound systemic transformation. At the same time, one should also realise the limitations and potential dangers of embracing new technologies too rapidly.

Historically, rigid adherence to established doctrines and bureaucratic inertia have often impeded the very dynamism that drives intellectual and technological breakthroughs. As a result, there may be a pressing need to cultivate an epistemic environment that not only acknowledges uncertainty but actively

integrates it as a foundational principle in decision-making, strategic planning, and policy development. The implications of such a "paradigm shift" extend beyond the academic sphere. The broader societal landscape, governance structures, economic models, and educational systems must evolve in tandem with the realities of an increasingly interconnected and technologically mediated world. The challenge at this point, therefore, may not be one of adaptation but of proactive reimagination, of reconfiguring existing systems in a manner that accommodates ambiguity, builds resilience, and cultivates an ethos of continuous adaptation.

In essence, the question is not whether the past has prepared society and the academic community for the level of innovation now required to stay relevant. Instead, whether existing institutional frameworks and intellectual traditions possess the necessary flexibility to facilitate such innovation without being constrained by outdated assumptions and legacy constraints. As humanity navigates this transition, the ability to embrace uncertainty as an opportunity rather than a challenge will be a defining characteristic of those institutions and societies that thrive in the emerging era of knowledge production and technological evolution.

Our overall observations and examples of how professors deal with AI/GenAI within the academic community finally point to at least two main conclusions and implications. *Firstly,* the current and future reality and implications of the rapid development of AI/GenAI in the academic workplace, and *secondly,* the future implications of AI/GenAI for the academic community and in particular, professors as senior academics and academic leaders in higher education.

Current and future implications of AI/GenAI in the academic workplace

What seems clear is that one major implication in store is the potential for AI to replace certain tasks, such as grading and data entry, freeing up academics to focus on more critical aspects of teaching, such as assessment, individual feedback to students and promoting inclusivity in the teaching-learning space. Additionally, AI/GenAI-powered tools can help to personalise

learning experiences for students, making higher education more accessible and effective.

However, there also seems to be concerns about the impact of AI/GenAI on academic jobs and the need for academics to develop new skills to work effectively with AI/GenAI. Moreover, the increasing reliance on AI/GenAI raises questions about authorship, ownership, and the role of human intervention in the academic workplace. To navigate these changes, academics will need to develop new skills sets, including the ability to work with AI/GenAI, critically evaluate AI/GenAI-generated content, and adapt to new instructional, research and communicative approaches. Ultimately, the effective integration of AI/GenAI in the academic workplace will require a collaborative effort between academics, administrators, and technologists to ensure that AI/GenAI enhances, rather than replaces, the human aspect of academic work.

Future implications for the academic community and professors as senior academics and academic leaders

Institutional examples and personal evidence on the views and behaviours of the professoriate points to at least four future AI/GenAI-related issues for the professoriate: (1) Promoting and practicing new forms of scholarship, including AI/GenAI-assisted research, AI/GenAI-produced content and AI/GenAI-facilitated collaboration; (2) Enhancing teaching and learning, where AI/GenAI-powered tools could assist professors to personalise student learning experiences, automate grading and provide real-time feedback to students; (3) Increasing productivity, whereby AI/GenAI will automate administrative tasks, freeing up time for professors to focus on research, teaching, mentoring and community engagement; (4) Adopting new roles and responsibilities, whereby professors may need to take on new responsibilities such as AI/GenAI ethicists, influencers or promoters.

As academic leaders, the professoriate may, in future, (1) be more involved in strategic planning and decision-making where AI/GenAI will provide them with data-driven insights to inform strategic planning, decision-making, and resource allocation;

(2) leading institutional innovation and transformation, whereby AI/GenAI will enable academic leaders to drive innovation and transformation, such as creating new AI/GenAI-powered programmes, courses and research initiatives; (3) becoming more involved in faculty development and support by enhancing training, support, and resources to effectively integrate AI/GenAI into teaching, research, and service-oriented programmes; (4) promoting ethics and governance by establishing AI/GenAI-related ethics guidelines and governance frameworks to ensure the responsible development and deployment of AI in academic settings.

Regarding the role of the professoriate within academic communities as related to AI/GenAI, the future may see (1) increased forms of inter-, trans- and multi-disciplinary collaboration where AI/GenAI will facilitate such collaboration, enabling researchers from diverse fields to work together on complex problems; (2) promoting new forms of academic publishing where AI/GenAI will enable new forms of publications such as AI-generated research papers, AI/GenAI-assisted peer review, and increased AI-facilitated open-access publishing; (3) increasing accessibility and inclusivity whereby AI-powered tools will help to make academic resources and opportunities more accessible and inclusive for diverse learners, and finally (4) rethinking academic credentials and qualifications where AI/GenAI may increasingly challenge traditional notions of academic credentials and qualifications, potentially leading to new forms of certification and recognition.

Ultimately, the future of AI/GenAI influencing the roles, responsibilities and responses of the professoriate will depend on the ability of professors, senior academics and academic leaders to work together to harness the potential of this emerging technology while addressing its multiplicity of challenges and risks.

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Chapter 6

The Role of Artificial Intelligence in Enhancing Scholarship

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Abstract

This chapter explores the transformative role of artificial intelligence (AI) in redefining academic scholarship within the context of Industry 5.0. It builds on Boyer's four dimensions of scholarship, namely, discovery, integration, application, and teaching, and Boyes' model for learning and development to examine how AI enhances research, learning, and inter-disciplinary collaboration. The chapter highlights AI's capacity to personalise education, automate research processes, and support inclusive, lifelong learning. It also addresses the ethical implications of AI in academia, including concerns around academic integrity, critical thinking, and equitable access. A framework is proposed for AI-informed postgraduate scholarship, emphasising responsible AI use, updated curricula, and institutional policies. This chapter further illustrates AI's potential through regional case studies and advocates for multi-, inter-, and trans-disciplinary approaches to complex societal challenges. Ultimately, it calls for a reconsideration of traditional scholarship models to ensure that AI augments rather than replaces human intellect, fostering a future-ready, ethically grounded academic environment.

Introduction

Enhancing scholarship is key to academic life. Scholarship captures the quality and impact of knowledge creation, transfer, and application. The best-known example of scholarship is defined by Ernest Boyer's reference to the scholarship of discovery, integration, application, and teaching (1990). An emerging question is how scholarship should be understood, given the growing influence of artificial intelligence (AI) on the world of work. Scholarship and AI are important for universities and the marketplace. Learning outcomes should, therefore, be relevant to the world of work.

AI is playing a crucial role in promoting educational content and resources. Platforms like Coursera and edX use AI to recommend courses based on user preferences and learning history (Ascione, 2025). These recommendations are personalised, ensuring that learners find relevant and engaging content. AI-driven marketing tools also help educational institutions to reach a broader audience by targeting potential

students with tailored advertisements and content suggestions (Kelly, 2025). Looking ahead, AI is expected to further integrate into education, enhancing both teaching and administrative functions. Experts predict that AI will enable more immersive learning experiences through virtual and augmented reality, providing students with hands-on, interactive learning environments (Cardona *et al.,* 2023). Additionally, AI will continue to improve adaptive learning technologies, making education more inclusive and accessible to diverse learners (SU2, 2023). As AI evolves, it will play an increasingly central role in shaping the future of education, driving innovation and improving outcomes for students worldwide (LR, 2025).

AI impacts education by automating teaching, learning, assessment, and research processes. These advancements make education more personalised, efficient, and accessible, paving the way for a future where AI plays a vital role in educational success (Digitaldefynd, 2025). Given the importance of scholarship, the influence of AI on scholarship should be explored, especially in the context of the emerging Industry 5.0.

The above question opens other questions, such as the role of multi-, inter-, and trans-disciplinarity in AI-based and informed scholarship and what the impact will be on the quality of education and learning outcomes. An unexpected consequence of AI is its contribution to lifelong learning, which will also impact scholarship. This chapter will consider the features of an AI-based and informed scholarship. These features are important for universities as workplaces and their contribution to the next generation of workers in an AI-based and informed world of work.

Industry 5.0 – Basic concepts

Industry 5.0 represents the next phase in industrial evolution, focusing on the collaboration between humans and advanced technologies like robots and Internet of Things devices. Unlike Industry 4.0, which emphasised automation and digitalisation, Industry 5.0 aims to create more sustainable, resilient, and human-centric manufacturing processes (Kraaijenbrink, 2022). It prioritises societal value and well-being, integrating environmental, social, and governance (ESG) principles into industrial practices (Kyriakakis, 2024).

Industry 5.0 is about utilising technology to enhance human capabilities and ensure that industrial advancements benefit people and the planet. This approach improves efficiency and productivity and fosters a more responsible and inclusive industrial environment (Berg, 2022). Researchers at the University of California, Berkeley, have developed a framework called RoVi-Aug that allows robots to teach each other without human intervention (Malayil, 2024). This system enables robots to transfer skills between different models autonomously, enhancing their ability to adapt to new tasks and environments. This development is a significant step towards making robots more versatile and independent.

AI-powered avatars are being used in educational settings to teach students. These avatars can provide personalised instruction, answer questions, and offer feedback in real time. For example, platforms like Synthesia use AI to create digital avatars that can deliver lectures and tutorials, making learning more interactive and engaging (FP, 2024). Looking ahead, the role of AI in education is expected to expand further. Experts predict that AI-driven robots and avatars will become more common in classrooms, providing personalised learning experiences and reducing the need for human or even no human intervention (St. Louis, 2024).

These advancements will likely make education more accessible and efficient, catering to the diverse needs of students worldwide. AI is revolutionising education by enabling robots and avatars to autonomously teach humans, a trend poised to reshape the educational landscape. If AI processes and intelligence hubs were to mutate towards a specific intelligence goal, whether human or artificial, it could diverge from the current Industry 5.0 objectives. However, a crossover between human and AI might offer a more gradual and predictive path to the future. These developments will surely influence scholarship. The interpretation of scholarship within Industry 5.0 requires a closer look at the role of AI in Scholarship.

The Role of AI in Scholarship

Scholarship generally involves activities that deepen understanding and appreciation of a specific field, while also keeping current on its advancements (TEQSA, 2021). Scholarship influences the three mission statements of a university, namely,

knowledge creation (research), knowledge transfer (teaching) and knowledge application (engagement). Mollick advocates engaging with AI and seeing how it can enhance various aspects of our lives. "AI can change our lives by acting as a coworker, a teacher, an expert, and even a companion" (Mollick, 2024). He describes rules for working with AI that anthropomorphise it, by inviting AI to the table and treating it like a person when writing prompts and engaging with work. It easily becomes a research assistant, soundboard or co-author in the academic context.

The discussion on scholarship and AI is important, as AI is changing education by automating various aspects of teaching, learning, assessment, and research. Regardless of the change, educational values should be paramount. A Manifesto from the University of Cambridge explores the role of generative AI in scholarship, emphasising the need to align AI use with core educational values (UC, 2024). The manifesto refers to the "Role of Generative AI in Scholarship" and highlights how Generative AI (Gen AI) can assist in various scholarly activities, such as data analysis, content creation, and enhancing learning experiences. The text stresses that AI should be used as a tool to complement human intellect, not replace it. Regarding the "Alignment with Core Educational Values", the Manifesto emphasises the need for AI applications to uphold academic integrity, ethics, and excellence. It states that AI tools should be used responsibly, transparently, and in ways that support the educational mission rather than undermine it.

AI and Gen AI play a crucial role in modern scholarship. Gen AI can assist in creating new content, such as research papers, by synthesising information from various sources. This technology can also generate hypotheses and suggest experimental designs, aiding researchers in their work. AI Agents and specifically Generative Pre-trained Transformers (GPTs) can engage with specific data analysis, ranging from interpreting typical large data sets to explaining why a scientific paper matters.

In research, AI tools like Elicit (ELI, 2025), IBM® Watson and Google Scholar aid in literature reviews and data analysis (MIT, 2025). These tools can sift through high volumes of academic papers, identifying relevant studies and summarising key findings. AI algorithms also assist in designing experiments and analysing complex datasets, accelerating the research process. Predictive

analytics, powered by AI, helps researchers to forecast trends and outcomes, guiding future studies and innovations (Meakin, 2024). There is no doubt that AI will influence scholarship. The following regional case serves as an example thereof.

Illustration: The contribution of artificial intelligence to scholarship

Students have access to and knowledge of cutting-edge technologies such as AI. However, some students, often in the same university or course, have very little exposure to technology. Some students have access to common technologies like PCs, mobile devices, and the latest apps or games. In contrast, other students in the same class may only have a mobile device and a limited Internet connection, arriving at university without any significant exposure to the latest apps, games, or emerging technologies. The digital divide refers to significantly different learning curves in the university experience (Moonasamy & Naidoo, 2024). For these students, especially, AI can serve as a useful tutor (Atlas, 2023) but may also prevent deep learning. The supervisor can facilitate the students to set up the necessary prompts to create a tutor in ChatGPT, for example, that can respond as a subject expert and "discuss" concepts with the student. Students with limited exposure to technology need to be guided so that they do not just generate texts without really engaging with the subject matter.

Supervisors need to equip themselves with the necessary skills to guide postgraduate students using AI tools such as ChatGPT (Atlas, 2023) effectively. This can range from how to recognise and critique poor AI-generated content to how to approach unethical use of AI- generated content. Additionally, it is increasingly important that students approach AI- generated content critically and not assume its correctness (Atlas, 2023). They need to engage with the generated content as scholars and not see it merely to cheat the process (Cotton *et al.,* 2023), but rather to equip themselves as better researchers, who will, in turn, be sought after in the world of work.

Students may need support in effective prompt writing, for example, or need to be taught how to interpret AI analysis or data summaries. In the context of central South African institutions, many students engage with research materials in their second or

third language. AI agents can assist with translating or explaining concepts or methods to students. This may allow for more time to deeply engage with the research content, rather than becoming stuck on the meaning of unfamiliar terminology. AI tools can support scholarship for emerging researchers, as they can assist them through the more tedious tasks and ensure that they can focus on the parts of the process that they are more passionate about and skilled in. Tools are available for literature reviews, data analysis, and proofreading to streamline the process and reduce the barrier to entry into a specific subfield of research (Oyelude, 2024; Khalifa & Albadawy, 2024). However, it is important to ensure that students still gain the critical thinking skills linked to good quality research (Cotton *et al.,* 2023).

In South Africa, new generation universities such as a university of technology (UoT) are still developing research cultures as young universities (Mtshali & Sooryamoorthy, 2019). This means that the leap to postgraduate studies and high-level research can be daunting. As several postgraduate students have noted, students in the year immediately following graduation from a Bachelor's programme can be supported using these tools for brainstorming, analysis, and general academic writing. However, concerns about the accuracy of the content generated have been noted, making human oversight crucial (Segooa *et al.,* 2025). The effective use of AI tools under the expert guidance of supervisors, who are also current with the best practices for employing these tools as researchers, can help students to transition from undergraduate to independent postgraduate researchers. "Therefore, educators must consider the skills, resources, and capabilities needed to handle generative AI in their disciplinary context" (Segooa *et al.,* 2025).

Given this, it is worthwhile to explore another meaningful way to advance AI in scholarship: employing multi-, inter-, and trans-disciplinary (MIT) research approaches. The following section explores this concept.

Multi-, Inter- and Trans-Disciplinary Research in Scholarship

The world is continuously confronted with complex problems and challenges that necessitate the cooperation of various

academic disciplines to provide sustainable solutions; hence, the importance of MIT research (Kokt *et al.*, 2012). There is a growing impetus to bridge the gaps between academia, scientific communities and civil society. In this sense, AI has the potential to revolutionise scholarship by fostering MIT research (Toomey *et al.*, 2015). AI tools can analyse vast amounts of data across different fields, identifying patterns and connections that might not be apparent to human researchers. This capability encourages collaboration between various disciplines, leading to innovative solutions and new knowledge creation.

Multi-disciplinary research involves studying a phenomenon from different disciplines, creating a broader understanding of the problem. For example, understanding human behaviour in the work context needs to consider multiple perspectives, from psychology, biology, sociology, anthropology and law. Although multi-disciplinary research straddles different disciplines, the boundary of the enquiry stays intact (Lu, 2024). In the multi-disciplinary research context, AI can enhance timely reflections on pertinent issues like market demands (Lu, 2024). AI can also facilitate accelerated model-building and integrate multi-disciplinary research processes.

Inter-disciplinary research usually starts with real-world problems requiring applied research. Inter-disciplinary research aims to harmonise and integrate different fields of study, providing solutions to problems and challenges, including incorporating diverse research methodologies. AI has the potential to collate the efforts of various experts to address challenges and solve problems (Lu, 2024). Trans-disciplinary research considers input from academics and wider society in searching for solutions to societal problems. Science and practice collaborate in addressing societal needs and challenges, like climate change and sustainable food security. According to Mollick (2024), AI can assist in knowledge transfer beyond academia; it can summarise and "translate" research for the public to explain and integrate its value.

Disciplinary-centredness can create visible and invisible boundaries that can impact MIT research. This supports the notion that, despite the transformative nature of AI, MIT research remains human-powered (Deloitte, 2024) as researchers continuously need to navigate the human interactions that drive the processes.

Regardless of the value that AI can add to scholarship, another question is whether the quality of education will be influenced.

Quality, Artificial Intelligence and Scholarship

AI enhances the quality of scholarship by providing tools for more accurate data analysis, reducing human error, and enabling more rigorous peer review processes. AI-driven platforms can assist in detecting plagiarism, ensuring the originality of research, and improving the overall integrity of academic work. Mollick (2024) cautions that the way in which peer review and academia operate will continue to be disrupted by using AI. Scholars need to consider what it means for scholarship if both the writing and the peer review process become entirely automated using AI.

A recent survey by the UK Higher Education Policy Institute amongst full-time undergraduate students showed that 92% of students use AI in some form, and some 88% have used AI for assessments (Freeman, 2025). Universities are catching up fast with their AI policies, as 80% of students felt that their institution had a clear policy on generative AI and assessments. Three-quarters of students said that their institution would spot it when AI was used in an assessment. However, students are divided on whether it is legitimate to use AI-generated text in assessments. The survey also showed that Arts and Humanities students are less familiar with using AI tools than STEM students.

Ghent University has recently shifted its position regarding the use of generative AI by students, especially when writing their Master's thesis, for which the University allows the responsible use of Gen AI tools (De Groote, 2024). For other (written) assignments, the University encourages the responsible use of these tools, although a ban is possible if this is necessary for the assessment of the intended learning outcomes. Students must be made aware of the ethics and risks when using Gen AI and must learn how to deal with those risks. Similarly, the assessors must become acquainted with Gen AI; the "process" of writing will be strictly monitored, and assessment methods and grading must be adapted. The oral defence of the dissertation, where the student can be questioned thoroughly, will receive greater weight in the assessment. AI-literacy, which is inevitable for research activities,

becomes a required competence. Students should reflect on their use of Gen AI and document this reflection.

Boyer (1990) posited that accrediting bodies could contribute to scholarship by respecting the diversity of the university's missions, measuring each institution based on its distinctive mission, and making standards flexible and creative to encourage innovation. Since the 1990s, quality assurance has moved in this direction in many places. The Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) are based on four principles: higher education institutions have primary responsibility for quality and quality assurance (QA); QA responds to the diversity of institutions, their systems, programmes and students; QA supports the development of quality cultures that considers the needs and expectations of all stakeholders and society (EQAR, 2015). The last revision of the ESG stems from 2015. Hence, it is no surprise that the ESG do not refer to AI. However, the inclusion of AI is currently much debated in the context of the upcoming revision of the ESG.

From a QA perspective, the use of AI in assessments and the associated risks of not being able to determine the student's achievement of learning outcomes and of detecting fraud, plagiarism, etc., remains a concern. Another concern is curricula and learning outcomes that become outdated because of rapidly changing needs in the labour market, which are of concern as well. How can institutions, lecturers and students keep up with the skills and competencies, technical but also social and ethical, that are needed whenever higher levels of Gen AI become common in the workplace? An institutional policy on Gen AI and assessments is not sufficient.

What is required is a broad institutional AI policy covering all aspects of education, from the formulation of up-to-date intended learning outcomes, curricula and learning environments to reliable assessments capable of measuring the achievement of the learning outcomes. These policies should be supported by continuous professional development and AI skills training of teachers, researchers, managers, and IT support staff. As AI quality increases, scholars have fewer incentives to exert effort and remain attentive, allowing the AI to substitute, rather than augment their performance (Dell'Acqua, 2022). For students,

especially, it is important to consider how their skills as critical thinkers can be retained as they engage with AI, without compromising their learning. The discussions so far have pointed towards ethical challenges for AI in scholarship.

Ethical Implications when Using Artificial Intelligence in Scholarship

Relying on AI in scholarship has ethical issues that need to be considered. As researchers and practitioners rely more on algorithms and data, humans and their emotions can easily be relegated to the background (Lu, 2024). Ethics, potential bias, transparency and accountability of AI systems must be continuously monitored. Vanhée (2023) cautions that creating trust in human AI teams can be daunting, as researchers from different disciplines and sectors must contemplate solutions or interventions. Often, researchers adhere to the values and mindsets of their respective fields, which are deeply ingrained in their worldviews (Vanhée, 2023). As with all new technologies, the integration and adaptation of AI within a research context must be carefully considered. Both ethics and integrity guidelines are required. Ethics represents accepted behaviour based on globally supported and approved values. Integrity refers to the trustworthiness of an activity. Professional councils require ethical training as part of registering with these councils. Curriculum developers and relevant heads of departments should ensure compliance with this requirement. These discussions require a new look at Boyer's scholarship orientation in the context of AI.

Boyer's Scholarship in the Context of Artificial Intelligence

Boyer's model of scholarship (also known as the Scholarship Reconsidered model) is based on four dimensions, namely, the Scholarship of Discovery, the Scholarship of Integration, the Scholarship of Application, and the Scholarship of Teaching.

It should be noted that Boyer perceives scholarship within a *community of scholars*. AI tools can aid scholars, but AI robots have the potential to automate nearly all aspects of scholarship without much human interference. Hence, the following questions: What are the implications of using AI for

a community consisting of human and non-human scholars? How do the interactions between these human and non-human actors take shape, and who controls whom? A thorough reconsideration of what scholarship means in the era of AI is needed to answer these questions. Part of this reconsideration is the realisation that we are currently only witnessing the beginning of the AI revolution.

Experts from Google DeepMind (Ringel Morris *et al.*, 2024) identify five stages on the path to Artificial General Intelligence (AGI). These five levels are: Emerging AGI (Level 1), Competent AGI (Level 2), Expert AGI (Level 3), Virtuoso AGI (Level 4), and Artificial Superintelligence (Level 5, surpassing all human cognitive and metacognitive abilities). Current large language models, such as ChatGPT, fall under Level 1. The subsequent levels remain unrealised for now. It is impossible to predict the consequences of achieving these different AGI levels for scholarship and society. Ringel Morris *et al.*, (2024) point to some of the risks that we are already witnessing at Level 1, e.g. de-skilling and disruption of established industries. At higher levels, examples of risks entail targeted manipulation (Level 2), rapid social change (Level 3), mass labour displacement (Level 4), and misalignment and concentration of power (Level 5).

Boyer's model of scholarship (also known as the Scholarship Reconsidered model) can be interpreted in the context of AI-based or AI-informed higher education as follows:

- **Scholarship of Discovery**: AI can enhance the discovery process by analysing large datasets, identifying trends, and generating new insights.
- **Scholarship of Integration**: AI tools can integrate knowledge from various disciplines, providing a holistic view of complex problems.
- **Scholarship of Application**: AI can be applied to solve real-world problems, demonstrating the practical impact of academic research.
- **Scholarship of Teaching**: AI can personalise learning experiences, providing tailored educational content and feedback to students.

These views on scholarships have specific implications for postgraduate research. The next section proposes guidelines for AI-based and informed scholarship for postgraduate students.

Artificial Intelligence: Informed Scholarship in Postgraduate Education

The integration of AI into postgraduate research has significantly changed academic practices, necessitating clear guidelines to balance innovation with integrity. In South Africa, universities are developing models that recognise AI as both a valuable tool and a potential disruptor of knowledge creation. Researchers must acknowledge AI as a method in proposals and ethics applications. National guidelines, like those from the Academy of Science of South Africa (ASSAf) and SciELO, state that AI should not be considered an author, and all AI-generated contributions must be disclosed in research outputs. Stellenbosch University mandates that postgraduate students declare their AI usage at both the proposal and examination stages, and examiners are discouraged from using AI to summarise or critique work. These measures reflect the consensus on the importance of transparency in AI-enabled scholarship (ASSAf, 2024; SU1, 2025a).

AI can enhance research, but supervisors must direct students towards innovative questions that can't be answered solely by automated outputs. For instance, the University of Johannesburg uses chatbots like Ulwazi and SociBot to assist with research design and writing, allowing supervisors to focus on deeper mentorship. Meanwhile, Wits University emphasises assessment methods that require critical evaluation of AI-generated content to keep human reasoning central to research.

As assessment practices adapt in an AI-driven environment, the University of Cape Town's AI in Education Framework outlines three pillars, namely AI literacies, assessment integrity, and AI-enabled curriculum innovation, to promote critical engagement with AI outputs. Similarly, Rhodes University's guidelines encourage clear communication about acceptable AI use and awareness of risks such as bias. These initiatives reflect a new assessment paradigm that safeguards academic integrity while acknowledging AI's role.

Institutional ethics bodies are essential for responsible AI engagement. The Senate Ethics in Research Committee at the University of Cape Town (UCT) has set guidelines linking AI use to research integrity, emphasising transparency, accountability, and ethical practices. Discussions amongst universities, including North-West University (NWU), University of the Western Cape (UWC), Rhodes University, and University of Johannesburg (UJ), have highlighted ethical dilemmas, student misconceptions, and the need for updated institutional policies to address AI risks and opportunities.

Updating postgraduate curricula is vital for preparing scholars for AI-enriched research environments. NWU's AI Hub provides training programmes focused on ethical AI use, while Wits University offers guidelines to help students to responsibly engage with generative AI. Stellenbosch University's Generative AI Bootcamp fosters practical engagement with AI tools and ethical awareness (SU1, 2025b). These initiatives reflect a national movement towards enhancing technical skills and critical AI literacy.

AI significantly influences scholarly communication, impacting research design and publication practices. Guidelines from ASSAf and SciELO prohibit AI use in confidential peer reviews, affirming that authors must ensure the accuracy and integrity of their work, regardless of AI assistance. Publishers like UJ Press require authors to disclose AI use in various tasks while emphasising human accountability for authorship.

South African universities demonstrate responsible AI integration in postgraduate education through disclosure requirements, updated assessment criteria, and enhanced ethics governance. This fosters an environment where AI supports scholarly integrity. As AI evolves, maintaining transparency, critical evaluation, and human accountability in research is essential to deepen enquiry rather than replace it.

These various initiatives culminate in the following guidelines:

- AI should be acknowledged as a research method or research tool and should be recorded as such within study and research protocols.

- Where results emanate from AI, it should be indicated in the text and cited accordingly. The current public research domain discussion is that although AI is not an author, the contribution should be recorded.
- Supervisors should guide students to focus on a context-unique problem which is not dependent on existing data resources or qualitative analysis only. This will call for data collection and analysis, and can avoid data being simply extracted from big data sets.
- Examination guidelines and assessment rubrics should be adjusted accordingly.
- The university's Senate Academic Ethics and Integrity Committee should include ethical training relevant to AI chatbots and formulate the minimum standards to adhere to the ethical guidelines.
- Researchers should become aware of the role that AI chatbots can play in peer review.
- The training of next-generation and early-career researchers should be updated to include the role that technology and supportive devices play in research, which implies an update of the research education curriculum.
- Postgraduate students and researchers should declare the use of any AI tools in their research and results.
- Use AI-powered adaptive learning platforms for reskilling in automation, robotics, and AI ethics.
- Mentor academics and students in ethical AI applications and human-robot collaboration.
- Develop worker-friendly AI interfaces that enhance, rather than replace, human expertise.

An essential part of scholarship is to promote lifelong learning. The next section will focus on this dimension of AI in scholarship.

Lifelong Learning – A Consequence of Artificial Intelligence

In today's rapidly evolving manufacturing landscape, Industry 5.0 is reshaping the role of production engineers, emphasising human-AI collaboration, sustainability, and resilience. Investing in lifelong learning for engineers is not just a workforce development strategy; it's a competitive advantage that drives

operational efficiency, cost reduction, and sustainable growth. We examine key activities that enable production engineers to integrate AI, optimise processes, and adopt Industry 5.0 principles, thereby ensuring long-term financial sustainability and innovation.

By fostering a culture of continuous AI-driven efficiency and ethical automation, organisations can maximise return on technology investments and build a resilient, future-ready workforce. To put this into practice, a lifelong learning strategy for a technical operator, focusing on personal development through South African Qualifications Authority (SAQA)-aligned education, can be considered. It should be noted that as the technical operator's qualifications advance, they may eventually progress to Doctoral studies.

Daily strategic activities that align with financial goals include reducing downtime, optimising energy consumption, and enhancing workforce productivity through AI-enhanced learning and automation.

Step 1: AI-driven process optimisation and human-centric automation (Application and Discovery)

Objective: Enhance production efficiency through AI while prioritising human-machine collaboration.

Activities:

- Implement AI-powered **predictive maintenance** to reduce downtime and optimise resource use.
- Develop **co-bots (collaborative robots)** that assist human workers rather than replace them.
- Use **digital twins** to simulate production processes and enhance decision-making.

Example: Engineers use AI-driven digital twins to optimise supply chains while keeping workers in control.

Reference: Industry 5.0 emphasises human-centred smart factories where AI augments human creativity (European Commission, 2024).

Step 2: Cross-disciplinary AI and Sustainability Initiatives (Integration and Discovery)

Objective: Integrate AI, sustainability, and inter-disciplinary collaboration in production.

Activities:

- Attend **Industry 5.0-focused workshops** on sustainable and human-centred automation.
- Develop AI-driven **green manufacturing solutions** that reduce waste and energy consumption.
- Collaborate with **environmental scientists and AI experts** to improve sustainable production.

Example: Engineers implement AI-powered **circular economy** practices, such as waste-to-resource transformation.

Reference: Industry 5.0 promotes sustainable and regenerative manufacturing practices (UNIDO, 2024).

Step 3: AI-Powered Skill Development and Human-Centric Workforce Training (Teaching and Application).

Objective: Foster lifelong learning through AI-driven education and mentorship for Industry 5.0 readiness.

Activities:

- Use **AI-powered adaptive learning platforms** for reskilling in automation, robotics, and AI ethics.
- Mentor junior engineers in **ethical AI applications and human-robot collaboration**.
- Develop **worker-friendly AI interfaces** that enhance, rather than replace, human expertise.

Example: Engineers co-develop an AI system that assists rather than replaces technicians in complex tasks.

Reference: AI-driven training solutions empower workers to thrive in Industry 5.0 by focusing on human-AI synergy (WEF, 2024).

These strategies confirm the benefit of using AI in scholarship and that it fosters lifelong learning through AI-driven education and mentorship for Industry 5.0 readiness. To illustrate

Table 6.1: Lifelong Learning Scholarship for Technical Operators in a Production Company

Boyes Learning Stage	Scholarship Stage	Qualification Stage	Key Skills Development	SAQA Level
Unconscious Incompetence	Entry-Level (Basic Production Skills)	National Certificate in Manufacturing Operations (NQF Level 2-3)	Awareness of production processes, safety, and basic operation of equipment	Level 2-3
Conscious Incompetence	Intermediate-Level (Skills Development)	FETC in Production Technology (NQF Level 4)	Understanding process control, troubleshooting, quality assurance, and teamwork	Level 4
Conscious Competence	Advanced-Level (Specialised Training)	National Diploma in Engineering or Production Management (NQF Level 5-6)	Ability to optimise production processes, manage teams, and troubleshoot complex issues	Level 5-6
Unconscious Competence	Expert-Level (Leadership & Strategic Skills)	Bachelor's / Master's in Industrial Engineering or Operations Management (NQF Level 8-9)	Expertise in strategic planning, innovation, and leadership in manufacturing	Level 8 -9
Reflective Competence	Transformational-Level (Global Research & Innovation)	Doctorate (PhD) in Industrial Engineering / Manufacturing Systems / Operations Research	Leading industry transformation, contributing to global knowledge, policy influence, and pioneering innovation.	Level 10

this benefit, the following example for *Technical Operation in a Production Company* is taken. The learning pathway is aligned with the learning outcomes requirements identified by the National Skills Authority (2020).

Boyes' model for learning and development (2012) enhances lifelong learning for Technical Operators, composed of the following elements.

- **Entry-Level (Unconscious Incompetence to Conscious Incompetence)**: At this level, Technical Operators are learning the basics of production operations. They are unaware of the full scope of skills needed in their field, but gain awareness through entry-level qualifications such as the National Certificate in Manufacturing Operations. Scholarship programmes can help them to transition from being unaware of their skills gaps to recognising what they need to improve (Boyes, 2012).
- **Intermediate-Level (Conscious Incompetence to Conscious Competence)**: Operators move into developing greater technical skills. They are aware of their weaknesses and are actively learning new skills like quality control and equipment maintenance. Programmes like the **Further Education and Training Certificate (FETC)** in Production Technology offer opportunities to gain competence in their tasks, preparing them for leadership roles (Gould, 2015).
- **Advanced-Level (Conscious Competence to Unconscious Competence)**: At this level, operators have mastered several technical aspects of production and can handle advanced tasks like process optimisation and team management. Advanced qualifications like the **National Diploma in Engineering or Production Management** help operators to move beyond just following processes to improving them and ensuring seamless integration into the production line (Scholtz, 2017).
- **Expert-Level (Unconscious Competence)**: Operators who reach this stage have achieved mastery, where their skills are second nature, and they can lead production strategies and innovations. With a **Bachelor's or Master's in Industrial Engineering**, they can shape long-term production goals, mentor others, and introduce high-level efficiencies (Williams, 2019).

At each stage, **scholarship opportunities** are aligned with the learner's progression in the Boyes model:

- **Entry-Level**: Scholarships or funding from companies or Sector Education and Training Authority (SETA) grants help them to gain foundational skills.
- **Intermediate-Level**: As operators become more aware of their technical growth areas, learnership programmes or employer-sponsored education can help them to progress.
- **Advanced-Level**: Advanced diploma scholarships and government funding (e.g., National Student Financial Aid Scheme (NSFAS)) help operators to expand into managerial roles, advancing their professional development.
- **Expert-Level**: Employers may sponsor continued professional development at higher levels, and funding for postgraduate qualifications can be obtained from industry-specific grants or academic scholarships (National Skills Authority, 2020).

Incorporating Industry 5.0 principles into the production engineering framework is crucial for staying ahead in a highly competitive, technology-driven environment. By making use of Boyer's Model of Scholarship, a culture of lifelong learning can be fostered that enhances workforce capabilities and ensures that engineers are equipped to harness AI-driven innovations for sustainability, efficiency, and human-centred manufacturing.

This investment in human capital translates directly into financial returns, whether through cost reductions in waste, increased production efficiency, or reduced downtime. Furthermore, the integration of AI in manufacturing operations opens opportunities for new business models and global competitiveness. By prioritising upskilling, ethical AI adoption, and sustainability, an organisation is positioning itself as a leader in the transition to Industry 5.0. Adopting these strategies will not only empower the workforce but will also provide a robust foundation for long-term profitability and growth, ensuring that a company thrives in the next phase of industrial evolution.

The Lifelong Learning Scholarship Matrix, aligned with the Boyes' model and SAQA qualifications, provides a

clear framework for developing Technical Operators within a production company. By progressing through the stages of competence outlined in Boyes' model, operators can gain a structured path for professional growth. Scholarship opportunities at various stages help to bridge the skills gap, enabling operators to move from basic proficiency to expert-level competence. This approach not only supports the individual development of operators but also contributes to overall efficiency and innovation within the production sector. By providing continuous learning opportunities, supported by scholarships and aligned with relevant qualifications, companies can ensure that their workforce remains highly skilled and adaptable to the evolving needs of the industry. In the long run, this will enhance individual career prospects and organisational performance, ultimately fostering a culture of lifelong learning and development.

Summary

AI profoundly impacts scholarship by enhancing multi-, inter-, and trans-disciplinary research, improving academic quality, and fostering professional learning communities. Integrating AI within Boyer's scholarship framework equips students with advanced tools and methodologies, preparing them for modern academic challenges. However, disparities exist; while some students have access to cutting-edge technologies like AI, others in the same institution or course have minimal exposure, creating uneven learning curves. In this context, AI can act as a supportive tutor by personalising and augmenting learning experiences rather than replacing the learning or research process. Nevertheless, careful consideration is needed to ensure that AI integration preserves students' critical thinking skills and does not substitute deep learning.

In scholarship and higher education, we should remain attentive while exerting effort on the depth of scholarship and learning, while relying on AI tools to augment, and not replace, the key aspects of human research and knowledge creation.

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Discussion Piece

Artificial Intelligence, University Training and Regional Industry Networks

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The relationship between higher education institutions (HEIs) and their regional environments has long been shaped by proximity (Arbo & Benneworth, 2007), allowing these institutions to utilise the direct advantages of their local ecosystems. This embeddedness positively influences programme performance, student employability, and pedagogical quality.

Wine-producing regions offer a particularly illustrative example (Cardebat *et al.*, 2025): where a well-established regional industrial ecosystem predates the creation of university programmes, proximity to producers, professionals, and sector events enriches experiential pedagogy and strengthens graduates' career prospects in ways that no curriculum design alone could replicate. Students do not simply learn about an industry - they are immersed in its networks, its culture, and its tacit knowledge (Porter, 1998). Artificial intelligence (AI) is now reshaping this relationship between universities and regional ecosystems. Not by dissolving the importance of place, but by reconfiguring what proximity means and what universities are expected to deliver.

The most immediate impact concerns pedagogy. AI tools can simulate professional environments, generate sector-specific case studies, and personalise learning at scales previously unattainable. In the wine sector, for instance, AI can now model climate scenarios, analyse market trends, or predict vintage

quality in ways that once required sustained immersion in professional settings. This is an opportunity: AI can extend the reach of sector-specific learning beyond physical boundaries. Yet what AI cannot replicate is the trust-building, informal networking, and cultural immersion that physical ecosystem proximity affords. Softer dimensions of professional interaction - intuitive and empathetic - gain relative weight (Huang & Rust, 2018) as AI absorbs more analytical tasks (Tegmark, 2017). A wine programme located within a living regional ecosystem trains students to navigate these human dimensions alongside technical ones; no algorithm substitutes for meeting a winemaker, understanding a local market, or reading a professional community.

The second impact concerns the university-industry relationship itself. HEIs have long fulfilled a "third mission" beyond teaching and research, contributing to regional development through knowledge transfer, entrepreneurship, and innovation (Chatterton & Goddard, 2000; Etzkowitz & Leydesdorff, 2000; OECD, 2007). AI intensifies rather than diminishes this mission. Industries across all sectors - including those, like wine, that may seem distant from digital transformation - urgently need graduates who are not merely technically literate in AI tools, but critically reflective about their implications: their biases, their opacity, and their potential to displace human judgement from consequential decisions (Kellogg *et al.,* 2020; Raisch & Krakowski, 2021). Universities can only fulfil this role if they sustain genuine, ongoing connections with regional partners - moving beyond transactional internship arrangements towards co-constructed curricula and shared research agendas.

This connects directly to the Industry 5.0 vision in which technology functions as a collaborator rather than a replacement (Budhwar *et al.,* 2023). Human-centredness must be actively built into institutional practice as it does not emerge spontaneously from technological adoption. Wine regions illustrate the point well: Their educational programmes have historically derived value not from technology alone, but from the dense human relationships - between academics, students, and professionals -

that a living ecosystem makes possible. AI can enrich those relationships, but the institutional commitment to sustaining them remains irreplaceable.

Finally, generative AI expands the scope for transdisciplinary research collaborations between universities and regional industries. Complex challenges - from climate adaptation in wine-growing territories to social resilience in post-industrial regions - require analytical frameworks that no single discipline or firm can provide alone (Langer & Landers, 2021). Universities embedded in regional ecosystems are natural conveners for this kind of enquiry, and AI offers them powerful new tools to pursue it.

AI will not render territorial embeddedness obsolete. It will, however, demand that universities and their regional partners renegotiate what closeness means and what it is for. Institutions that engage seriously with this renegotiation will find that the real question is not how much AI to adopt, but what kind of university they want to remain.

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Part 3

The Operational Lens

The operational lens shifts to various industries, revealing a tapestry of both differences and commonalities across five distinct sectors. In the healthcare industry, there is a heightened awareness of the profound impact that artificial intelligence (AI) is having on patient-centred care, alongside the roles of healthcare practitioners. The relationship between patient and doctor holds significant importance; however, this dynamic is transforming, sometimes beneficial, at other times detrimental, because of the integration of AI technologies. These changes not only alter the patient-doctor relationship but also reshape the experiences of healthcare practitioners. As a result, there is an urgent need to re-evaluate and enhance the educational pathways for future healthcare professionals. While existing ethical codes and practices may suffice for the time being, the vital question now emerges: is it merely a matter of change, or do we need to take a more proactive approach?

Turning to the tourism industry, AI is emerging as a revolutionary force, redefining the very essence of travel and hospitality. The incorporation of big data and AI-driven technologies is being recognised as a disruptive phenomenon, emphasising the necessity for a deep understanding of their current and anticipated roles within the industry. Within the hospitality sector, invaluable lessons abound regarding the ways in which AI and digital innovations are transforming service delivery, enriching customer experiences, and redefining employee responsibilities. This industry navigates a delicate balance, striving to harmonise technological efficiency with authentic human engagement and adaptability in an ever-evolving landscape.

The audit industry has increasingly come under scrutiny for its growing dependence on AI, a trend that raises significant concerns. This overreliance threatens to undermine the essential professional judgement that auditors must exercise, leading to alarming disparities between well-resourced audit functions and those that are significantly under-resourced. The critical role of professional judgement cannot be dismissed; if it is supplanted or diminished in an AI-driven landscape, particularly within the auditing realm, the consequences could be dire. Such a shift poses challenges that extend far beyond what we might currently envision, reshaping the very fabric of the workplace and the standards by which audits are conducted.

In addition to the pressing concerns raised by AI in the workplace, there is a noteworthy development emerging from religious institutions. The COVID-19 pandemic has acted as a catalyst for transformation, dramatically altering digital ministerial practices within congregations. This evolution, however, is only part of a larger narrative; the rapid advancement and integration of artificial intelligence into various aspects of community life. The impact on communal interactions, spiritual guidance, and overall societal values is poised to be profound and far-reaching as these technologies continue to weave themselves into the tapestry of everyday existence.

In the wake of the transformative world of work ushered in by AI, a host of new ethical challenges have surfaced. This prompts a critical examination: are our existing ethical guidelines truly adequate, or are they merely old wine poured into new skins? To navigate the complex web of ethical dilemmas, it is essential to consider the established codes of conduct that govern professional environments, as individuals within these contexts bear the primary responsibility for upholding ethical standards. Beyond personal accountability, the presence of robust and sustainable institutions is vital in championing the ethics of AI. These institutions must strive to comprehend the profound implications of AI technologies and how they might reshape every facet of their operations. A purposeful approach is needed, where responses, practices, and strategic initiatives are carefully crafted

to address ethical concerns in a manner that prioritises openness, transparency, and accountability. To achieve this goal, it is imperative for institutions to create or adopt a forward-thinking ethical governance framework. Such a framework should ensure that the integration of AI within organisations aligns with human-centric values, actively promotes employee trust and well-being, and adheres to relevant regulatory standards. By doing so, organisations can adeptly navigate the ethical landscape of AI while fostering a culture of responsibility and integrity.

Chapter 7

Artificial Intelligence in Patient-Centred Healthcare: What are the Challenges and Levels of Educational Preparedness?

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Abstract

This chapter explores the role of artificial intelligence (AI) in medicine and health. The text addresses specific issues related to the impact of AI on the healthcare industry. Key topics include the management and influence of AI in patient-centred healthcare, including healthcare practitioners, its effects on the training of future healthcare practitioners, and the ethical challenges and dilemmas

that arise in an AI-informed healthcare environment. The chapter addresses the challenges of preparing patients and healthcare workers for a changing AI-based and -informed healthcare industry, particularly regarding its impact on the patient-doctor relationship. While there are significant challenges, it is important to highlight the advantages that AI brings to the healthcare industry. Specific contributions include the interpretation of bioethical principles in technology and health economic frameworks, as well as the implications of these interpretations for the healthcare sector within the wider context of the new world of work. This chapter asks whether a new ethical code is necessary and, if so, what it should entail. It concludes by highlighting the importance of collaboration between industry, government, and the public to maximise the potential of AI while minimising patient risks.

Introduction

This chapter explores the role of artificial Intelligence (AI) in medicine and health. AI has the potential to fundamentally transform healthcare delivery as its use increases (Al Kuwaiti *et al.,* 2023; Chen & Decary, 2020). Most patients and healthcare workers appear aware of the rapid pace at which AI is evolving and its increasing application in healthcare. Whether this awareness translates into being prepared for a greater role of AI in the delivery of care is another question. While the potential of AI is clear, is this enough for both patient and healthcare workers to invite a "third other" in a space that has traditionally been protected to some extent by the bounds of ethics of privacy, confidentiality, and safety (Farhud & Zokaei, 2021; Gerke *et al.,* 2020; Lorenzini *et al.,* 2023; Wubineh *et al.,* 2024). The emerging evidence seems to suggest that the responses to these questions appear to be mixed.

In this chapter, we will first focus on the impact of AI on patients. A shift from the traditional medical epistemic authority perspective of "the doctor knows best" towards a patient-centred approach represents a transformative milestone in healthcare (Dunn, 2003; Popowicz, 2021; Pilnick, 2023). Value given to the "lived experiences of patients" humanises healthcare (Sloan *et al.,* 2024) and is consistent with contemporary medicine where emphasis is placed on respect for autonomy, individual preferences, communication, collaboration, diversity, and the

rights to self-determination and shared decision-making (Havana *et al.*, 2023). It has been argued that involving the patient's "voice" leads to quality interaction between patients and practitioners, enhanced communication, and shared decision-making that is tailored to the individual patient's needs and preferences (Kwame & Petrucka, 2021). The importance of the perspectives for the use of AI in digital technologies is crucial and is deemed especially important in older patients and those in advanced stages of the disease (Paccoud *et al.*, 2024).

Thus, patient-centred care involves the patient as a member of the healthcare team. We will then explore the impact of AI on other members of the team, the healthcare practitioners, and whether they are prepared for a greater role for AI, whose responsibility it is to develop their understanding, and that of patients, on the change in dynamics that AI brings. Having explored the potential benefits and challenges of AI in medicine and health, we will propose some ethical guidelines concerning AI for the world of work in healthcare. Throughout this chapter, the term AI describes the capacity of computers or machines to simulate human intelligence. In referring to AI designed to produce output or create content; the more specific term "generative AI" will be used.

Role for AI in healthcare provision

Influence on patients

Despite the growing recognition of the importance of patient-centred care, it is not without challenges. Barriers such as time constraints, workforce shortages, and limited resources in terms of accessibility and availability, hinder the delivery of patient-centred care, particularly in lower-income countries (Al Kuwaiti *et al.*, 2023). AI is considered a solution to many of these challenges (Meskó *et al.*, 2018; Kumar *et al.*, 2021), introducing another layer of interaction in healthcare delivery and creating a triadic relationship between the patient, healthcare provider, and AI system (Lorenzinzi *et al.*, 2023). Theoretically, AI could ensure that the patient remains at the centre of care by enabling more personalised, precise, and timely information, for the patient to be actively and autonomously involved in healthcare decision-making (Bajwa *et al.*, 2021; Uymaz *et al.*, 2024).

Furthermore, integration of digital technologies, e.g., wearables, voice assistants, or mobile health apps across health sectors is enabled (Alowais *et al.,* 2023; Lennox-Chhugani, 2022) and creates person-specific interfaces to the intelligence system, thus encouraging patient involvement and promoting self-determination and autonomy (Johnson *et al.,* 2021). It can be argued that this kind of shared decision-making has the potential to promote an integrated experience that is built upon transparency, thus enhancing trust in the relationship between health providers and patients.

Trust is an important ingredient in patient-centred care and is essential for ensuring successful buy-in and implementation of AI innovation. While patients generally engage positively with AI and value timely, efficient, and personalised, tailored care, when it comes to decision-making, they value the human judgement of the healthcare provider to mediate their engagement with AI (O'Dell *et al.,* 2022). Patients need to understand how AI fits into their care to trust its role. Therefore, it is essential to ensure that patients have sufficient information to fully benefit from integrative care (Jeyakumar *et al.,* 2023; Shaw *et al.,* 2025). This will promote realistic expectations when juxtaposing it against actual experiences with healthcare providers (Clavel *et al.,* 2021) and promote trust and self-efficacy amongst patients to safely navigate AI-integrated healthcare (Jeyakumar *et al.,* 2023).

Influence on the healthcare team

Although some healthcare workers find AI appealing as a tool that can support and enhance the delivery of care, others have a general sense of uncertainty (Wood *et al.,* 2021). When AI is perceived as enhancing decision-making and making the process of delivering care more efficient without compromising quality, the attitudes of healthcare providers seem to be more positive (AlZaabi *et al.,* 2023). Furthermore, those with knowledge and understanding of the role of AI in healthcare perceive it positively and feel prepared for its implementation (Catalina *et al.,* 2023). Others have reported concerns, including a lack of adequate training to use AI technologies (Dankwa-Mullan, 2024; Sittig & Singh, 2025; Wilhelm *et al.,* 2025), issues of trust (Ayorinde *et al.,* 2024), fear of being replaced by technology (Weber *et al.,* 2024), and concerns about

developing a dependency on AI technology (Siafakas & Vasarmidi, 2024; Wubineh *et al.*, 2024). There are calls for formal education to prepare the team to navigate and integrate AI in medicine and health, towards a digital future (Rainey *et al.*, 2021; Bhatia *et al.*, 2024). This also addresses the concerns and scepticism that some healthcare professionals have about using AI. AI cannot be ignored as an additional team member to the team, bringing another level of complexity to the treatment environment and needs to be part of innovative education solutions (Benis *et al.*, 2024).

Potential benefits

AI is revolutionising medicine. It has already accelerated the drug discovery process by predicting how different compounds will interact, allowing for the development of targeted interventions. This speeds up the development of new medications and treatments and will have an extensive impact on clinical practice and roles (Ellis, 2024). With its rapid application and utilisation, benefits are discovered daily, e.g., in data acquisition, workflow management and processing. Where AI streamlines tasks, there is increased operational efficiency, reducing the workload on healthcare personnel and allowing them to focus more on patient care and improving future care. It allows focusing more on personalised patient treatment plans because unique circumstances, histories, and conditions can be included in the scenario-building. There is also the capacity to evaluate a substantial amount of patient data to recommend alternative plans for treatment. Remote patient monitoring continuously allows for timely interventions and reduces the need for frequent hospital visits (González-Jiménez & Haidar, 2025). AI should be seen as a retention strategy that enhances careers and the vital human element of care, rather than just replacing clinicians (Dai *et al.*, 2026).

The full extent of the positive impact of AI on patient care remains uncertain. One study in a clinical environment has documented reduced length of stay, lower depression symptoms in non-complex cases and lower mortality (Wilhelm *et al.*, 2025). More accurate procedures are recorded with robotic surgery (Ellis, 2024). Providing rapid access to datasets and information increases the speed of treatment, improves the accuracy of diagnosis and treatment and improves predictions (Moulaei *et al.*, 2024).

Identifying and detecting pathologies that might be missed by observation and the human eye, improves the accuracy and leads to more accurate and enhanced diagnosis and treatments required for a specific disease (González-Jiménez & Haidar, 2025). Specialised training to bridge the gap between medical practice and technological innovation is likely to increase benefits (Reuben *et al.,* 2024).

AI is likely to reshape the nature of the patient-doctor relationship. Some suggest that the impact would be positive, in line with the trending perspective held by healthcare workers of AI as a supportive or assistive tool that will aid in the delivery of healthcare that is more person-centric and effective (Kundu, 2021; Sauerbrei *et al.,* 2023). Because of the automated, predictive and efficient capabilities, it is argued that AI holds the promise of "creating time" by streamlining tasks that could be performed by automation (Akingbola *et al.,* 2024). This will enable refocusing time and attention on the patient-doctor relationship that can be used to build a more meaningful care dynamic that is focused on helping the patient traverse the complexity of treatment. AI may enable healthcare workers to be more attuned to the patient's needs and listen to their concerns more closely - in this way, maintaining the human element of care, amidst a digital evolution (Aminololama-Shakeri & López, 2019).

Challenges, risks and limits

Although there is optimism amongst healthcare workers about the benefits of AI, there are still concerns about the potential risks to both them and their patients (Stroud *et al.,* 2025). There is concern that patients and doctors may become overly reliant on AI, which might lead to a breakdown in collaborative decision-making, with patients choosing algorithms over their doctor's advice (Allen *et al.,* 2024). Furthermore, research suggests that AI could limit healthcare workers' professional autonomy, as their ability to exercise clinical judgement may be curtailed by the influence of AI (Lorenzini *et al.,* 2023). Some literature suggests that, unless AI is implemented carefully, it poses a risk of establishing a new form of paternalism, where "AI knows best" and makes decisions on behalf of patients and doctors. Thus, while AI may represent a powerful supportive tool, human oversight is critical to final healthcare decisions. However, doctors who feel pressured to

follow AI-generated recommendations may compromise patient care (Akingbola *et al.,* 2024).

This would also fundamentally challenge the principle of shared decision-making and undermine the autonomy of the patients. A lack of transparency from healthcare workers using AI, and, therefore, a lack of explicit informed consent from patients, would also undermine trust. Furthermore, it is important to understand that AI is designed to process available data, identify patterns, and generate output based on available learning algorithms that are vulnerable to bias (Quinn *et al.,* 2020). A level of sensitivity to the ethical and social values of a multicultural context is crucial. In the South African context, for example, the historical practices of discrimination have created a dataset that raises concerns about AI algorithms (Moodley, 2024). Key issues include African ethnic underrepresentation, age, and gender, all of which can exacerbate health disparities (Obasa & Palk, 2023). This may lead to the overestimation or underestimation of risks associated with algorithmic bias. Another challenge noted in the literature is that AI generates decisions without moral reasoning, but with learning capability. Healthcare workers, however, apply common sense, clinical experience, and intuition in the decision-making process, emphasising the essential humanistic aspect of healthcare.

With the introduction of AI, there is a need for professional and legal guidance to support its use (e.g., Moodley, 2024; Sittig & Singh, 2025). Furthermore, embracing innovation brought on by AI requires a variety of stakeholder involvement, including regulatory and statutory bodies for healthcare professionals, the pharmaceutical industry, data protection and legal entities, which currently offer little specific guidance for health professionals required to use AI for patient care. This is a call for action for regulators and statutory bodies to develop clear guidance for the responsible application of AI in healthcare to mitigate issues of patient risk, social risk, and professional and reputational risk that come with the integration of AI in healthcare (Obasa & Palk, 2023).

AI creates new ethical challenges, but the basis of patient privacy, ethical responsibility, legal responsibility, fairness and trustworthiness stays the same. Bias and errors need to be minimised (Drabiak *et al.,* 2023). The integrity of the practitioner

is paramount in bringing in AI as part of the health professional and patient relationship. Data privacy, informed consent with AI declared to be used, and confidentiality remain pillars in this debate, along with awareness of historical and automation bias and discrimination, and the potential erosion of clinical skills amongst health practitioners (HPCSA, 2025). AI procedures and treatment are multifaceted, including identifying and correcting errors. Therefore, responsibility for these diverse elements involves several stakeholders. It is clear from the literature that ethical responsibility primarily lies with the developers and organisations or institutions deploying AI systems. They must ensure that AI operates transparently, fairly, and without bias.

Legal responsibility for AI will be complex and vary by jurisdiction. Generally, it involves:

- **Regulatory Bodies:** These entities oversee compliance with laws and regulations, ensuring that AI systems meet safety and ethical standards (Sittig & Singh, 2025).
- **Developers and Manufacturers:** They can be held liable for defects in the AI system, like product liability laws (Reed, 2024).
- **Healthcare Providers:** In the context of medical AI, healthcare providers may share responsibility for ensuring the AI's safe and effective use (Sittig & Singh, 2025).

Economic responsibility involves the costs associated with developing, implementing, and maintaining AI systems. While organisations bear the financial burden of integrating AI into their operations and ensuring its ongoing functionality, insurance companies may need to cover damages caused by AI errors (Reed, 2024). The responsibility for identifying and correcting errors in AI systems is shared between developers who must continuously monitor and update AI algorithms to correct errors and improve performance, healthcare providers who must validate AI recommendations with application providers and intervene when necessary, and regulatory bodies who need to ensure that mechanisms are in place for reporting and addressing AI errors (Sittig & Singh, 2025). This shared responsibility framework helps to mitigate risks and enhance the reliability and trustworthiness of AI systems.

The sharing of costs is an important issue and needs to be addressed as part of the financial practices before AI is used (Potter, 2025). Organisations that develop and deploy AI systems bear the primary financial responsibility. This includes the costs of development, implementation, maintenance, and any potential liabilities arising from AI errors (Potter, 2025). They must ensure that their AI systems are cost-effective and provide a clear return on investment (Carlyle, 2025). The costs of data storage, processing, and the personnel required to manage these tasks are part of developers' costs, but also operational costs. By sharing these responsibilities, stakeholders can mitigate the financial risks associated with AI decisions and procedures, ensuring that AI systems are both effective and economically viable (Mainz *et al.*, 2024).

Influence of healthcare on how AI is shaped

The influence of AI on medicine and health is already apparent in preventative care, in-hospital patient monitoring, and treatment planning. In the South African healthcare sector, it has been recognised that the introduction holds enormous potential that ultimately will benefit, aid in treatment and improve patients' quality of life, with some of the existing AI technologies already supporting healthcare workers in decision-making (Moodley, 2024; Obasa & Palk, 2023). It was successfully used during the COVID-19 pandemic, where AI provided significant assistance with decision-making about prioritisation and allocation of limited resources. More noticeable is the impact of an AI-empowered system developed by the South African government to aid in the prediction of patient vulnerability to be diagnosed with tuberculosis based on data utilisation via medical records and symptom profiles. AI has implications for health equity, particularly noticeable is Telemedicine, another example of the positive influence of AI on healthcare systems with scarce resources.

Through utilising the AI potential of remote medical care, the monitoring of patients has been realised, allowing healthcare workers to serve a large rural-based population and ensuring quality healthcare access. Robotic-assisted surgery has advanced the practice of minimally invasive surgery procedures in both

public and private hospital settings. This progress is a positive step towards narrowing the gap in inequalities in access to healthcare. With AI support, healthcare professionals can detect and diagnose conditions earlier and provide expanded healthcare services to the people of South Africa. Through these efforts, it becomes evident that the future of healthcare resides in the integration of technology and human expertise. Given the high burden of disease, AI's potential towards precision medicine, amongst others, ensuring systems efficiency, accurate diagnosis and treatment to improve patient outcomes are currently being explored (Obasa & Palk, 2023).

Another consideration, of course, is competence, readiness, and preparedness for the integration of AI in healthcare delivery. AI is part of our realities, and it is evolving and exerting great influence on daily lives; certainly, within the context of healthcare provision (Nene & Hewitt, 2023). Future healthcare providers must have the necessary knowledge, understanding and skills to effectively use technology to enhance patient care. There is some concern, however, that the training and competency of the healthcare provider have been slow to match up with the skills and competency of evolving technology (Titus, 2024). There is a need for reform in the education of health professionals, especially in terms of upskilling current healthcare professionals (Nciki & Hlabangana, 2025) and, particularly, health education for future health professionals - i.e., current medical students. Investing in AI upskilling for healthcare professionals will create a workforce capable of effectively making use of AI to adapt to the evolving healthcare landscape.

Some have proposed that this process should begin with foundational AI literacy, focusing on understanding its technical foundations, strengths, and limitations (Ng *et al.*, 2023). This is partly achievable through on-the-job training opportunities and continuing professional development training courses. In terms of training current medical students, the medical curricula need to align with training objectives that will result in equipping a future health workforce that is "fit for purpose" based on the evolving needs of patients. Seemingly, patients are actively participating in the technologically evolving society, for example, from the comfort of their homes, with a single touch of a button, through

smartphones, they have access to AI-enabled doctors that enable them to receive medical care at their convenience.

The medical curricula need to equip medical students with the necessary skills that will enable them as future healthcare professionals to effectively integrate AI tools into the delivery of care (Issa *et al.,* 2024), whilst at the same time demonstrating an understanding of the ethical aspects of the delivery of care. Particularly, a medical curriculum focusing on emphasising communication, collaborative working, risk management, and ethico-legal competencies within integrative AI systems of healthcare delivery should be a core component of health education that needs to be optimised. While a formal AI curriculum has yet to be established in medical schools worldwide, some institutions in several countries (i.e., countries in the UK, the US, Canada, Korea, and China) have begun offering elective modules aimed at providing basic AI literacy (Ng *et al.*, 2023). These courses also promote inter-disciplinary collaboration between medical students and those from data science and computational fields. In this context of rapid technological transformation, becoming skilled in AI cannot be viewed as optional by health professionals but is necessary.

Ethical guidelines about AI for healthcare

Is a new ethical code needed? If so, what should that code look like?

Medicine (the science and art of maintaining and restoring health) and health (as the state of complete physical, mental, and social well-being, and not merely the absence of disease) (World Health Organization [WHO], 1946) were always at the forefront with using technology, including large language models, robotics, and 3D printing, either in patient cure, care, control and community.[1] The continuous growth of AI in medicine and health is no exception. Medicine and health not only use AI and GenAI[2],

[1] Glouberman and Mintzberg (2001) identify these four "worlds" or "activities" in health. Physicians are generally associated with "cure", healthcare professionals with "care", health administration and management with "control", and relatives, friends, and the community at large with "community." These "worlds" or "activities" represent various aspects of medicine and healthcare.

[2] AI refers to tasks performed that require human intelligence. Generative AI (GenAI) refers to the creation of new content based on learned patterns from existing data (Marr, 2023).

but also debate the consequences of AI, such as what the ethical considerations for using AI should be. A random collection of comments on ethics in AI and GenAI points at matters such as the encompassing of data privacy, algorithmic bias, transparency, informed consent and accountability. There is no doubt that AI and GenAI can be beneficial for policy, pandemic prediction, diagnosis, treatment plans, recordkeeping, budget allocation and public health services. Patients can benefit from AI and GenAI in understanding their needs and managing their healthcare.

AI and GenAI have benefits and downsides in medicine and health. It is for this reason that responsible and equitable AI and GenAI applications in medicine and health are required. James (2023) comments that AI can "transform healthcare and disrupt the field of medicine in significant ways," and Alowais *et al.,* (2023) argue that AI can revolutionise healthcare. Rajpurkar *et al.,* (2022) say that AI can reshape medicine and improve the experiences of clinicians and patients. Panteli *et al.,* (2025:1) summarise the meaning of AI for public health by commenting that "As such, AI has the potential to revolutionise public health practice and research, but accompanying challenges need to be addressed."

Regarding the ethical consequences, there is no shortage of advice on what the ethical requirements should be. The WHO (2021:23) identifies six core principles as the basis for AI in healthcare, namely: protect autonomy; promote human well-being, human safety, and the public interest; ensure transparency, explainability, and intelligibility; foster responsibility and accountability; ensure inclusiveness and equity; and promote AI that is responsive and sustainable.

In a newsletter about AI in healthcare, the WHO is excited about the potential benefits of AI in supporting healthcare professionals, patients, researchers, and scientists. However, it cautions against overlooking important values such as transparency, inclusivity, public engagement, expert oversight, and thorough evaluation. Patient safety requires more attentiveness to relevant policies in the support of patients.

From an Organisation for Economic Co-operation and Development (OECD) Working Paper on AI (OECD, 2024), the authors identify demands on the healthcare profession, soaring

costs and an overburdened workforce as challenges within the healthcare sector. The authors are positive that AI can alleviate some of the pressures on the healthcare sector. The reality of risks, however, such as the bridging of privacy, increased liability because of wrong diagnosis, rising cost, inconsistent data management and governance, can negatively impact healthcare provision. From their research based on a survey into the perspectives of medical associations regarding the integration of AI, healthcare providers' perspectives can guide the responsible use of AI in healthcare. Their research confirmed that the AI can enhance the health outcomes for patients. With this said, risks are not ignored, but the benefits are potentially more than the risks. Another positive confirmation is that healthcare professionals will not be replaced by AI tools.

In addition, AI-powered systems can support healthcare professionals as "advisors" or "assistants." Especially, administrative tasks can benefit from AI and GenAI tools. AI may not address the shortage of healthcare professionals; instead, it may address some of the workload experienced by the healthcare workforce. Reference was made to the Australian Medical Association (AMA, 2023), which published a position statement that humans will remain responsible for decisions and communications. From the authors' research, data security and privacy were again highlighted with the associated complexities of having access Plto data, data standardisation and operability, not being biased and protecting the individual's privacy and rights.

An important aspect highlighted by them was the role of continuous learning in interpreting data and new challenges caused by AI and GenAI algorithms. What should not be ignored in general is the level of data literacy and the effective use thereof. Apart from the known ethical challenges, access to, cost of, and resources for AI-based and informed healthcare are highlighted. It was emphasised that especially low-income countries may suffer most because of the quality and cost of digitalisation and data. Liability for data misinterpretation is another matter that should be dealt with. Moving forwards necessitates addressing skills development for health professionals, considering the impacts on the broader health workforce supporting the front-line

application of AI in healthcare, and exploring methods to enhance the assurance, adoption, and adaptation of AI tools in health.

With this in mind, we can turn to the question of whether a new ethical code is needed and what the code should look like. The brief account of AI and GenAI in medicine and health makes it clear that the four bioethical principles identified by Beauchamp and Childress (2014), namely, respect for autonomy, non-maleficence, beneficence, and justice, can still be regarded as the backbone even for this aspect of ethics in healthcare; however, new demands should be explicitly interpreted against the standard meaning of these principles. Alternatively, these principles should be framed in two specific frames, namely, technology that will include data ethics, and health economy that will include economic fairness and transparency.

Conceptually, it can be argued that data, information, cost and transparency are all part of the justice principle. Although this is not disputed, the inclination is towards an interpretation of the four bioethics principles in the broader ethical frameworks of technology and the health economy. Figure 7.1 gives an outline of the intention of this view:

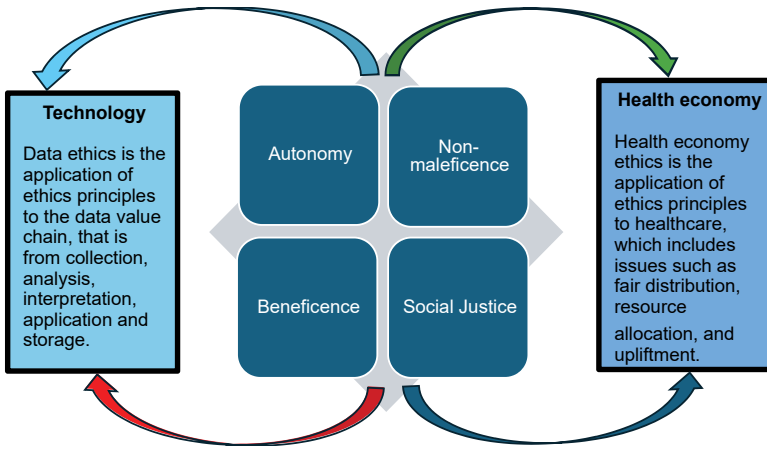


Figure 7.1: The interpretation of bioethical principles against technology and health economy frameworks

These interpretations can be visually presented in the following table:

Table 7.1: The interpretation of bioethical principles against technology and health economy frameworks

Bioethical Principles	General meaning of bioethical principles	Technology	Health economy
Autonomy	Self-determination and own informed decision-making.	Data collection and subsequent actions cannot be without informed consent.	Social advantage should be balanced with individual needs.
Non-maleficence	The duty is not to harm anyone.	AI and GenAI tools should not cause direct or indirect harm.	Education and lifelong learning should be part of AI in health.
Beneficence	Healthcare professionals should act in a way that benefits the patient. The patient's well-being and welfare should be promoted.	The health workforce should be able to use AI and GenAI tools to the benefit of cure, care, control and the community.	AI cannot exclude communities in a country or low-income countries internationally.
Justice	Fairness in the distribution of benefits and burdens. All individuals should be treated equitably. Resources should be allocated fairly.	Both the health workforce and patients should have access to the available AI tools.	AI and GenAI tools cannot be different for low-income economies.

Following this discussion that a new ethical code is needed, an important question remains about how informed consent and data security will be handled in AI-based and informed medicine and health.

What are the implications for informed consent and data security?

Informed decision-making always remains a cornerstone of ethical healthcare. The WHO (2021:47) guidelines on using AI in healthcare remind us of the reason for informed consent, namely protection, autonomy, prevention of abusive conduct, trust, self-ownership, non-domination and personal integrity. Regardless of the benefits that AI can bring to medicine and health, informed decision-making should be respected in this new working environment. The above-mentioned guidelines are integrating ethics with human rights standards. This process, known as "design for values", includes the values of human dignity, freedom, equality and solidarity.

A specific comment by the WHO is relevant to the focus of this book, namely, that of citizen science. Citizen science is the contribution of non-scientists to scientific research. The relevance of this approach is, on the one hand, for the public to understand the research, its meaning and impact, and on the other hand, for the community to contribute to the discussions and AI toolmaking, for example. Citizen science is closing the gap between what can be achieved (AI tools) and how something is perceived (by the public) (WHO, 2023). Such an approach can foster trust in using AI.

Data security depends very much on how the data is stored, for example, on SharePoint; the data management plan, and whether the results were first discussed with participants before public distribution. The interchange between informed consent and data security leaves patients vulnerable if data is misused. The complexity of informed consent and data security relates very much to the professional values embodied by the health workforce in the broadest sense of the word. This opens the debate on professional behaviour in healthcare. Chapter 12 argues in support of an ethics of explicability, which is based on transparency and

accountability. This principle is recommended for the new world of digital technologies such as AI (Coghlan *et al.*, 2023).

When should AI proposals / decisions be overridden, and what is the process?

As commented, the individual's responsibility cannot be waived at any stage. This means that the healthcare professional can use AI tools as "advisors" and "assistants". For healthcare professionals to override AI and GenAI proposals and decisions, they must possess professional and disciplinary expertise in their field. As the global workforce becomes increasingly informed and influenced by AI, the core principles of the healthcare profession must always be in place.

Yaghy (2023) emphasises that the physician-patient relationship is fundamental to medical care, defined by mutual trust, respect, and collaboration. This partnership guides the practice of medicine and is essential for achieving shared health and well-being goals. Trust is a fundamental element in this relationship. This view can be applied to all healthcare professions, as healthcare is about the patient's health and well-being. With this as a departure point, AI tools should not be seen as a replacement for any healthcare; instead, an enhancer for quality healthcare. The healthcare practitioner's expert knowledge should be evident at all times. A comment by Suriyan and Ramalingam (2022) should be taken seriously. Technology can enhance decision-making but may diminish human judgement. The solution is not to avoid AI, but to balance decisions with relevant clinical queries. Apart from upscaling one's knowledge regarding new developments, two other important requirements of the modern workforce are problem-solving and teamwork.

In developing countries, the availability of co-workers can be a challenge because of, amongst others, insufficient staff trained for a specific job, resources or budgets. This is where technology steps in, allowing onsite consultations to be combined with virtual meetings. There is sufficient evidence that technology contributes to e-health, both in the Global North and the Global South. The guidance provided by Bouderhem (2024) is valuable

for addressing AI issues. He presents his advice as five themes for creating ethical and responsible AI systems, based on the WHO criteria. These themes are:

- Compliance with guiding principles.
- Balance innovation and responsibility.
- Engage in collaboration and dialogue.
- Build organisational awareness and culture.
- Use appropriate tools and methods.

The insights provided by Panteli *et al.*, (2025:5) are crucial for addressing issues related to AI. Public health institutions should prioritise equity and ethics by using datasets that represent diverse populations. Additionally, it is essential to adopt explainable AI technologies and actively engage stakeholders in participatory decision-making processes.

Concluding comments: Implications for the world of work

It is clear from the discussions that the role of AI is impactful and complex in healthcare, with a legislative component to be addressed. These developments require a very well-established academic process that needs to review the role of AI in the clinical team, the clear clinical decision pathway, updating communication skills and planning the treatment of a patient, improving standard operation procedures and guidelines, well-structured health management of AI, provide clear and ethical guidelines and consideration, and most importantly, define the final decision status in the clinical team on AI. Training in using the application in clinical care in terms of disease risk prediction, diagnosis assistance, treatment regimes, surgery support, and documentation automation are some of the areas that need to be included in the training. The training and educational needs are defined as part of the list in this section, and formal changes in the curriculum training are required to accommodate the functioning of the health team in the AI environment.

This chapter provides a clear perspective on how AI and GenAI will enhance medicine and health, while also highlighting

the associated challenges. AI is undeniably a transformative force that brings both positive and negative outcomes. However, not all these advantages and challenges can be solely attributed to AI. The following issues should be considered in the realm of AI-driven medicine and health.

Over time, the focus in medicine and health shifted from the patient alone to include physicians, healthcare professionals, the health industry, and the community. AI can benefit all four aspects of medicine and health.

AI's main advantage for medicine and health is the analysis of data, forecasting, prediction, planning and resource allocation. E-health, partly because of AI, enhances accessibility to healthcare facilities.

AI will come with a cost. Improved healthcare should be a national priority, supported by policy, budget and resources.

AI can never be regarded as a supplement for human responsibility, accountability and empathy. This calls not only for reimagining professional behaviour in medicine and health but also training that includes how to deal with new technologies in medicine and health.

Medicine and health have always been at the forefront of ethical discussions, and this should continue to be the case. Concepts such as "data ethics" and "explainability," along with technologies like machine learning, blockchain, and augmented reality, play a crucial role in modern healthcare. We must also consider patient vulnerabilities stemming from technological advancements, the health economy, and the increasing reliance on diagnoses provided by machines rather than human practitioners. Additionally, addressing the trust deficit in the patient-provider relationship and reframing the concept of "disease burden" to focus on the "burden of disease" are essential for developing a new ethical framework for AI-based and informed medicine and healthcare.

To fully utilise the capabilities of AI, various regulatory mechanisms will need to be actualised locally to address various ethical challenges and issues of responsibility for legal liabilities. To benefit from new technological innovations in AI-driven

systems in healthcare, adequate investment in the development of regulatory frameworks must be put into place (Palaniappan *et al.,* 2024). Careful consideration of risks and benefits in line with the cornerstone of medical bioethics must be prioritised. Putting regulatory frameworks in place to guard and protect, and ultimately caution against causing harm.

Bioethical principles should be at the core of infrastructural and regulatory developments to protect individuals and avoid perpetuating health inequalities and disparities that are evident in the local context. A framework that guides data procurement within the African context that will inform AI systems for use and application in Africa would go a long way in minimising unintended algorithmic biases that could result in inaccurate decisions and discriminatory practices. Development of such a framework will call for a partnership between industry, government, and the public to maximise and make use of the potential of AI whilst minimising risk for harm (i.e., social, psychological, economic, and physical).

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Chapter 8

Artificial Intelligence and Tourism: Are We Ready?

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Abstract

In an era of rapidly evolving tourism, staying ahead of emerging trends is paramount. Tourists' travel habits are continuously adapting to these new trends, which include digitalisation, responsible and sustainable tourism, and a surge in domestic tourism. For the tourism sector, swiftly adjusting and responding to these new realities is crucial for regional sustainability. Amongst these trends, AI is a transformative force reshaping tourism. Integrating big data and AI technologies has been identified as a disruptive phenomenon, warranting a thorough understanding of their current and future roles within the industry. AI's capabilities extend beyond simple conveniences; it can recommend cost-effective flights, suggest accommodations, and offer comprehensive support to travellers. Recent studies highlight that AI-driven personalisation enhances tourist experiences by tailoring services to individual preferences. As the tourism industry embraces these technological advancements, it becomes crucial to consider the implications for sustainability, ethical considerations, and the human touch in tourism and hospitality. This chapter provides a comprehensive exploration of the future of AI in the tourism industry. By examining topics such as the delineation of the tourism industry, the role of AI in the tourism landscape, and presenting a futuristic view, this chapter will offer valuable insights into how AI is set to revolutionise tourism.

Introduction

Integrating AI into the tourism industry reshapes service delivery and experiences. Furthermore, machine learning, big data, and human-computer interaction can enhance experiences, optimise destination management, and revolutionise tourism marketing (Tuo *et al.,* 2025). The COVID-19 pandemic accelerated AI adoption, introducing new business models and virtual experiences (Koo *et al.,* 2021). AI also offers customised, automated travel services, improving customer engagement and streamlining arrangements in the tourism industry. Chatbots and virtual reality (VR) have transformed how tourism marketing is being executed (Samala *et al.,* 2022). Despite data handling and technology challenges, AI promotes innovation and customer satisfaction (Teemu & Laatikainen, 2023), supporting sustainable tourism through predictive analytics (Das & Patnaik, 2024). To remain competitive, tourism stakeholders must embrace AI integration, which improves operations, supports security, and provides valuable policy insights (Tussyadiah, 2020).

As AI continues to evolve, its impact on tourism will likely deepen, offering new avenues for research and development. The industry's readiness to embrace these changes will determine its ability to thrive in an increasingly competitive and technologically driven market. The chapter will delineate the nature of the tourism industry and reflect on the future of tourism in an AI-enabled world within the current literature base.

Delineating the Tourism Industry

Before we can deal with the role of AI in the tourism landscape and what the future could look like, it is important to delineate the tourism industry and better understand what it entails. Tourism is one of the most significant contributors to the economy worldwide, contributing around 10% to the global gross domestic product. Tourism also plays a role in job creation worldwide (Engelbrecht & Zeelie, 2023). Other benefits from tourism include improving living standards, more employment opportunities, enhancing local pride, improving relationships between people with different cultural backgrounds, preservation of cultural

heritage, infrastructure development, entrepreneurship, and conservation (Ekstrom, 2023).

In literature, numerous definitions of tourism exist and are defined by the United Nations World Tourism Organisation (UNWTO) as "a social, cultural and economic activity which entails the movement of people to countries or destinations outside their usual environments". According to Herman (2016), tourism is not a new phenomenon, as people have travelled for different reasons since ancient times. Three types of tourism can be identified in the tourism sector, namely, domestic tourism (resident visitor within a country), inbound tourism (activities of a non-resident visitor within a country), and outbound tourism (activities of a resident visitor outside a country) (UNWTO, 2024). Transportation, hospitality, travel facilitation and information, destination marketing organisations (DMOs), attractions, tourism wholesalers and retailers, the event sector, and entertainment all comprise the tourism industry (Herman, 2016).

The tourism industry is a very vulnerable sector with many aspects which could have an impact. External factors can impact it, leading to job losses, etc. A recent example of the vulnerability of the tourism industry was the COVID-19 pandemic, which caused millions of workers to become unemployed (Meng, 2022). The tourism industry was one of the most severely affected sectors in the world because of the COVID-19 pandemic (Proos & Hattingh, 2022). To understand the tourism industry better, it is crucial to have an overview of topics such as tourist destinations and tourist attractions or activities.

A tourist destination is a physical space with or without administrative boundaries where visitors can stay overnight (UNWTO, 2024). Throughout the world, travellers traverse many tourist destinations. Well-known examples of tourist destinations worldwide include Paris in France, London in England, Cape Town in South Africa, and New York City in the United States of America. Tourist attractions are the features of a destination that make it appealing to tourists. Well-known examples of tourist attractions include the Colosseum in Rome, the Taj Mahal in India, and Table Mountain in South Africa, to name only a few. Tourism attractions

also tend to motivate tourists to visit a particular area (Herman, 2016). Numerous reasons can be considered as the motivation behind a tourism trip.

Tourists are motivated by different reasons to travel, as Mason (2010) highlights, which could include escape, relaxation, play, strengthening family bonds, prestige, social interaction, sexual opportunity, educational opportunity, self-fulfilment, wish fulfilment, and shopping (Mason, 2010). Considering all these different motivational factors, we find different types of tourists within the tourism industry. They include adventure tourists, sports tourists, dark tourists, heritage tourists, leisure tourists, and business tourists, to mention a few.

The tourism industry is, thus, highly diverse, resulting in numerous individuals being employed in different roles. Planning a trip, transportation, and the services provided to travellers all form part of the jobs within the tourism industry. Prominent jobs within the tourism industry include tour guides, travel agents, tour operators, tourism marketers, tourism officials, and different positions within the accommodation sector. Tourism Management studies at higher education establishments are prevalent on a global scale. Tourism-themed academic journals and conferences also highlight the importance of the tourism industry. However, the tourism industry is constantly changing, and with this in mind, it is essential to consider the role of AI in the tourism landscape.

The Role of AI in the Tourism Industry

AI can enhance tourism by improving efficiency, personalisation, and satisfaction. Technologies like big data analytics, robotics, and machine learning are used across sectors to refine service delivery (Samara *et al.,* 2020a; 2020b; Tuo *et al.,* 2025). These tools streamline operations and enable intelligent automation, especially with the Internet of Things (IoT) and sustainability strategies (Tussyadiah, 2020). The following sections explore AI's role in key tourism sectors, including accommodation, transportation, travel agencies, attractions, adventure tourism, and MICE.

AI and Emerging Trends in the Accommodation Sector

AI drives advancements in guest experiences, operational efficiency, and marketing strategies in the accommodation sector. From smart hotel rooms to AI-driven pricing models, the hospitality industry is undergoing a technological transformation that enhances personalisation and automation. While these innovations present significant opportunities, they also introduce challenges such as job displacement, data security, and technological readiness, particularly in developing economies like South Africa (Rapanyane & Sethole, 2020; Nannelli *et al.,* 2023). AI personalises guest experiences by integrating AI-powered chatbots and virtual concierges to provide real-time customer support, reducing response times and improving service efficiency (Kim *et al.,* 2024). AI-driven systems analyse guest preferences and booking histories to offer tailored recommendations, such as personalised room settings, dining options, and activity suggestions (Kong *et al.,* 2022).

In South Africa, luxury hotels and urban accommodations are adopting smart room technology, where AI-powered voice assistants adjust lighting, temperature, and entertainment based on guest preferences (Buhalis & Moldavska, 2021). These innovations enhance convenience but raise concerns about data privacy and cybersecurity, as guest data must be securely managed to prevent breaches (Bulchand-Gidumal *et al.,* 2024). AI is also revolutionising operational efficiency in accommodation management. Machine learning algorithms are used for predictive maintenance, monitoring equipment performance, and alerting hotel staff to potential malfunctions before they occur (S. Kumar *et al.,* 2021). AI-powered housekeeping management tools optimise cleaning schedules based on occupancy patterns, reducing costs and improving sustainability efforts (Hodibert *et al.,* 2024).

Revenue management is another area experiencing a significant AI-driven transformation. Hotels use AI-driven dynamic pricing models that analyse demand trends, competitor rates, and market conditions to optimise pricing strategies in real-time (Nannelli *et al.,* 2023). This is particularly relevant in

South Africa, where the accommodation sector must balance seasonal fluctuations in tourism demand (Rogerson, 2012). By utilising AI for pricing and inventory management, hotels can maximise revenue while ensuring competitive positioning in the market (Gatera, 2024). The accommodation sector increasingly relies on AI-powered digital marketing tools to enhance customer engagement and target specific traveller segments. AI-driven sentiment analysis allows hotel brands to assess online reviews and social media feedback, refining their services and tailoring their marketing messages accordingly (Bulchand-Gidumal *et al.*, 2024). AI-generated content and automated email marketing campaigns further streamline customer interactions, ensuring personalised communication at scale (Kim *et al.*, 2024).

For accommodation businesses in South Africa, AI-driven marketing strategies provide an opportunity to reach international travellers more effectively. By analysing traveller data, AI systems identify potential guests based on their previous travel behaviours and preferences, enabling targeted promotions that increase direct bookings (Said, 2023). However, small and independent lodges may face challenges in adopting AI marketing tools because of financial and infrastructural constraints (Hodibert *et al.*, 2024).

AI and Emerging Trends in the Transportation Sector

AI transformed the transportation sector in the tourism industry, enhancing efficiency, safety, and the overall travel experience. AI-driven platforms now provide personalised travel recommendations, tailoring itineraries based on user preferences and behaviours, thus improving visitor satisfaction and engagement (Broncano & López, 2024). Additionally, intelligent customer service solutions such as AI-powered chatbots have revolutionised traveller support, offering instant assistance for bookings and enquiries and greatly enhancing overall customer experiences (Broncano & López, 2024). Airlines have adopted AI predictive analytics to optimise maintenance scheduling and streamline operational efficiency, as demonstrated by Air France-KLM's collaboration with Google Cloud, where AI

significantly reduces downtime through predictive maintenance (Reuters, 2024).

Further, AI applications contribute to managing tourist traffic by analysing real-time data to optimise visitor flows, thus reducing congestion and improving the tourism experience in densely visited locations (Efimova, 2024). Finally, the emergence of autonomous vehicles and electric vertical take-off and landing (eVTOL) aircraft signifies a transformative phase in tourism transport; for instance, China's ambitious plan to integrate 100,000 flying vehicles within six years will offer tourists innovative mobility solutions, such as air taxis, greatly changing urban and regional tourist transportation (Lima, 2024). As AI technology evolves further, it promises to redefine the landscape of tourism transportation, making it more efficient, personalised, and sustainable.

AI and Emerging Trends in the Tourism Services and Travel Industry

AI is enhancing customer interactions, optimising operational efficiency, and improving destination management in the tourism industry. This transformation is driven by integrating sophisticated AI technologies such as machine learning, big data analytics, natural language processing, generative AI, and advanced chatbot solutions (Samara *et al.,* 2020b; Florido-Benítez & Martinez, 2024; Ku & Chen, 2024). AI-driven chatbots deliver 24/7 personalised assistance, instant responses, and efficient trip planning, significantly increasing customer satisfaction and purchase intentions (Pillai & Sivathanu, 2020; Zhu *et al.,* 2023). These chatbots mimic human interaction, reducing the need for constant human intervention while preserving the warmth and responsiveness expected by travellers (Pillai & Sivathanu, 2020; Wong *et al.,* 2023). AI also facilitates highly customised travel experiences by utilising big data analytics to understand customer preferences, behaviours, and interests. This enables travel agencies to tailor their services to individual needs, providing unique travel solutions and achieving a competitive advantage (Kazak *et al.,* 2020; Samala *et al.,* 2022).

Because of AI integration, operational efficiency within travel agencies and tour operators has improved significantly. Predictive analytics and machine learning enhance demand forecasting, resource allocation, and crowd management, supporting more informed, sustainable decision-making (Filieri *et al.*, 2021; Das & Patnaik, 2024; Tuo *et al.*, 2024). AI is also instrumental in destination management, offering advanced forecasting of tourist flows to optimise local resource allocation (Tuo *et al.*, 2025).

AI and Emerging Trends in the Attraction Sector

AI is reshaping the attractions sector by playing a crucial role in enhancing visitor engagement, operational efficiency, and personalised experiences. AI improves efficiency and visitor satisfaction in attractions like parks, museums, and zoos. In theme parks, mobile apps and wearable devices personalise experiences (SSA Group, 2024). Real-time data from sensors manages crowd flow, and virtual queues reduce wait times (Orea-Giner *et al.*, 2022). Interactive animatronics and augmented reality (AR) experiences add narrative depth to attractions (Chen, 2024). Museums use AI for virtual tours and personalised exhibits, removing geographical barriers (Artsology, 2024). AR guides enrich education, while algorithms help to curate and preserve collections (Klingler, 2024).

Zoos use AI to monitor wildlife via camera and sensor data. Real-time alerts aid anti-poaching and conservation, while chatbots and VR exhibits boost engagement (Matuszewski, 2024; List, 2025). Historical sites use AI to build virtual reconstructions and personalise guided tours. Continuous monitoring supports preservation (Richardson, 2025). These innovations show AI's potential to enhance experiences, though human interaction remains vital for emotional connections (Tussyadiah, 2020).

AI and Emerging Trends in the Adventure and Outdoor Sector

AI is transforming the adventure and outdoor sector of the tourism industry by enhancing safety, personalisation, and operational efficiency. AI personalises adventure tourism by analysing user

behaviour, budgets, and history (Filieri *et al.,* 2021; Harbison, 2024). Virtual assistants provide booking support and real-time recommendations (Kidecha, 2025). AR and VR help travellers to explore destinations before arrival, enriching planning and education (Samala *et al.,* 2022). AI ensures safety through monitoring systems that assess risk, detect hazards, and support rescue operations. Wearable devices track locations and issue emergency alerts (QAOU Outdoor, 2025). Tools like Google Maps' "explore" function identify lesser-known locations, appealing to adventure seekers (Travel Explorations, 2024). AI assists park and wildlife management by analysing satellite and audio data to monitor ecosystems and detect threats (Tung, 2024). It also helps with individual animal tracking and anti-poaching (Matuszewski, 2024; Vietze, 2024). Visitor management benefits from predictive trend analysis, crowd control, and digital guides that direct tourists to under-visited areas, supporting sustainability (Hopguides, 2023).

AI and Emerging Trends in the MICE Sector

AI has profoundly impacted the Meetings, Incentives, Conferences, and Events (MICE) sector, transforming event planning, attendee engagement, marketing, and operational efficiency. Chatbots enhance customer service by instantly responding to enquiries, reducing wait times and costs (Pillai & Sivathanu, 2020). Data analytics support targeted marketing by evaluating consumer preferences and behaviour (Doborjeh *et al.,* 2021). AI segments audiences and automates messaging, tailoring promotions for better engagement (Filieri *et al.,* 2021). VR and AR create immersive experiences for delegates, increasing satisfaction and interactivity (Nannelli *et al.,* 2023). Predictive analytics optimise planning, resource allocation, and crowd control, enhancing event execution (Das & Patnaik, 2024). Real-time data analysis supports safety by detecting and addressing threats. AI also promotes sustainability by monitoring environmental impacts and reducing resource use (Das & Patnaik, 2024; Kim *et al.,* 2024).

AI enables travel personalisation for MICE attendees through custom services based on behaviour and preferences

(Ilieva *et al.,* 2024). These advances improve attendee experience and provider outcomes (Tussyadiah, 2020). Despite technological progress, user discomfort and the need for human interaction in MICE settings highlight the importance of thoughtful AI design and implementation (Pillai & Sivathanu, 2020).

The Futuristic View on Tourism

AI is redefining the future of tourism, revolutionising service delivery, enhancing customer experiences, and optimising operations across all sectors. From AI-driven automation in hospitality to predictive analytics in travel planning, intelligent systems are shaping a tourism landscape where hyper-personalisation, immersive experiences, and sustainable operations become the norm (Koo *et al.,* 2021; Nannelli *et al.,* 2023). As AI continues to evolve, the future of tourism will require a delicate balance between technological innovation and human-centric experiences.

AI-Driven Personalisation and Smart Travel Experiences

One of the most significant AI trends in tourism is the shift towards hyper-personalised travel experiences. AI-powered recommendation engines analyse traveller preferences, past behaviour, and real-time data to curate tailored itineraries, accommodation suggestions, and activity recommendations (Filieri *et al.,* 2021). Predictive analytics enables businesses to anticipate traveller needs, offering customised experiences before customers express their preferences (Bulchand-Gidumal *et al.,* 2024). In the hospitality sector, AI-driven chatbots and virtual assistants enhance guest interactions, providing 24/7 support, personalised service recommendations, and seamless check-in / check-out experiences (S Kumar *et al.,* 2021). In South Africa, AI-powered destination management systems are being explored to attract international visitors by tailoring digital marketing campaigns based on traveller data (Tuo *et al.,* 2025). However, the ethical implications of AI-powered personalisation, particularly potential biases in algorithmic recommendations, raise concerns about inclusivity and fair access to tourism opportunities (Doborjeh *et al.,* 2021).

The Rise of Robotics and Automation in Tourism Operations

AI-powered robotics is transforming tourism by automating repetitive tasks and enhancing operational efficiency. Service robots are increasingly used in hotels, airports, and restaurants for check-ins, room service, and concierge assistance (S Kumar *et al.*, 2021). AI-driven robotic concierges, already operational in Japan, China, and select European destinations, provide multilingual support and touchless services, reducing reliance on human staff (Samala *et al.,* 2022). In South Africa, airport operations and hotel management are adopting AI-powered self-service kiosks and biometric-based travel authentication to enhance security and efficiency (Khan & Efthymiou, 2021). While robotics promises cost reductions and operational efficiency, the displacement of human workers raises concerns about job losses in an industry traditionally reliant on human interaction (Grundner & Neuhofer, 2021).

Immersive AI-Enhanced Travel: Virtual and Augmented Reality

AI is revolutionising travel experiences through VR and AR, offering travellers immersive previews of destinations, attractions, and accommodations before making bookings (Tussyadiah, 2020). AI-driven VR platforms allow tourists to explore historical sites, cultural landmarks, and adventure tourism experiences from their homes, reducing decision-making uncertainty and promoting sustainable travel choices (Fouad *et al.,* 2024). In South Africa, where cultural heritage and wildlife tourism are significant attractions, AI-powered AR applications are being tested in national parks and museums to provide interactive experiences, overlaying historical narratives and wildlife information for visitors (Tuo *et al.,* 2025). While immersive AI technologies enhance accessibility and engagement, they also raise questions about the authenticity of travel experiences. Will virtual tourism replace traditional travel, and if so, what impact will this have on local economies and tourism-dependent communities? (Grundner & Neuhofer, 2021).

AI in Smart Destinations and Sustainable Tourism

AI is central to developing smart tourism destinations and data-driven decision-making optimises resource management, sustainability efforts, and visitor experiences (Tup *et al.,* 2025). AI-driven crowd management systems help to mitigate over-tourism by monitoring visitor flows, adjusting entry restrictions, and suggesting alternative sites to distribute foot traffic more evenly (Khan & Efthymiou, 2021). AI-powered energy optimisation in hotels and transportation systems supports eco-friendly tourism operations. In South Africa, where environmental sustainability is a key concern, AI is integrated into conservation efforts, particularly in wildlife tourism. AI-powered surveillance and predictive analytics combat poaching, monitor ecosystem changes, and manage protected areas more effectively (Nannelli *et al.,* 2023).

AI-driven sustainability initiatives must remain accessible to smaller tourism operators and local communities (Fouad *et al.,* 2024). AI is set to catalyse transformation in tourism, driving efficiency, personalisation, and sustainability. However, ensuring ethical implementation, workforce reskilling, and inclusive AI access remains crucial.

Challenges and Ethical Considerations in the AI-Powered Future of Tourism

Integrating AI in tourism has significantly enhanced efficiency, personalisation, and service delivery. However, AI adoption also presents various ethical and operational challenges across multiple tourism sectors. These challenges include job displacement, data privacy concerns, algorithmic biases, and disparities in technological access. Addressing these issues is essential to ensure an equitable and responsible AI-driven tourism industry.

Job Displacement and Workforce Reskilling

One of the most pressing concerns regarding AI adoption in tourism is the risk of job displacement. Automation reduces the need for front-desk staff, customer service representatives,

transport operators, tour guides, and travel agents, impacting employment levels (Rapanyane & Sethole, 2020). AI-powered tools streamline operational tasks, but their implementation must be balanced with strategies for workforce reskilling and employment retention (S Kumar *et al.*, 2021).

For instance, AI-driven check-in kiosks and robotic housekeeping services in the accommodation sector reduce the demand for human employees (Bulchand-Gidumal *et al.*, 2024). Similarly, AI-powered ride-hailing services and autonomous transportation pose risks to traditional transport workers (Henama & Sifolo, 2017). In adventure tourism and attractions, AI-driven digital guides and automated booking systems threaten traditional employment structures (Sousa *et al.*, 2024). As AI becomes more prevalent, the tourism industry must invest in workforce training programmes to help employees to adapt to AI-driven environments.

Data Privacy, Cybersecurity, and AI Ethics

AI systems rely on vast traveller data to enhance service delivery, raising critical concerns about data privacy, cybersecurity, and ethical AI governance. Hotels, transport providers, travel agencies, and MICE operators collect sensitive guest information, making them prime targets for cyber threats (Bulchand-Gidumal *et al.*, 2024). Ethical concerns arise regarding AI-powered surveillance in public spaces, attractions, and transportation hubs. AI-driven facial recognition in tourism settings enhances security but raises concerns about privacy violations and the potential misuse of visitor data (Hodibert *et al.*, 2024). In AI-powered adventure tourism, data tracking tools used for safety monitoring may inadvertently infringe on personal privacy (Giddy & Webb, 2017). Ensuring regulatory oversight and compliance with data protection laws such as the General Data Protection Regulation is crucial for responsible AI implementation (Doborjeh *et al.*, 2021).

Algorithmic Bias and Fair Access to AI Technologies

AI-driven recommendation systems influence traveller choices, but biases in AI algorithms can reinforce social and economic inequalities in tourism (Grundner & Neuhofer, 2021).

If AI platforms favour well-funded businesses and mainstream destinations, smaller independent operators and rural tourism enterprises may struggle to compete. Similarly, AI-driven marketing in tourism services could disproportionately benefit major brands while neglecting smaller operators, leading to market imbalances (Ferhataj & Memaj, 2024). Addressing algorithmic bias requires industry-wide collaboration to develop transparent, fair, and inclusive AI systems.

Infrastructure Readiness and the Digital Divide

Disparities in AI adoption between developed and developing markets highlight the issue of technological readiness. While AI-driven tourism services thrive in technologically advanced nations, regions with limited digital infrastructure face challenges in implementation (Van Dijk, 2019). In South Africa, urban hotels and corporate travel agencies have access to AI tools, whereas rural lodges, small guesthouses, and independent travel operators struggle to afford AI investments (Rogerson, 2012). AI-powered transport solutions require stable Internet connectivity and smart infrastructure, which are lacking in many developing regions (Kruger & Viljoen, 2023). Similarly, AI-driven MICE solutions may not be accessible to smaller event organisers in regions with limited technological resources (Dewi & Darma, 2024). Bridging this gap requires investment in AI research, digital literacy programmes, and policy frameworks to ensure equitable AI adoption across the tourism sector.

Maintaining Human-Centric Tourism Experiences

Despite AI's ability to enhance efficiency, maintaining human-centric experiences in tourism remains vital. AI cannot replicate the emotional intelligence and personal interactions that human tourism professionals provide. For example, while AI streamlines event planning in the MICE sector, the value of in-person networking and human decision-making remains irreplaceable (Croes *et al.,* 2024). Similarly, in adventure tourism and cultural attractions, AI-powered experiences should complement, rather than replace, human tour guides and customer service representatives (Lalicic & Weismayer, 2021).

Tourism stakeholders must strike a balance between automation and meaningful human interactions. This balance ensures that AI supports, rather than diminishes, the core values of hospitality, service excellence, and customer engagement.

The future of AI-powered tourism offers exciting opportunities for efficiency, personalisation, and innovation. However, ethical and operational challenges such as job displacement, data privacy risks, algorithmic biases, and disparities in AI accessibility must be addressed. Developing responsible AI policies, investing in workforce reskilling, ensuring regulatory compliance, and fostering inclusive AI adoption will be crucial for a sustainable and equitable AI-driven tourism industry.

The Road Ahead: Balancing AI Innovation with Human-Centric Tourism

Integrating AI into tourism operations requires collaboration between humans and AI systems, which can be challenging, as it involves aligning AI capabilities with human skills to enhance customer experiences (Fouad *et al.,* 2024). AI offers numerous opportunities for the tourism industry, such as improved personalisation and operational efficiency. However, to fully realise AI's potential, challenges like maintaining the human touch, managing technological and financial constraints, addressing socio-economic and cultural barriers, and navigating ethical and legal concerns must be addressed.

How to prepare university students for AI and the new world of work

To prepare students for integrating AI into the tourism industry, universities should focus on several key areas of study and skills development. The following are important:

AI Literacy and Education

Students need to develop a strong foundation in AI literacy, which includes understanding AI concepts and technologies. This can be achieved through mandatory AI courses that are accessible and comprehensive, especially for students in IT- and computer-related fields (O'Dea *et al.,* 2024). Exposure to

AI education enhances students' confidence and competence in using AI technologies, which is crucial for their future roles in the tourism industry (Chiu, 2025).

Practical AI Applications in Tourism

Universities should incorporate practical applications of AI in tourism into their curriculum. This includes training students to use AI tools like Google Maps, GPS tracking, and self-service kiosks, which are already being utilised in the tourism sector (Haji & Kassim, 2024). Understanding these applications will help students to improve their employability and performance in the job market (Haji & Kassim, 2024).

Inter-disciplinary Approach

An inter-disciplinary approach to AI education is essential. Students from various academic backgrounds should be encouraged to learn about AI, as it is relevant across different fields, including tourism (Li *et al.*, 2023; Magrill & Magrill, 2024). This approach helps students to understand the broader implications of AI and prepares them for diverse roles in the industry.

Critical Thinking and Problem-Solving Skills

Developing critical thinking and problem-solving skills is vital for students to apply AI in real-world scenarios effectively. These skills are necessary for analysing and addressing challenges in the tourism industry using AI technologies (Çela *et al.*, 2024). Universities should enhance these competencies through targeted educational programmes (Çela *et al.*, 2024).

Ethical and Social Implications

Integrating AI into tourism operations requires collaboration between humans and AI systems, which can be challenging, as it involves aligning AI capabilities with human skills to enhance customer experiences (Fouad *et al.*, 2024). AI offers numerous opportunities for the tourism industry, such as improved personalisation and operational efficiency. However, to fully realise AI's potential, challenges like maintaining the human

touch, managing technological and financial constraints, addressing socio-economic and cultural barriers, and navigating ethical and legal concerns must be addressed.

Summary

Integrating AI in the tourism industry offers significant opportunities and challenges. AI technologies, such as big data analytics, machine learning, and robotics, are transforming the sector by enhancing efficiency, productivity, and personalisation of services, thus enriching traveller experiences (Samara *et al.,* 2020b). Adopting AI strategies is crucial for maintaining competitiveness and resilience, enabling the automation of services and the creation of personalised travel experiences (Samara *et al.,* 2020b). However, the human touch remains irreplaceable, and AI should complement rather than replace human interaction (Samala *et al.,* 2020; Grundner & Neuhofer, 2021). Addressing ethical considerations and sustainable practices is essential as the tourism industry evolves (Tussyadiah, 2020; Tuo *et al.,* 2025). By embracing AI while focusing on human-centric experiences, the tourism industry can navigate the future with confidence and innovation.

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Chapter 9

Artificial Intelligence and Automation in the Hospitality Industry

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Abstract

The tourism industry is a social phenomenon that is reliant on various human factors, such as people's willingness to extend hospitality to others. The hospitality industry is the largest sector within the wider tourism industry, and the term "tourism and hospitality industry" applies widely. The term "hospitality" is used to describe the interaction between a host and a guest, and it originates from Latin. The words *hospes* and *hospitari* refer to guests, and *hospitalitas* denotes entertainment or hospitableness. The chapter will examine how automation is becoming more prevalent in the hospitality industry, focusing on how artificial intelligence (AI) and digital technologies are changing service delivery, customer experiences, and employee roles. It will consider AI applications and their impact on operational efficiency, and customer perceptions of automated interactions. A balance between technological efficiency and human interaction in service encounters is proposed. It will also address the balance between technological efficiency and maintaining the human touch in service encounters.

Introduction

Customer satisfaction relates to the customer experience and shows how well a product or service experience compares to the buyer's value expectations (Bin Hamzah & Shamsudin, 2020). Customers expect that firms will go above and beyond to satisfy their needs, compared to just offering good value, and are likely to choose companies that make them feel valued and appreciated. Hence, customer service plays an important role in the hospitality industry, as competition within the sector has increased significantly. While "guests" are always the key focus of any service-oriented business, a company's capacity to meet and exceed customer expectations serves as the benchmark for customer service (Poudel & Thapa, 2019). According to Westcott and Anderson (2021), hospitality can be defined as the business of making people feel welcome, relaxed, and ensuring that they enjoy themselves. It is an industry with a prime focus on leisure, enjoyment, and experience and encompasses a wide range of organisations and administrations that are associated with entertainment and customer satisfaction (Mim & Ferdous, 2021).

The shift to artificial intelligence (AI) requires a sound understanding of the market in which a company operates, given the level of tech-savviness of its customer base. The use of technology must enhance the perception and level of satisfaction in the service encounter (Kumawat *et al.*, 2023). Any service encounter in the hospitality industry that replaces human labour with digital technology must meet or exceed set standards to achieve customer satisfaction (Hottat *et al.*, 2023). Given these realities, the chapter used extant literature to delineate trends and challenges of AI integration for the hospitality industry.

Artificial Intelligence in the Hospitality Industry

The technological components of the Fourth Industrial Revolution (4IR) also impact the hospitality industry, and it is expected that in the future the industry will continue to grow and change significantly with smart technologies applied more widely and frequently. This means that the traditional way of business operations in the hospitality industry is insufficient for the challenges that it faces, and the era of the 4IR. Decision support

systems, virtual reality systems, robotic technologies, ambient intelligence, autonomous agents searching and Web source mining, recommender systems, and context-aware systems are just a few examples of the smart technology applications in the hospitality sector that are causing significant changes to how the industry operates and functions, as well as in tourist behaviour and demands (Osei *et al.,* 2020).

According to Dinal and Krishna (2023), the transformation that automation brings to the hospitality industry is efficiency, cost-effectiveness and being guest-centric. The industry is revolutionised by a wave of technologies that are transforming the guest experience from robotic concierges and automated check-in processes to online booking engines, voice control systems, smart locks, and complete hotel property management systems (PMS). These systems aim to enhance operational efficiency, personalisation and guest satisfaction (Zahidi *et al.,* 2024). This is notable through technological investments by hospitality establishments such as Accor and Intercontinental that have introduced several key technologies (such as mobile apps and contactless check-ins) to enhance guest experiences, improving efficiency and remaining competitive in the market where these technologies are becoming widespread. The SkyCity Entertainment Group, which operates New Zealand's largest casino, adopted electronic facial recognition technology (Wang, 2023). It is thus clear that AI can elicit smarter work routines that can result in better business outcomes. This, however, requires the development of new competencies and capabilities from management and staff alike (Zahidi *et al.,* 2021; Limna, 2023).

Understanding customer reactions and behaviours

Changes in digital tools available to guests are transforming their habits and routines, as well as their expectations about service, experience, and price. Consumers select products that they believe are the best for a specific task at a given price, the most readily available, high-quality, well-branded, comparable with other products, and most cost-effective. Search engines, social media, data analytics, AI, and other digital technologies have made it possible for consumers to obtain a previously unheard-of amount

of information about available products, service options, and price differences. They can quickly explore nearly all available options for a specific product or service, compare prices, and evaluate the benefits of various choices with the touch of a button (Busulwa *et al.,* 2020).

Modern guests are better informed, detail-oriented, and open to new ideas, and they expect that all aspects of their journey must cater to their specific needs and preferences. This is caused by the advancement in digital technology that has shaped customer expectations and behaviours, fostering a demand for unique and authentic experiences (Arapou & Kapiki, 2023). Customers who are unhappy with any aspect of the service encounter are more likely to express their negative opinions, as opposed to satisfied customers. When concerns are not addressed correctly, it can lead to increased negative reactions, which can cause brand resentment (Sarkar *et al.,* 2021). Meeting evolving customer expectations is a trend that compels hospitality organisations to reassess the customer experience and enhance their operations accordingly. When businesses fail to do so, it may result in negative feedback from customers, which is often seen in online reviews and discussions. This can be very harmful to businesses, as it damages their competitiveness in the market (Busulwa *et al.,* 2020).

According to Kelly *et al.,* (2023), customers in the hospitality sector primarily accept AI and robot services because of their usefulness, enjoyment, innovativeness and ease of use. On the other hand, customers reject AI and robot services for various reasons, including technology anxiety, safety and privacy concerns, and the complexity of the technology (Islam & Zhou, 2023). These factors are well known; hence, technology should be made more effective and user-friendly as it will lead to increased customer satisfaction, while simultaneously improving customer efficiency and advancing responsible innovation in the industry. Hospitality businesses must implement AI in a way that aligns with their customers' values, motives, and concerns (Rasheed *et al.,* 2023).

Before demonstrating their inclination to use AI devices or voicing opposition to their use, customers generally go through three stages of decision-making: primary appraisal,

which considers social influence from peers or society; hedonic motivation, where they can view AI as a form of entertainment and enjoyment; and anthropomorphism, which considers the human-like qualities of AI (Solakis *et al.,* 2024). To affect a customer's feelings towards AI, AI devices are evaluated on performance expectancy, which measures how well a task is completed. Effort expectancy then measures how simple it is to use AI. Initially, the third step is based on the emotions of the clients, who either express a willingness to employ AI when they are feeling positive or object to its use when they are feeling negative (Roy *et al.,* 2024).

Current Artificial Intelligence Applications in Hospitality

AI and its associated technologies have and will continue to transform all industries on a global scale. This also includes service industries, notably the hospitality industry. AI technologies currently used in the hospitality industry include, but are not limited to, language translators, virtual assistants, AI-powered site search, augmented reality, booking systems, biometric data recognition, QR codes, drones and robots (Sousa *et al.,* 2024).

As AI grows, it will become more noticeable, because AI and robots can perform jobs in reception, the concierge, bartenders, butlers, chefs, waiters, housekeepers, hosts, and robotic tour guides. Some of these technologies are already in use, such as virtual guides for many notable museums like the Louvre in Paris, the Rijksmuseum in Amsterdam and even the White House, in Washington, DC. Other AI technologies that are being used are chatbots, face recognition technology, optimisation services, consultancy services, self-service kiosks, and virtual reality devices (Kiliçhan & Yilmaz, 2020; Huang *et al.,* 2021). Technologies also noted by Doborjeh *et al.,* (2021) are augmented reality (an interactive experience that uses computer-generated perceptual information to improve the real environment), virtual reality (using a virtual reality headset that replicates a three-dimensional and digital environment) and chatbots (that can act as virtual assistants).

Technological advances that completely transform the hospitality industry are innovative in-room automated technologies and are currently an investing hotspot because not only do they enhance the guests' experiences, but they also increase the revenue performance of hotels (Fan *et al.,* 2022). Furthermore, it provides value-added services with its unique features and desirable functionalities. This AI-powered voice assistant represents a major technology shift for the hospitality industry as it can communicate with customers and fulfil a variety of tasks, such as access to controls for lighting, heating and digital entertainment. By combining AI with this cutting-edge technology, management can learn about individual preferences of the guests and improve the overall guest experience. These smart rooms also increase operational efficiency and income (Lukanova & Ilieva, 2019).

Benefits of artificial intelligence for operational efficiency and customer service

The benefit of AI lies in the automation of repetitive tasks by using robots and self-service kiosks, which reduces the workload of human employees and enables them to focus on more essential tasks. AI, furthermore, provides round-the-clock customer service and simultaneously saves on operating expenses by automating routine tasks, reducing labour costs, and yielding higher profit margins. It is also evident that AI can manage massive amounts of data, which enhances information processing, improves operational accuracy, and supports better decision-making (Roy *et al.,* 2024; Rasheed *et al.,* 2023).

The hospitality industry is heavily integrating AI to improve guest satisfaction and streamline operations. Many AI applications, such as revenue management and customer feedback analysis, are less visible and frequently go unnoticed by customers (Xu *et al.,* 2024). Personalisation and customisation have become important factors in guests' satisfaction and loyalty. Data-driven personalised experiences are at the forefront, with hotels utilising guests' data to customise their experiences. Attributable to the extensive technology and greater comprehension, it has become the cornerstone in the hotel industry (Bardukova, 2023).

The adoption of AI-driven technologies is causing a transformational change in the hospitality industry (Zahidi *et al.*, 2024), redefining the hospitality industry to an intelligent hotel industry (Ruel & Njoku, 2021). Service robots and voice assistants are emerging, and these innovations are changing customer relationships because they improve service delivery efficiency, personalisation, and convenience (Skubis *et al.*, 2024). Immersive technologies are emerging and seen in the development and provision of hospitality services with the incorporation of virtual and augmented reality to further improve AI-powered customer experiences within resource constraints (Lim *et al.*, 2024).

Advancements in deep learning and other AI technologies ensure that the field of AI remains in a constant state of flux and has shifted from a niche topic to a central focus in the hospitality industry, to provide better experiences at each stage of the customer service journey (Gursoy & Cai, 2024).

Predictions for future developments and their potential impact

As AI and its applications continue to evolve, the following types of hospitality innovations are likely to emerge and are the ones that people will frequently use.

According to Kiliçhan and Yilmaz (2020), smart rooms, where visitors can manage the lights, curtains, air conditioning, television, temperature, and smart room systems via voice-activated virtual assistants, are foreseen. Additionally, AI can be used for cleaning and laundry duties, folding towels and sheets, and gathering and relocating soiled linens to a designated location. Future technology is also anticipated to include the ability to determine a customer's mood and to save guest history. This can be achieved by AI visual and audio systems, such as face recognition technology, as humans do emotionally respond to spatial conditions; these responses can be measured by automatic facial expression recognition (Leon *et al.*, 2019).

According to Ruel and Njoku (2021), AI could transform traditional operations with applications in customer relationships and supply chain management, offering hospitality businesses a

chance to enhance operational efficiency, engage more effectively with customers, and develop new innovative products. The future of AI in the hospitality industry is bound to expand and bring a lot of changes in the products, processes, and behavioural traits of the users. Society has the potential to address the key concerns surrounding AI. Privacy issues will be resolved, and the necessary connections established to allow seamless collaboration between employees and AI systems. A visual positioning system (VPS) may eventually replace the global positioning system (GPS), as VPS is a cutting-edge technology that puts a live picture of the actual world and visual landmarks in front of travellers (Bhaskar & Sharma, 2022).

In the hospitality industry, further integration of AI and machine learning is necessary to completely transform customer experiences by offering tailored and seamless services suited to individual preferences. This is seen with the expansion of AI using robotic applications to enhance customer engagement in hotels and restaurants, which helps customers to find more relevant information to improve their decision-making (Knani *et al.,* 2022). AI will most likely be used for predictive analytics that gives hotels the ability to predict guest preferences and helps them to provide highly customised services that will increase customer retention and attraction. Making use of augmented reality for interactive room displays, virtual tours, and contextual information about nearby attractions will revolutionise the way that guests experience hotels (Bardukova, 2023).

Technological singularity is a future point where technology evolves so quickly and uncontrollably that it surpasses human intelligence and abilities, and where no distinction can be made between what is human and what is artificial (Yeoman & McMahon-Beattie, 2023). AI is a key example, and when it happens, the lines between humans and technology could blur, causing an unknown impact on society and human life. It is predicted to be realised by 2040 through the improvement of ultra-AI, being extremely advanced and highly capable AI systems surpassing human intelligence in an unprecedented way, rendering the need for human labour obsolete (Xu *et al.,* 2024).

Analysis of the comfort levels of customers and the trust in artificial intelligence

A study by Dinal and Krishna (2023) draws attention to the effectiveness and practicality of several automated services. Customers regularly give praise for offering seamless, quick, and hassle-free experiences that boost their overall satisfaction. However, inefficiencies such as breakdowns and delays can negatively impact the client experience. User-friendliness, clear instructions, dependability, security and transparency are some of the aspects that affect customers' confidence and trust in automated hotel services.

The use of AI systems in tourism and hospitality makes most customers feel satisfied, amused, hopeful, or relaxed, experiencing advantages such as quick access to useful information, simpler processes, shorter waiting times, and efficient services. This indicates that customers' primary motivations for using AI are perceived usefulness, pragmatics, and effectiveness (Sousa *et al.,* 2024). A main factor that inhibits the use of AI systems is data privacy and security; organisations that supply AI technologies should offer guarantees of greater data safety and confidentiality (Ma & Zhang, 2024). Understanding customers' emotional responses can guide designers in creating AI systems that are more acceptable by involving AI designs with certain emotional expressiveness or human-like characteristics to foster trust amongst consumers (Ding & Najaf, 2024).

The balance between artificial intelligence and human touch in hospitality services

Dinal and Krishna (2023) focus on the sentiment and the importance of human interaction, especially when it comes to making personalised recommendations and obtaining assistance. This is despite the growing acceptance of automated services; the quality of human interactions significantly influences guest satisfaction. Using technology can add real value to services. Service delivery is, however, the cornerstone of the hospitality industry and adopting new technologies should be well managed to produce positive outcomes (Xiaowei & Jamaluddin, 2023). Technology is merely a value-added tool intended to create

differentiation and enhance guest satisfaction. This also emphasises the human-powered nature of 4IR, and technology adoption as alluded to in Chapter 1 (Deloitte, 2024).

Xiaowei and Jamaluddin (2023) further state that regardless of the technology's functionality, service personnel add a certain human touch because technology can only improve services; it cannot create them on its own. As a result, technology should be seen as a useful tool that enhances customer satisfaction and encourages creative differentiation, but it cannot take the role of interpersonal engagement (Deloitte, 2024). Positive ratings and general satisfaction are mostly determined by emotional involvement, which also has a significant impact on the possibility of repeat business.

The past, present, and future have always been driven by innovation and technology, and it should be embraced, but keeping a balance is important. Having real intelligence instead of AI is important, as humans convey emotions, attitudes, and personality. Technology can be used for service in automated areas of control measurements, supply chain management, inventory management, sales control, and other management functions. It can even assist in enhanced speed, eliminating mistakes, cutting costs, and improving efficiency and profitability, but technology should not dilute the interpersonal value internally or externally with customers (Bisoi *et al.,* 2020). Technological developments have tangible benefits, such as empowering administrative staff for better future projections and healthier decisions with the help of precise predictions (Kiliçhan & Yilmaz, 2020).

How artificial intelligence influences customer expectations and behaviours

Gursoy and Cai (2024) mention that physical attributes in the appearance of service robots have been shown to play a major role in influencing customer satisfaction and intention to revisit even after a service failure. This means that anthropomorphism or a cute appearance tends to elicit a positive response from customers, which mitigates the negative impact of service.

Chatbots offer real-time responses, support in multiple languages and are available 24/7, thus changing customer

service tremendously. AI-driven technologies such as chatbots, virtual concierges and personalised recommendation systems are redefining customer expectations from business. It is an unprecedented force that shapes customer expectations and behaviours in the hospitality as a service industry. The level of personalisation offered by AI enhances customer satisfaction and fosters brand loyalty, as customers increasingly prefer businesses that understand their unique needs. Furthermore, automation offers seamless and hassle-free customer experiences as AI systems handle online bookings, check-ins, and check-outs, reducing dependency on human intervention (Astuti *et al.*, 2024).

Customer expectations are reshaped by AI-driven technologies in hospitality in the fact that they offer instant, personalised, and efficient service. The Expectation-Confirmation Model suggests that customer satisfaction and continued AI adoption depend on AI meeting or exceeding expectations. The perceived enjoyment plays a key role, as customers now prefer AI experiences that are efficient and engaging, and businesses must balance AI's functional benefits, such as efficiency and accuracy, with its emotional appeal of personalisation and enjoyment (Huang *et al.*, 2024).

Potential shifts in customer preferences towards personalised services vs. human interaction

Technology can benefit companies depending on the customer perception of technology, as the hospitality industry is widely known as "high touch", which refers to the provision of personalised attention and service by frontline personnel and creates the human touch, the conversion to "high-tech" services that include the newest technology on the market is not always generally accepted (Xiaowei & Jamaluddin, 2023)

Customers also share their scepticism about AI and that it might lose the "human touch", leading to customer anger, confusion, and dissatisfaction. Customers who have strong relationships with a service provider also feel insulted when, suddenly, they are assisted by AI rather than a human. It is still very clear that customers are keen on receiving services from human staff rather than robot staff. This still stays the same even

if the human services are inferior and at a higher price, and this type of scepticism from customers is a clear indication of the long road ahead for the hospitality industry that is traditionally centred on human interaction and relationship building (Gursoy & Cai, 2024). Goel *et al.,* (2022) agree and go further to note that the usage of technology by service providers reduces social interaction opportunities, leading to loneliness and anxiety amongst consumers and causing people to live in isolation.

The integration of advanced technologies, such as AI and virtual reality, poses challenges in terms of infrastructure, staff training and guest acceptance. The impact of technology on the hospitality workforce and customer experience is surreal, and a seamless adoption is needed without compromising the human touch (Bardukova, 2023). The hospitality enterprise and the specific needs of the customer will influence the choice of options between automated, face-to-face human service, or the hybrid model of technologically centred service that incorporates both. A hybrid strategy will prove to be the most effective way for businesses to address the changing needs of their workforce while also delivering outstanding customer experiences. The whole service encounter, with its focus on user touchpoints and emotional connection, is central to the overall customer journey (Roberts & Maier, 2023).

Job displacement and creation of new roles because of artificial intelligence

A business that incorporates intelligent automation also carries risk, such as the loss of low-tech jobs, safety, and security, as well as the potential for workers' mental health to deteriorate because of a new threat associated with the presence of AI-assisted workplace robots. Workers are becoming stressed at the possibility of losing their jobs or robots monitoring their work performance, which creates a competition between the robots and humans (Limna, 2023).

According to Busulwa *et al.,* (2020), digital technologies are disrupting both organisations and management practice. Without digital transformation and digital business competencies, management risks harming the long-term survival and

competitiveness of the business. Managers must acquire new skills to lead digital transformation strategies, innovation, and learning, while demonstrating adaptability, agility and ambidexterity. This requires inter-disciplinary knowledge, ongoing lifelong learning, and continuous competency development in the field of digital technology by managers.

Against the backdrop of the hospitality industry that is still recovering from the COVID-19 pandemic, AI has a significant impact on employees' sentiment in the workplace, and businesses must provide resources and support mechanisms to help employees to navigate and cope with the challenges that AI integration brings to the workplace. Staff training and development are key for the infusion of generative AI (Gen AI), as it can empower individuals to develop exactly the skills that they are lacking and can create an individualised training programme that provides real-time feedback (Gursoy & Cai, 2024).

Changing job responsibilities and the need for reskilling

The adoption of AI is reshaping various industries and job roles, and AI and robots have the potential to automate many tasks; however, certain jobs are less likely to be fully replaced by technology because of their unique human qualities (Lee *et al.*, 2024). When it comes to tasks where these human abilities are required, employees with critical soft skills like creativity, teamwork, problem-solving, initiative, attention to detail, and resilience will be far more valuable than robots (Lu *et al.*, 2019).

Effective daily robot management became crucial for employees who sought assistance to enhance their capacity to handle malfunctions and frequent breakdowns brought on by the robots, as it gave them a sense of empowerment and necessity because it required human intervention. These technologies were labelled as interdependent and unreliable. Outsmarting the robots to meet personal performance goals is conducive as it allows workers to feel that their work has purpose (Goštautaite *et al.*, 2023).

Employee retention is significantly enhanced by workforce training and development, and labour can be very much improved

with the use of GAI, because it automates time-consuming and repetitive tasks. It is anticipated that with GAI, new job opportunities will be generated and roles within hospitality will be redefined, ultimately transforming frontline service encounters, allowing employees to concentrate on more complex activities that require critical thinking, creativity and interaction with customers (Dogru *et al.,* 2023).

As Kiliçhan and Yilmaz (2020) mentioned, it is imperative to include AI technologies in the curriculum of higher education to encourage students to know artificial intelligence applications and robotic technologies and conduct joint projects with academics in engineering departments. Having people who understand the nature of the industry may encourage different results with innovative technology developments to satisfy consumers' needs and demands. Scholars must integrate the impact of robots into their work theories and advance academic understanding in this domain to help designers and managers to be cognisant of work design changes that may adversely affect job responsibilities to avoid problematic changes (Bhatti *et al.,* 2024).

GenAI can contribute to the development of a more diverse and inclusive learning environment by promoting personalised learning experiences and enhancing students' technological skills. It can also support the development of human-like creativity and intelligence, enabling the creation of diverse content such as images, text, audio, and computer code. Such integration of adaptive learning platforms, virtual reality experiences, and real-world simulations can boost student engagement, motivation and their academic performance. Most importantly, it prepares students for an increasingly technology-driven industry, as hospitality professionals in the future at any level will be expected to be knowledgeable in applying technology to provide services. Future managers also need to know how to manage blended teams that are made up of humans and GAI-driven platforms, and to prepare students for blended environments, GAI will need to be embedded into the curricula at all levels (Dogru *et al.,* 2023).

Summary

Every industry faces defining moments, times when innovation challenges tradition. This also applies to the hospitality industry. The rise of automation is altering not just the way that the industry operates; it is rewriting the expectations of guests. Automation should deepen guest satisfaction rather than create a hospitality environment where efficiency takes precedence over satisfaction. The future belongs to those who can find the perfect balance between technology operating behind the scenes and human warmth taking centre stage.

As the hospitality sector races towards automation, an indisputable paradox arises: An industry that thrives on human interaction is redefining itself through machines. Technology has the potential to improve service rather than diminish the motivational centre that makes hospitality so special. The goal of automated hospitality in the future is to reinvent service and not replace humans, but to humanise technology. This means that where AI anticipates, robots assist, and people remain at the heart of every guest experience. This human-automation threshold is no longer a futuristic concept; it is now shaping every guest's interaction. Automation is the silent revolution that is fundamentally changing the hospitality industry. But trust, not technology, is the way of the future. Guests need to embrace automation because it makes them feel understood, appreciated, and cared for, not because it is faster or more sophisticated. The real disruptors will not be those who automate the most, but those who automate best, with purpose, personalisation, and the wisdom to know when only a human touch will do.

The future is about reimagining the human experience through technology, not about machines taking the place of people. The true measure of success will not be how well automation works, but how effortlessly it maintains the warmth, intuition, and caring that makes hospitality an art. The future is hybrid and AI and automation in hospitality should strive to enhance human interaction rather than replace it. The most successful implementations use AI for efficiency while preserving human qualities of warmth, empathy, and personalisation.

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Chapter 10

Navigating Practical Challenges in the New World of Work: Guidance for Internal Auditors

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Abstract

The rapid advancement of artificial intelligence (AI), coupled with digital transformation and remote work, has fundamentally reshaped the operational landscape of internal auditing. This chapter employs a critical desktop research methodology drawing on academic literature, professional standards, and industry publications. It critically examines how internal auditors are responding to these shifts through the lens of Alvesson and Deetz's (2011) critical research framework, focusing on insight, critique, and transformative redefinition. The study draws on recent literature, professional standards, and industry practices to challenge the assumption that AI is a neutral, efficiency-enhancing tool. It problematises the ethical and procedural dilemmas that AI introduces, such as overreliance, loss of professional judgement, and widening inequalities between resource-rich and under-resourced audit functions. A key concern explored is the dominance of proprietary AI tools by elite firms, which threatens to entrench a two-speed profession. In response, the chapter proposes a forward-looking redefinition of the internal audit profession: updating global standards, redefining competencies, augmenting rather than replacing human judgement, and advocating for democratised, ethically governed

AI integration. The analysis ultimately calls for inclusive, scalable frameworks to ensure that internal audit remains a resilient, value-adding function in the AI-driven workplace.

Introduction

The rapid evolution of the workplace, driven by technological advancements, artificial intelligence (AI) and digital transformation, has significantly altered the operational and governance landscapes of modern organisations. This new world of work is characterised by remote and hybrid work models (Issa *et al.*, 2016; Plesner *et al.*, 2018), the availability of real-time data analytics (Han *et al.*, 2023), decentralised decision-making (Bernier *et al.*, 2023) and increasing process automation (Cooper *et al.*, 2019).

Lenz and Jeppesen (2022) explain that internal auditors are guardians of governance, risk management, and compliance in organisations. Resultingly, these changes present unprecedented challenges for internal auditors. They must now navigate a landscape where AI-driven systems detect anomalies, predict risk, and generate financial reports, to name but a few. Authors such as Lehner *et al.*, (2022), as well as Munoko *et al.*, (2020a), raise critical questions about auditor independence, professional judgement, and ethical accountability. They argue that, while AI and new developments enhance work efficiency, it significantly complicates traditional internal audit methodologies by introducing biases in machine-learning models, new cybersecurity risks in cloud-based audit environments and so-called "black-box" decision-making (Rikhardsson & Dull, 2016; Roussy, 2015). A significant factor worsening the issue is that global internal audit standards are giving broad guidance on technology strategy (Chambers, 2024a), but fail to address the practical challenges faced by internal auditors in today's world of work.

In response to these changes, this chapter aims to critically examine the role of internal auditors within an AI-driven workplace, utilising as its theoretical lens the framework of Alvesson and Deetz (2011), focusing on insight, critique and transformative redefinition. The chapter contributes by reevaluating assumptions surrounding AI's role in internal auditing, exploring power dynamics within organisations,

and proposing alternative methods as forward-looking recommendations for integrating AI into audit practices to maintain professional integrity and accountability.

Literature review

Lenz *et al.,* (2018) posit that internal auditing research has historically been dominated by functionalist or normative approaches, which mostly focused on compliance, effectiveness and assurance outcomes. Even though these perspectives provide valuable insights into audit practices, they tend to assume that audit tools are neutral and that audit environments are stable (Appelbaum *et al.,* 2021; Lehner *et al.,* 2022). These approaches often present internal auditing as a neutral, rational process (Flint, 1988; Mautz & Sharaf, 1961), downplaying the political, ethical, and identity-related dimensions of the auditor's role. However, as AI and digital transformation disrupt traditional roles, critical perspectives are increasingly needed (Leitner-Hanetseder *et al.,* 2021), specifically a more in-depth exploration of power shifts in professional identity, legitimacy, ethics, authority, and control within internal audit functions.

Research studies have recently begun to apply critical research frameworks to explore these questions. Alvesson and Deetz's three-pillared framework, comprising insight, critique, and transformative redefinition, offers a particularly effective lens for examining the deeper implications of AI adoption in professional fields. For example, De Villiers and Hsiao (2018) made use of the framework to examine how assurance practices are shaped by hegemonic investor logic. De Villiers and Dimes (2023), as well as De Villiers *et al.,* (2024), used it to problematise the increasing reliance on AI-generated texts in accounting and auditing contexts, while De Villiers and Sharma (2020) critically reflected on the future of various reporting types. These studies demonstrate that AI is not merely a tool for auditors to use or evaluate, but also a force that can reconfigure auditing norms, values, and even epistemologies. It challenges the autonomy of human judgement, introduces ethical dilemmas around algorithmic bias, and recasts what it means to be professionally competent in a digital environment (De Villiers *et al.,* 2024). However, most critical literature to date has focused on the role of auditing AI, rather than its use within the audit function

itself, and most of the research was conducted on the external auditing profession, rather than focusing on internal auditing. This leaves a gap in understanding how internal auditors are personally affected by, and implicated in, the technologies that they deploy. This study builds on these scholarly contributions by using Alvesson and Deetz's critical framework as its theoretical lens to explore the embeddedness of AI in internal auditing practice. It focuses not only on how auditors interact with AI, but also on how their role is redefined in the new, increasingly automated, remote, and data-driven world of work. By shifting the lens inwards, the study responds to recent calls for research that centres auditors' own agency, ethics, and professional identity in the face of technological disruption (Kokina *et al.,* 2021, 2025; Lehner *et al.,* 2022; Munoko *et al.,* 2020b).

Research Methodology

This study employs a critical desktop research methodology, drawing on high-quality secondary sources such as academic literature, the Global Internal Audit Standards (The Institute of Internal Auditors [IIA], 2024), and industry publications. Guided by the theoretical framework of Alvesson and Deetz (2011), the goal of this critical discourse analysis is not to produce generalisable outcomes, but rather to critically interrogate dominant professional discourses and surface the underlying assumptions, contradictions, and omissions in how internal auditing is evolving in response to AI, as currently embedded in existing texts. This approach enables a timely, exploratory analysis grounded in existing evidence and theoretical critique.

Following the framework (Alvesson & Deetz, 2011), the study will unfold in three stages. The insight phase challenges the common assumptions that AI is a neutral, objective, and purely efficiency-driven tool in internal audit, and questions how AI is often uncritically accepted without considering its deeper impacts on professional judgement, ethics, and power dynamics. The critique phase explores tensions, dilemmas, and power asymmetries arising from AI use, such as the erosion of human judgement, overreliance on black-box algorithms, and the professional implications of working with tools designed outside of internal audit practice. Transformative redefinition

will offer alternative visions for internal auditing, including new standards, competencies, and governance practices that enable auditors to use AI ethically and strategically. In this study, validity is strengthened through triangulation, through comparing the recent regulatory discourse, scholarly analysis, and real-world implementation challenges documented by audit practitioners (Gasco-Hernandez *et al.,* 2022). The study also integrates basic scenario-building logic to forecast plausible futures for the internal audit profession, a method consistent with Alvesson and Deetz's call for transformative redefinition.

Insight: AI In Internal Auditing Amid Digital Transformation and Remote Work

A recent study by Li *et al.,* (2023) explains the rapid shift towards remote auditing. These changes have not only introduced new tools into internal audit functions but have also reshaped how auditors work (Eulerich *et al.,* 2022), where they work (Lorentzon *et al.,* 2024; Internal Audit Foundation, 2021) and what is expected of them (Elad Fotoh & Lorentzon, 2022). Kandeh and Alsahli (2020) explain that in this new world of work, the assumptions underlying internal audit practice, such as human judgement, physical presence, and linear reporting cycles, are being challenged by automation, decentralisation, and continuous risk monitoring, to name but a few.

The digitalisation of business processes has created both a need and an opportunity for internal audit functions to incorporate AI into their methodologies. Auditors are no longer limited to sample-based reviews; they now have access to tools that can analyse entire populations of transactions, allowing for real-time identification of anomalies and emerging risks (Ghanoum & Alaba, 2020; Wassie & Lakatos, 2024). These capabilities reflect a broader evolution of audit from a retrospective, checklist-based process towards one grounded in predictive analytics, data-driven insight, and automated assurance (Shinde, 2021). While this evolution offers clear efficiency gains, it also signals a shift in how internal audit defines its purpose and exercises its judgement.

During the COVID-19 pandemic, most internal audit teams globally were forced to operate without physical access

to auditee sites, turning to cloud platforms, video conferencing, and various manners of digital evidence-gathering (Al-Okaily *et al.,* 2022; Okfitasari *et al.,* 2022). These adaptations were not temporary, with hybrid and virtual audits becoming a core feature of post-pandemic audit practice (Internal Audit Foundation, 2021; Internal Audit Foundation & AuditBoard Inc., 2021). Remote work redefined audit planning, execution, and supervision, with AI-enabled and other technological tools, previously considered to be peripheral (Issa *et al.,* 2016), now supporting internal audit functions from data extraction to virtual walkthroughs (Appelbaum *et al.,* 2021).

As explained by Munoko *et al.,* (2020b), continuous auditing, supported by AI, is fast gaining prominence. Algorithms running in the background can flag anomalies or control deviations as they occur, enabling auditors to respond in near-real-time. Likewise, audit planning is increasingly shaped by AI's ability to synthesise vast quantities of internal and external data to update risk assessments dynamically (KPMG, 2025; LeewayHertz, 2023).

As internal auditors adapt, so too does audit reporting. Natural language processing (NLP) applications now also assist practitioners in reviewing contracts, policies, and regulations, highlighting key compliance risks that may otherwise go undetected (Otia & Bracci, 2022). In recent years, internal audit teams have begun experimenting with generative AI models to structure segments of audit reports, extract patterns from large datasets, and produce first-draft narratives that are later refined by human judgement (Chambers, 2025). In addition, LeewayHertz (2023) explains that AI can support regulatory compliance by monitoring legal updates across jurisdictions and notifying audit teams of relevant changes, a task once reliant on manual tracking or legal counsel.

The rapid innovation in AI brings certain challenges. One significant issue is the growing skills gap within internal audit functions. Many auditors who are trained in accounting and control evaluation, often lack the necessary expertise in data analytics and algorithmic logic. Scholarly works such as those of Ham *et al.,* (2024) and Wassie and Lakatos (2024) emphasise that to use AI tools effectively and responsibly, it is essential

that auditors engage in upskilling and collaborating across multiple disciplines.

The challenge is not only technical but cultural. Resistance from within audit teams, as well as from stakeholders uncertain about the reliability of AI outputs, can hamper the integration of these tools (Otia & Bracci, 2022). Establishing trust in AI-assisted auditing requires a demonstration of value, transparency about methods, and assurance that human oversight remains central (Ingrams *et al.*, 2022).

Data quality and accessibility pose further challenges. AI tools require structured, integrated datasets to function effectively. In many organisations, data silos or legacy systems make it difficult for internal auditors to access the information needed for meaningful analysis (Bernier *et al.*, 2023; Olaitan *et al.*, 2019). Ensuring appropriate data infrastructure, such as analytics platforms and business intelligence systems, has now become a foundational requirement for modern internal auditing (Internal Audit Foundation & AuditBoard Inc., 2021).

Despite these challenges, several best practices are emerging. Leading audit functions integrate AI throughout the audit lifecycle (risk assessment, fieldwork, reporting, and follow-up) rather than confining its use to specific tasks (Chambers, 2023; KPMG, 2025). They adopt dual-control models, where AI outputs are validated by parallel algorithms or human reviewers. The responsible use of AI is also becoming a key internal audit concern, with policies emerging to manage risks related to data privacy, ethical use of AI, and audit trail documentation (Mökander & Floridi, 2021, 2023; Stahl, 2021).

The insight that emerges is clear – internal auditing is undergoing more than a technological upgrade; it is confronting a transformation in identity and practice. The profession is evolving from a role focused on retrospective checks to one that emphasises real-time advisory services, driven by algorithmic insights. Auditors are no longer the only interpreters of data; they are transforming into mediators between human judgement and machine analysis. To effectively navigate this shift, internal audit must not only embrace AI but also critically evaluate the underlying assumptions and expectations associated with it.

Critique: Ethical, Procedural and Professional Dilemmas in Adopting AI

While the integration of AI tools offers significant opportunities, it also exposes internal auditors to ethical, procedural, and professional dilemmas. This section examines transparency, bias, privacy, professional judgement, power dynamics, current standards, and professional values, critically evaluating the implications of an AI-augmented audit function.

Transparency and Explainability of AI

One major challenge in using AI is the opacity of its models. Complex machine learning systems often act as black boxes, making it nearly impossible for internal auditors to fully understand how risk classifications or recommendations are formed (Lenz *et al.*, 2018; Kossow *et al.,* 2021). This undermines the fundamental principle that internal auditors should be able to support conclusions with clear reasoning. This opacity leads to two main dangers: blind reliance on AI or the dismissal of valuable insights because of distrust, both of which can harm audit quality (Gotthardt *et al.,* 2020). The Institute of Internal Auditors continually emphasises that auditors remain accountable for their findings, even when making use of, or when their work is influenced by AI (Institute of Internal Auditors Global, 2017; IIA, 2024). To ensure transparency, audit teams, both external and internal, are validating AI tools with known datasets, preferring interpretable models, and seeking thorough documentation from AI vendors (Noordin *et al.,* 2022). However, in practice, adhering to this is easier said than done (Sandu *et al.,* 2022).

Bias and Fairness Issues

AI's reliance on historical data presents a significant risk of bias. Much has been written about this challenge from an internal audit perspective, explaining that AI may disproportionately focus on certain areas while neglecting emerging risks, thereby reinforcing organisational blind spots (Ingrams *et al.,* 2022). This is particularly important in contexts such as fraud detection, location-based assessments, and diversity, equity, and inclusion metrics. Additionally, power dynamics within the organisation

can complicate matters when internal audits are pressured to use AI tools provided by management (Milana & Ashta, 2021; Mökander & Floridi, 2023).

Data Privacy and Confidentiality

Internal auditing, in general, but more specifically AI-enabled auditing, involves processing large volumes of sensitive information, while ethical, professional and legal requirements require that auditors exercise utmost care to safeguard data (IIA, 2024). However, cloud-based AI tools raise risks related to data leakage or third-party access (Chambers, 2025), or unknowingly uploading personally identifiable information into generative AI tools (Yang *et al.,* 2020). This is an expansion of existing data protection obligations, not a replacement.

Overreliance and Erosion of Judgement

A further serious concern is the potential erosion of internal auditors' professional judgement and scepticism (Hamdam *et al.,* 2021). As AI assumes greater roles in risk assessment, data analysis, and even report drafting, there is a risk of auditors deferring too much decision-making to machines (Aslan, 2021; Stahl *et al.*, 2017). This not only contradicts the principle of due professional care but may also lead to a deskilling of auditors over time.

Researchers like Ghanoum and Alaba (2020) and Kokina *et al.*t (2025) warn against "auditor overreliance on AI," particularly amongst inexperienced staff. When AI is perceived as authoritative, auditors may struggle to challenge outputs, even when discrepancies arise. This is a concern in the external audit as well (Public Company Accounting Oversight Board, 2023). Maintaining human oversight, encouraging interpretive critique, and emphasising critical thinking in auditor training are, therefore, necessary safeguards.

Power Dynamics and Organisational Politics

AI adoption in internal auditing shifts power within the function and between internal audit and management, as alluded to by Li *et al.,* (2018) and Kozlowski (2018). Internally, auditors proficient in data science may begin to dominate technical discussions,

creating hierarchies based on skill rather than experience. This may disempower experienced auditors and limit constructive dialogue. Externally, if internal audit depends on AI systems developed or managed by business units, independence may be compromised. The risk is that the audit simply confirms what management's systems already say, weakening the third line of defence. See also Misuraca and Van Noordt (2020).

Additionally, resource disparities can exacerbate these power issues. Larger functions may access advanced AI platforms, while smaller, under-resourced ones lag. This creates uneven expectations across the profession. From a South African perspective, many internal audit functions do not use and often do not even have access to generalised audit software tools (Smidt, 2016). Up to now, the IIA has not issued specific guidelines on equitable technology capacity or how audit independence should be safeguarded when AI is involved.

Ethical Tension: Technological Elitism in Internal Audit

While the Big Four auditing firms are pioneering sophisticated AI-driven platforms across internal audit, risk advisory, and governance functions, these innovations are largely inaccessible to in-house internal audit teams, start-up consultants, and early-career professionals. These elite firms have financial capacity, data infrastructure, and talent pipelines to invest in proprietary tools like GL.ai, GRAPA, Eagle Eye, or K-analyzer. (See Table 10.1.) Their scale allows them to pilot, validate, and refine AI systems in ways that smaller entities cannot feasibly replicate.

This seems to create a split in the profession, where elite firms can define the future of internal audit through proprietary systems and AI-enhanced services, while smaller teams risk obsolescence, left navigating complex AI risks with outdated tools and minimal resources. There is a power asymmetry at play. Not only in terms of access to technology, but also in shaping standards and client expectations. For example, if the Big Four auditing firms offer real-time, AI-enhanced assurance, auditees and clients may begin to expect similar capabilities from all audit providers, even those without the financial or intellectual capital

to deliver them. Furthermore, if professional standards evolve to align implicitly with the capacities of elite firms (e.g., referencing tools only available to them), they may unintentionally marginalise smaller practices.

Limitations of Current Standards

The recently issued Global Internal Audit Standards (GIAS) (IIA, 2024) mark a significant evolution in the IIA's guidance, including a greater emphasis on innovation and the use of technology. Chambers (2024b) explains that the updated framework raises the bar for chief audit executives (CAEs) on new technology strategies. However, the Standards still fall short in addressing the practical and ethical complexities surrounding AI usage by internal auditors. The words "artificial intelligence" is not even included in the new GIAS. Furthermore, there is no explicit guidance on the matters discussed in the sections above, for example, managing algorithmic opacity, auditing AI-generated outputs, or setting criteria for appropriate AI tool selection. The Standards also do not clarify what constitutes professional due care when AI is used in forming opinions.

Most of the supplemental guidance from the IIA, such as the Global Technology Audit Guides (GTAG®s) (Lambrechts *et al.*, 2011) and the IIA's Artificial Intelligence Competency Framework, currently still focuses on the auditing of AI systems and using general data analysis technologies. The IIA has an Artificial Intelligence Knowledge Centre, but much of the guidance provided is illustrative use cases, such as the ones provided by the Internal Audit Foundation (2024), not giving clear guidance on internal auditors using AI in their work. This raises questions such as whether internal audit functions should develop internal validation protocols for the AI tools that it uses or whether internal auditors, when using AI tools to produce assurance, should also provide assurance over the AI tool itself, that is, test whether the AI model's logic, assumptions, and outputs are sound, unbiased, and fit for purpose. This is a level above merely using the tool, also assuring the reliability and appropriateness of the AI system as part of the audit methodology. A further consideration is where the boundaries of "meta-assurance" should be drawn. These

practical questions remain unresolved by the standard-setter, placing pressure on individual auditors to devise their assurance mechanisms.

Reinforcing Professional Values

The adoption of AI tests the internal audit profession's core principles of integrity, objectivity, competence, due professional care and confidentiality (IIA, 2024). If internal auditors are uncertain of how AI operates, they may breach the competence principle. If they defer to opaque systems without verification, they risk breaching objectivity and due professional care. And if confidentiality is violated, integrity is undermined. These are not minor tensions.

Boards and executive leaders, meanwhile, may expect internal audit to utilise AI aggressively for speed, insight and competitive advantage. Internal auditors must, therefore, balance external pressure with core principles and ethics.

Transformative Redefinition – Strategies for an AI-Driven Internal Audit Future

Evolving Professional Standards and Guidance

As explained by Hasan (2022), so-called "professional hybrids" are expected to emerge. Modernising internal audit standards to address AI governance is essential. While the new Global Internal Audit Standards (IIA, 2024) acknowledge the importance of technology, they stop short of offering specific guidance on AI usage. To bridge this gap, the IIA and related bodies should develop practice advisories that guide auditors on validating AI-generated evidence, managing biases, and ensuring objectivity.

Such advisories might include protocols for testing model accuracy, retaining source data, and documenting assumptions. In parallel, integrating AI ethics principles (such as fairness, transparency, and accountability) into auditing standards would help to define boundaries for responsible AI use. The GIAS of the IIA could be revised to reflect expectations for auditors to understand and evaluate algorithms that they rely on, just as they would with external specialists.

Furthermore, the IIA's Global Technology Audit Guides (GTAGs) could be expanded to address not only the auditing of AI systems, but also the internal audit function's use of AI tools in executing audit activities. Detailed, scenario-based guidance (such as managing generative AI in audit reports or ensuring confidentiality in cloud-based platforms) would reduce ambiguity and promote consistency. Collaboration with technology and ethics bodies could further strengthen these standards, offering a unified vision for AI in internal audit.

Redefining Competencies and Training

Research going back almost 25 years (Wongpinunwatana *et al.,* 2000) emphasises that, as internal audit evolves with technology, so must its talent base. In the context of AI and the evolving world of work, internal auditors must understand data analytics, statistical reasoning, and AI functionality, even if they are not technical experts in these areas.

Leading audit functions are already hiring or developing professionals with dual backgrounds in auditing and data science. Others are creating cross-training opportunities, placing auditors in analytics teams or vice versa, to foster mutual understanding. On an institutional level, academic researchers as well as professionals advocate that the Certified Internal Auditor (CIA) curriculum and other certifications should be revised to include AI-related content (Kandeh & Alsahli, 2020; Modisane, 2019).

Developing AI literacy means teaching auditors to ask critical questions about AI tools, understand their limitations, and interpret outputs in context (Hasan, 2022). But this must be balanced with reinforcing foundational skills: critical thinking, professional scepticism, and ethics. As automation frees auditors from routine tasks, more time can be devoted to advisory roles, strategic risk evaluations, and governance reviews, areas where human insight is irreplaceable.

Partnerships with universities and professional forums can play a key role (Dzuranin *et al.,* 2018; Giles, 2019; Qasim *et al.,* 2020; Sledgianowski *et al.*, 2017). Academic programmes should reflect the shift in required skills, while professional associations

can provide platforms for sharing lessons learned and innovations in AI-integrated auditing.

Augmenting – Not Replacing – the Internal Auditor: AI Deployment by the Big Four Audit Firms

A compelling illustration of the augmented audit model can be found in how the Big Four global audit firms are deploying AI across assurance and advisory functions. The Big Four refers to Deloitte, EY (formerly known as Ernst & Young), KPMG, and PricewaterhouseCoopers (PwC), which collectively dominate the global audit, assurance and advisory professional services market. In recent years, the Big Four have invested heavily in AI, machine learning, advanced data analytics, and automation technologies to enhance assurance efficiency, expand data coverage, and strengthen risk identification capabilities. Therefore, the technological strategies of the Big Four provide a valuable lens through which to understand the evolving relationship between AI and professional judgement in modern assurance and advisory environments. Rather than replacing auditors, these firms are enhancing insight, efficiency, and strategic foresight through targeted AI integration, as illustrated by Hasan (2022). The discussions and tables under the sub-headings below summarise some of the key proprietary tools developed and used by the Big Four firms to elucidate the operationalising of AI in the assurance and advisory environment.

Deloitte

Deloitte, for instance, has developed *DocQMiner*, a self-learning tool that analyses contracts to support risk advisory services, and *Eagle Eye*, which scans the Web for early warning signs of credit migration. In support of behavioural auditing, the *Behavior and Emotion Analytics Tool (BEAT)* uses deep learning to analyse voice patterns. Deloitte's *Insight-Driven Organisation (IDO)* framework also enables organisations to utilise AI in achieving strategic objectives. These tools exemplify how AI can enrich, rather than replace, the auditor's role.

Table 10.1: Examples of key proprietary AI tools used by Deloitte

Tool Name	Tool Description	URL
Argus	A cognitive audit application that uses advanced machine learning techniques to identify and extract key financial information from electronic documents, enabling auditors to review entire populations of documents rather than samples.	Deloitte-Creatinga Cognitive Audit
GRAPA (Guided Risk Assessment Personal Assistant)	An AI-driven risk assessment tool that automates the evaluation process, improving predictive capabilities over time through machine learning algorithms that learn and adapt to changing situations.	Deloitte-16AIProjects
SONAR (Similarity Observant Network Analytics Report)	A network analytics tool designed to detect and analyse similarities and patterns within large datasets, aiding in the identification of anomalies and potential risks.	Deloitte-16AIProjects

(*Continued*)

Table 10.1: Examples of key proprietary AI tools used by Deloitte (*Continued*)

Tool Name	Tool Description	URL
DocQMiner	An AI-powered solution for extracting and analysing data from unstructured documents, supporting multiple languages and providing high data accuracy through a built-in review workflow.	Deloitte-DocQMiner
Eagle Eye	An AI solution that searches the Internet for early warning signals indicating potential financial distress for companies, aiding in proactive risk management.	Deloitte-EagleEye
BrainSpace	An advanced analytics platform that uses machine learning to uncover insights from unstructured data, assisting in tasks like eDiscovery and investigations by identifying relevant content through visual analytics.	Deloitte - Entity Recognition

(*Continued*)

Table 10.1: Examples of key proprietary AI tools used by Deloitte (*Continued*)

Tool Name	Tool Description	URL
BEAT (Behavior and Emotion Analytics Tool)	A voice analytics platform that uses cognitive technology and machine learning to monitor voice interactions, producing risk scores based on speech, behavioural, and emotional tendencies.	Deloitte - AI and Risk Management
Insight-Driven Organization (IDO) Framework	A framework that integrates data analysis and reasoning into decision-making processes, enabling organisations to become insight-driven by embedding analytics into their core operations.	Deloitte - Insight-Driven Organizations
Deloitte Signal	An AI-powered tool that enhances audit risk analysis by providing real-time insights and monitoring, helping auditors identify and assess potential risks more effectively.	Deloitte - Audit Innovation
Deloitte Optix	A digital audit platform that integrates cognitive technologies and advanced data analytics, empowering auditors to uncover deeper insights and deliver high-quality audits.	Deloitte - Audit Innovation

(*Continued*)

Table 10.1: Examples of key proprietary AI tools used by Deloitet (*Continued*)

Tool Name	Tool Description	URL
Deloitte Connect	A secure online collaboration platform that streamlines the coordination of data collection, file sharing, and communication between audit teams and clients.	Deloitte - Deloitte Connect
I-count	An application that utilises automated workflows, artificial intelligence, and cognitive technologies to enhance audit processes and deliver smarter audits.	Deloitte-SmarterAudits
Omnia	A cloud-based platform enabling secure data retrieval and analysis, streamlining audit processes with automation.	Deloitte-Omnia
Omnia DNAV	A digital solution revolutionising the audit of securities and investments by combining digital technologies and AI.	Deloitte-OmniaDNAV

EY

EY has similarly invested in AI and advanced data analytics to strengthen fraud detection, audit quality, and analytical coverage. A prominent example is *EY Helix*, EY's global audit analytics platform, which embeds analytics into significant aspects of the audit. EY has also publicised *Helix GLAD (General Ledger Anomaly*

Detector) as a tool that helps to identify unusual journal entries and the Fraud Investigation and Dispute Services (FIDS) platform, which uses machine learning to detect atypical invoices that may indicate fraud or error. In addition, EY uses natural language processing (NLP) and related AI techniques in audit and forensic contexts to analyse contracts, extract relevant terms, and support the identification of risk patterns in large volumes of structured and unstructured data. *EY Atlas*, its cloud-based accounting and auditing knowledge platform, further supports audit teams by providing up-to-date technical content and research tools.

Table 10.2: Examples of key proprietary AI tools used by EY

Tool Name	Tool Description	URL
NLP Tools for Contract Analysis	Applies natural language processing to analyse contracts, enabling quick validation, data extraction, and risk identification.	EY-NLP Tools
Helix GLAD (General Ledger Anomaly Detector)	An AI tool that detects anomalies in general ledger entries, aiding auditors in identifying potential fraud or errors.	EY-HelixGLAD
FIDS (Fraud Investigation and Dispute Services)	Offers services to investigate fraud, resolve disputes, and manage regulatory challenges, focusing on maintaining organisational integrity.	EY - Forensic Integrity Services
EY Helix	A data analytics platform that processes large volumes of data to identify anomalies and trends, enhancing audit quality.	EY- Helix
EY Atlas	A cloud-based knowledge platform delivering the latest accounting and auditing content to support audit teams' observations, enhancing audit accuracy and efficiency.	EY- Atlas

Together, these technologies illustrate a human-in-the-loop model in which AI extends analytical reach while professional judgement remains central.

KPMG

KPMG has adopted a platform-based approach to artificial intelligence through *KPMG Ignite*, which it describes as an AI platform combining machine learning, deep learning, and other advanced capabilities to accelerate AI-enabled solution development. Within its broader risk and advisory offering, *Dynamic Risk Assessment (DRA)* supplements traditional risk assessment by analysing the interconnections, velocity, and potential contagion pathways of risks, thereby supporting a more holistic view of the risk environment. KPMG has also integrated AI into its broader digital and audit ecosystem, including tools such as *KPMG Clara*, its global smart audit platform. Taken together, these developments show how AI can enhance risk analysis, prioritisation, and decision support, while leaving interpretation and assurance judgements in professional hands.

Table 10.3: Examples of key proprietary AI tools used by KPMG

Tool Name	Tool Description	URL
KPMG Ignite	A comprehensive AI platform combining machine learning, deep learning, and data analytics to accelerate AI adoption and solution development.	KPMG-AIIgnite
Dynamic Risk Assessment (DRA)	Utilises advanced analytics and network theory to assess and visualise interconnected risks, enhancing risk management strategies.	KPMG - Dynamic Risk Assessment
Intelligent Underwriting Engine	An Azure-based solution that aggregates data to assess risk profiles and calculate premiums, improving underwriting processes.	KPMG - Intelligent Underwriting Engine

(*Continued*)

Table 10.3: Examples of key proprietary AI tools used by KPMG (*Continued*)

Tool Name	Tool Description	URL
Sales Intelligence Engine	Supports sales processes by providing targeting, lead generation, and personalised recommendations through AI-driven insights.	KPMG - Sales Intelligence Engine
Sales Cycle Optimization Tool	Enhances sales efficiency by analysing and optimising the sales cycle using AI and data analytics.	KPMG - Sales Intelligence Engine
Strategic Profitability Insights	Provides detailed financial analysis to identify profitability drivers and opportunities for strategic growth.	KPMG - Sales Intelligence Engine
Digital Solution Hub	A portfolio of digital solutions leveraging Microsoft's cloud to deliver AI and analytics capabilities for business transformation.	KPMG - Sales Intelligence Engine
Tax Service Solution	Automates the extraction of relevant information from tax documents, streamlining tax preparation.	KPMG - Tax Data Reader

PwC

PwC has integrated artificial intelligence into its audit and assurance methodologies to enhance anomaly detection, data coverage, and reporting efficiency. One example is *GL.ai*, developed in collaboration with *H2O.ai*, which applies AI to general ledger analysis to identify unusual transactions and patterns that may indicate potential misstatements or fraud. *Cash.ai* further automates major elements of the cash audit process, including the reading and testing of client documents such as cash balances, reconciliations, bank confirmation letters, and foreign exchange information. PwC uses *Halo*, a suite of data-auditing tools that allows auditors to analyse large or whole populations of journal

Table 10.4: Examples of key proprietary AI tools used by PwC

Tool Name	Tool Description	URL
GL.ai	An AI tool that analyses general ledger data to identify anomalies and potential risks, enhancing audit quality.	PwC-GL.ai
Cash.ai	Automates cash flow analysis by examining transactions to detect irregularities and improve financial insights.	PwC-Cash.ai
ABAC Reporting	Provides reporting tools to monitor and ensure compliance with anti-bribery and anti-corruption regulations.	PwC-Anti-Briberyand Anti-Corruption
Halo	A suite of data auditing tools that analyse entire datasets to identify trends, anomalies, and areas of risk.	PwC-GeneralLedger Audit
RPA Technology for Tax	Implements robotic process automation to handle repetitive tax processes, increasing efficiency and accuracy.	PwC-TaxRobotics
Aura	A cloud-based audit platform serving as PwC's audit ERP, facilitating the planning and execution of audits with a risk-based approach.	PwC-Aura

data to improve risk assessment and testing. Together, these tools demonstrate how AI can expand the scope and speed of audit analysis while still depending on human auditors to interpret, challenge, and validate the results.

These innovations reflect a clear trend: AI is not displacing the auditor but augmenting the profession with deeper analytics,

predictive capability, and real-time responsiveness. This model, already embraced by leading firms, exemplifies how internal audit functions can become more resilient and forward-looking in an AI-driven landscape (Hasan, 2022).

Democratising AI Capabilities in Internal Audit Practice

The consolidation of AI capabilities within a handful of well-resourced firms risks deepening inequality across the internal audit profession. To avoid a two-speed profession segmented into "AI haves and have-nots," transformative redefinition must include deliberate strategies for inclusion and equity. This could involve the development of open-access AI audit tools, supported by international bodies or academic–industry partnerships, to ensure a baseline level of technological capacity across all audit providers. Public–private collaborations could play a vital role in funding and disseminating scalable AI platforms suitable for smaller teams. Moreover, standard-setters should actively consult smaller and mid-tier firms when shaping AI-related guidelines, ensuring that implementation expectations are proportionate and context-sensitive. Finally, global guidance must emphasise ethical scalability, setting out principles and practices that apply across organisational sizes, so that integrity and professionalism are not contingent on budget. This democratisation of AI in internal audit is essential not just for fairness, but for the resilience and credibility of the profession.

Summary

As this chapter has demonstrated, internal audit stands at a vital moment in its professional evolution. The integration of AI into audit processes is no longer speculative. It is reshaping how audits are conducted, who conducts them, and what constitutes professional competence. By applying Alvesson and Deetz's critical framework, this study has surfaced the underlying assumptions of technological neutrality, exposed the ethical and procedural risks of AI dependence, and revealed the uneven distribution of AI capacity across the profession. While leading firms use proprietary tools to redefine assurance and advisory services, smaller functions face growing barriers to relevance.

To remain a credible, forward-looking profession, internal audit must undergo a transformative redefinition. This means not only updating standards and competencies, but also embedding human oversight, strategic judgement, and ethical clarity into every phase of AI integration. It also requires collective action: professional bodies, standard-setters, and educators must work towards levelling the playing field by supporting open-access tools, scalable guidance, and inclusive policymaking. If internal audit can harness AI while preserving its core principles of integrity, objectivity, and professional scepticism, it will not only survive the disruption, but it will also lead by example in shaping governance in the new world of work. Future research must continue to explore how technological change impacts audit identity, ethics, and equity, ensuring that the profession adapts with both technical agility and moral clarity.

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Chapter 11

Congregations in an Artificial Intelligence-Informed World: Preliminary Perspectives

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Abstract

The digital ministerial practices of congregations have rapidly developed over the past few years, especially because of the challenges posed by the COVID-19 pandemic. Many congregations accepted these challenges and used communication technology and social media, with valuable contributions to innovative ministerial practices. This quest is; however, recently further amplified by the rapid development and implementation of artificial intelligence (AI) in various spheres of communal life. The question has now become a reflection on how congregations are functioning in an AI-informed world. On the one hand, as a space for worshipping and faith renewal; on the other hand, as a workplace that cannot be ignorant of the emerging AI-informed world. Comparing the perspectives of leading inter-disciplinary theorists with insights from an empirical enquiry, possible modalities for the interaction of faith communities with an AI-informed world are identified. Sprouting from these perspectives, the contribution reflects on the future

development and interaction between congregational culture and an AI-informed world, providing critical evaluative thoughts on some concrete examples from current ministerial practices.

Congregations as part of the changing world of work

Congregations[1] have a unique space within the world of work: they are organisations with employees, budgets, strategic plans, and must adhere to legal requirements, as with any other organisation. At the same time, their core business is based on the *ministry* and *related services*. People, also those employed in other organisations, are influenced by the ministries, and are using congregational services offered as part of the congregation's core business. Although ministries and related services are rendered to the employees in their private capacity or space, religious orientations and convictions influence workplaces. The role of workplace spirituality is but one example thereof. Workplace spirituality engenders spiritual growth and development of employees, which creates purpose, meaning, and community within the organisational context (Lategan & Kokt, 2022). Another special characteristic of congregations is that their character derives from Scripture, of which Ephesians 2:19-22 is well-known. In this text, the congregation is called the "household of God", meaning to be part of God (Greever, 2016). In addition, 1 Timothy 3:4-5 refers to managing the household of God. Oosthuizen and Lategan (2015) argue that managing the household of God lies in the morphological meaning of the word οἰκονόμος (*oikonomos*), which has a *practical* as well as *spiritual meaning*.

In the context of the world of work, the congregation cannot escape new developments. One such development is the influence of AI on the world of work. Reports from Forbes, SAGE, OECD, and the WHO confirm the major influence of artificial intelligence (AI) on the workplace (see Chapter 1). This influence refers to the local church or faith community and raises the question related to the

[1] Congregation refers to the local church or faith community. The research aims to trace and describe the potential impact of the reality of an AI-informed world on the functioning of the local congregation and her members. For this reason, the congregation rather than the church is used in the text.

impact of AI on the functioning, ministries and services of the congregation. The research aims to trace and describe the potential impact of the reality of an AI-informed world on the functioning of the local congregation and its members. Several questions inform the chapter's aim. How will the congregation guide its members in a way that is relevant to their world of work? What is the contribution of the congregation to the broader discussion on AI and the workplace? What is the preparedness of future pastors for an AI-based and informed world? How will AI influence the congregation as a workplace, considering its unique features?

One question asked in a recent discussion on human behaviour within AI draws our attention. Stratton (2025) poses the question of how humans will respond when AI reaches "singularity," a point where it surpasses its original programming and becomes uncontrollable. This situation presents a conflict between robots and humans, which raises challenges in areas such as creation theology, ethics, morality, and the responsibility that we have for one another as a fundamental aspect of congregational life.

An examination of the theology and religion curriculum at public universities in South Africa indicates that management, particularly the role of technology within management, is largely absent from the coursework. As a result, future pastors may not be adequately prepared or equipped for their future workplaces. To identify the role of congregations in an AI-based and informed workplace and to understand the training needs of future pastors, a closer look at congregations as workplaces is warranted.

To do so, we need to consider at least the following concepts:

- **Fourth Industrial Revolution** (or Industry 4.0) embodies interconnected technologies and smart devices. Machines are now performing human tasks.
- **Fifth Industrial Revolution** (or Industry 5.0). Humans and machines should jointly interact in activities, requiring the integration of human and technological strengths. In this integration, abilities for well-being are important. Industry 5.0 is a more collaborative approach than Industry 4.0.
- **Digitisation and digitalisation:** Although often used inter-changeably, there is a huge difference. Digitisation refers to

the process of taking *physical* or *hard copy* information to *digital* information. Digitalisation embodies improving business competitiveness and electronic communication.

- **Artificial intelligence (AI):** It creates information and knowledge based on existing information and knowledge. AI can further be grouped into categories such as *Weak AI* and *Strong AI*. Weak AI is associated with less complex tasks such as face recognition, access to bank cards, buildings and basic concept generation on what something means. Strong AI is a more complex activity, such as the analysis of big data sets, future forecasting and predictions and the writing of theories and algorithms.
- **Generative AI (GenAI)** refers to the creation of new content based on learned patterns from existing data.

In this chapter, the focus will be on AI and the congregation (as a specific formation of the congregation) on four levels, namely, (a) the congregation as workplace (organisation) responding to and making use of AI; (b) the influence of AI and the congregations' ministry and services, (c) guidance to its members participating within the broader context of the world of work and (d) contribution to the general discussion on AI and its implications.

This chapter is informed by perspectives from the literature and empirical data from a qualitative enquiry, providing an initial description and exploration of the role that AI is or might be playing at the congregational level (cf. section below).

Congregation and artificial intelligence – perspectives from literature and experience

The relationship(s) between artificial intelligence and congregations – Perspectives from both the literature and conversations with congregations

The research contribution in this chapter indicates that, when one explores the concept "world of work" concerning congregations, it should be understood on different levels. As mentioned earlier in this chapter, the three levels on which the congregation's identity is played out within a work environment are described as follows:

First, general administration and management within the congregation, including office administration, financial management, and strategic decision-making.

Secondly, the broad range of ministries of the congregation includes practices such as public worship and pastoral activities in caring for members.

Thirdly, the embodiment of so-called lived religion as an expression of the daily life of members, which conveys an embodied spirituality every day.

As part of the broader research project on AI and the world of work, the chapter provides perspectives on the nature of the relationship between AI and congregations and how AI impacts the functioning of the three levels that describe congregations. The description is based on rubrics in which a distinction is made between using digitalisation and AI within the context of a congregation. In addition, the chapter provides perspectives concerning the possible multidimensional nature and use of AI. These perspectives are supported by viewpoints from both literature and exploratory conversations with some congregations.

Distinction between digitalisation and artificial intelligence in congregations

When discussing the relationship between AI and congregations, it is important to distinguish between digitalisation and AI. Although both concepts convey a strong association with the origin and development of the Internet and the movement between the Third, Fourth and Fifth Industrial Revolutions, there are also obvious differences. The distinction between the concepts of digitalisation and artificial intelligence, as well as their function within the context of congregations, is important for the research project. Consequently, with the support of literature, the chapter explores these two concepts. In addition, and arising from the exploratory conversations with congregations, the chapter presents perspectives about how these concepts function in congregations at present, facilitating the movement between religion in an offline and online networked society (Campbell, 2012:64).

As indicated earlier in the chapter and arising from the development associated with the Third to the Fifth Industrial

Revolutions, digitalisation is understood as the automation of specific practices using digital technologies. Digitalisation is the process whereby analogue information or processes are turned into digital formats. This means that physical data (such as paper documents) and manual data (such as bookkeeping) are available and executable electronically. Fourie (2020:12) emphasises that: "The exponential growth in the Fourth Industrial Revolution is characterised by the tight and intelligent integration of different technologies, seamlessly combining the spheres of the digital, physical and biological... with a significant social and economic impact." Based on the exploration of conversations with congregations, the use of Whats App groups to, for instance, communicate information within the context of a congregation is a good example of digitalisation.

Communication to congregations occurs digitally by using, amongst others, digital congregation applications (apps), WhatsApp messages, e-mails, and various other social media platforms. Communication includes not only administrative aspects but also worship services for different languages and daily contemplations. This considerably expands the scope of the ministry. On a practical level, digital communication entails minimal printing work, thus a cost-saving process.

As further development and expression of the Fourth and even the Fifth Industrial Revolutions, AI is broadly introduced as the development of computer systems based on the use of large data models that can perform tasks which are normally associated with human intelligence. In support, Lennox (2024:6) provides the following explanation of artificial intelligence: An AI system is a machine-based technology that can impact its environment by generating outputs such as predictions, recommendations, or decisions based on a specific set of inputs. It utilises both machine-generated and human-provided data to (i) perceive real and/or virtual environments; (ii) abstract these perceptions into models through automated methods, such as machine learning, or through manual analysis; and (iii) use model inference to generate various potential outcomes. AI systems are designed to operate with varying degrees of autonomy.

It is clear from the empirical responses of the congregations that they hesitate about the true application of AI in, for example,

preparing worship services or preaching. They all agree that, for various reasons, it would not be theologically and ethically accountable to simply state that artificial designs are responsible for a worship service liturgy or create a sermon. It would be more feasible, accountable, and constructive to indicate how specific AI applications can make a positive contribution to preparing a liturgy or sermon. Congregations name different existing and practical examples of applications that already fulfil this role.

Examples of existing AI that are used in developing liturgies and sermons range from exegetic to structural or formulation aspects.

Multidimensional use of artificial intelligence in congregations

The use of the concept of artificial intelligence requires one to consider and formulate its identity, character, and function in a nuanced manner. AI elicits various reactions in people. The popular historian Harari (2024:399) has indicated that "[T]the invention of AI is potentially more momentous than the invention of the telegraph, the printing press or even writing because AI is the first technology that is capable of making decisions and generating ideas by itself". Recently, the media reported broadly on the potential dangers of AI worldwide (Vallance, 2023). On the other hand, various publication's view AI in a balanced way as a reality and positive development that can unlock new significance and possibilities (Campbell & Cheong, 2023; Lennox, 2024).

To differentiate between the various opinions on the use of AI, it is important to distinguish between so-called "strong" and "weak" artificial intelligence (Lennox 2024:9). "Strong" artificial intelligence presumes, amongst others, that the most comprehensive systems in which human decision-making and functioning are replaced with expressions of AI. A good example of a strong AI is the potential care of persons with Alzheimer's disease using a "robot carer" supported by AI. The development and use of chatbots to support the pastoral care of members is another modus that can exemplify the use of so-called "strong" AI in congregations. These extreme possibilities of the use of AI call for further exploration and nuanced use of the concept

of AI. On the other hand, in "weak" AI, aspects of AI are used to supplement human decision-making and practices. An example of this is the general and popular use of the AI platform ChatGPT (2025) in generating text descriptions.

The exploratory conversations with congregations indicate that AI should be used in an exploratory and differentiated way within the context of congregations in support of mainly administrative tasks. It was, indeed, obvious from the conversations with congregations and substantiated from literature that, irrespective of the relation with AI, all individuals, knowingly or unknowingly, are part of the AI ecosystem, with, amongst others, the daily use of cellular phones and facial recognition technologies that are used as part of individual access control.

In the discussion with the congregations, they were positive regarding the role of so-called "weak" artificial applications in facilitating decision-making processes by the leadership of congregations. Two aspects are emphasised. First, the usage of AI applications makes multidimensional levels of information available, and the professional analysis thereof is reasonably possible. Secondly, it benefits leadership structures within congregations to have real-time information available. This facilitates various potential alternative models of decision-making. AI applications contribute considerably to the creation of informed and professional decision-making practices within congregations.

Summative perspectives from literature and conversations with congregations

AI is already present on various levels in the existence and functioning of congregations. The use of AI is still, in many respects, of an exploratory and experimental nature. When describing the relationship between AI and congregations, it seems important to formulate the identity, nature, and function of AI in a nuanced manner. In re-reading the literature and in conversations with members of the congregations, it appears, amongst others, that there is a need for sensitivity about how, for example, AI is often referred to by simply using the concept, as if it concerns only one agent. AI is a collective noun for a variety of

applications, with various characteristics and outcomes. It should, accordingly, be referred to as such.

The congregational digitalisation and artificial intelligence – An empirical exploration

This section focuses on an empirical perspective on the role of AI in congregational ministry. Empirical information from congregations of the Dutch Reformed Church (DRC) will be used as a case study. The DRC is mainly an Afrikaans-speaking mainline church in South Africa with about 1,050 congregations and a membership of about 850,000. This case study is only an example and should not be generalised to all congregations of different denominations in South Africa.

The difference between digitalisation and AI is explained above. DRC congregations, to a very large extent, are functioning with a digital environment and use it within the ministry, to name just a few examples:

- Congregations have their membership (92.2%) and accounting system computerised (96.0%), and receive their offerings electronically (93.5%).
- SMS and WhatsApp (88.2%) are the preferred ways of communicating with the members.
- The online ministry of the congregation is limited to meetings (49.5.%).
- Less than half of the congregations are uploading their worship services on the Internet (47.9%)

According to the quantitative empirical data, the indication is that for administrative and meeting purposes, technology is used in the congregations. The Internet and social media are used to upload general information and information regarding worship services. The challenge would be to move to a more relational community utilising digital technology as an opportunity to create a space for conversation and care online (Campbell, 2020:52).

Digitalisation is used within the congregation as a workplace, but AI is also impacting the congregational ministry, and the next question would be to explore the role of AI. A quantitative methodology (Delphi survey) was used to ask about

the impact of AI on the congregation. A Delphi survey is in "... its most basic form, a Delphi procedure involves instructing a group of individuals to respond anonymously to a sequence of questions about a single quantitative estimate, such as the probability of an event occurring or the timing of when it will occur. A facilitator then combines, or aggregates, the responses into a statistical summary of the group response (e.g. median), sometimes along with the reasons given for the responses" (Belton *et al.*, 2019:72). The Delphi method seeks to portray a social phenomenon based on the description of experts by seeking consensus amonst the experts (Fink-Hafner *et al.*, 2019:1). A definition: "... Delphi is a vehicle and a method for informed consensus-building within a group for a complex problem by using a series of questionnaires delivered in multiple iterations to collect data from a panel of selected participants" (Fink-Hafner *et al.*, 2019:2).

The Delphi process is in the hands of the researchers, who design and implement it (Fink-Hafner *et al.*, 2019:3). The researchers decided to use three rounds in building a consensus view concerning the use of AI in the congregational ministry. The researchers are aware that the opinion of the participants may change because of the controlled feedback that they receive. When the feedback indicates strong agreement between the participants, the opinion shifts towards the majority opinion; when the feedback indicates strong opinion, opinions might change in a way that hinders consensus. "This finding highlights the importance of looking at the consensus-building process across Delphi rounds to ensure that the decisions made are valid and reliable" (Barrios *et al.*, 2021:8). This should be kept in mind when the reflection is made regarding the response of Round 3.

It is also important to note the strengths and weaknesses of the Delphi method:

- Some of the *strengths* of Delphi include avoiding confrontations of the experts; linking together existing knowledge and areas of agreement / disagreement; it doesn't demand face-to-face meetings, reflection on the controlled feedback enriches the descriptions and allows the correction of misconceptions (Fink-Hafner *et al.*, 2019:4-6).

- Some of the *weaknesses* of Delphi: lack of guidance and agreed standards, less ownership of ideas, difficulty of generalising to a wider population because of the selection of experts, a potential weakness is the discretion given to the researchers in applying the method, and the expert responses may not be truly independent (Fink-Hafner *et al.*, 2019:6-7).

The methodology that was used in this Delphi study needs to be described. The Delphi research focus is to enquire about the meaning and utility of AI in the congregational ministry. The leadership of three macro-DRC congregations, through purposeful sampling, were asked to participate in the Delphi survey. All three congregations are situated in an urban area in different regional synods of the DRC. They have a membership of more than 2,500 and a leadership team of more than five members.

The Delphi consisted of three rounds. The three leadership teams agreed to be part of the survey. Rounds 1 and 2 consisted of questions sent to them via email. Round 1 asked about the role of digitalisation and AI in the congregational ministry. The responses were summarised by the researcher, and a second set of questions was sent to the leadership for their response. All the responses of Rounds 1 and 2 were compiled in a single document. An inductive analysis was conducted by using Atlas.ti, and a few themes were identified. The three most prominent themes were discussed with the leadership teams in an in-person group discussion. Each leadership team was asked to reflect and present their consensus regarding the role of AI in the congregational ministry within the framework of the identified themes.

The following three themes, with references from the Delphi reports, were identified after the first two rounds:

Communication

- Communication includes not only administrative aspects but also worship services for users of different languages and daily contemplations. This considerably expands the scope of the ministry.
- Worship service – "Streaming" of worship services reaches many more people.

- General communication – The congregation app is now the primary source of communication in the congregation.
- Examples in the congregation are the personalisation of messages: AI can analyse the interests and needs of members and send specific content to them.
- Another function of AI is translation. AI can quickly translate messages or sermons in various languages for diverse congregations.

Ethics

- It would be more feasible, accountable, and constructive to indicate how specific AI applications can make a positive contribution to preparing a liturgy or sermon.
- Congregations can create space for ethical discussions on AI, based on biblical values such as justice, love, and truth.
- AI can improve transparency by holding people responsible, such as, honest reporting of finances or job monitoring.

Worship service

- Congregations agree that the digitalisation of the worship service is, on various levels, responsible for the growth of different aspects of congregational ministry.
- The minister must always take full ownership of the entire worship service. The message must first dwell and live in his or her heart. Therefore, AI must always play a supportive role.
- This should be managed and negotiated so that spiritual inspiration and aspects of creativity still fulfil the primary role of creating liturgies and sermons, amongst others.

The leadership was asked, as part of the third round, to critically reflect on the three themes with references from the Delphi reports:

Communication

- The use of AI may hinder authenticity (negative aspect). Not about generalisations.
- Assist in the translation of complicated material, e.g. video clips. Important question of contextualisation. It may become more impersonal.

- AI may enhance critical communication. Is this the correct information?
- Are automated messages good?
- AI is a tool and not a source.

Ethics

- Assist the membership to be ethical in their behaviour
- Look for alternatives, don't believe only what you see for the first time.
- Danger of the development of a meta-identity.
- AI cannot possibly accommodate emotional interaction.
- Transparency – Is it you? Need good discernment.
- The negative influence of algorithms.
- Assist in the formation of opinions and thought patterns.

Worship service

- Fast access to stories and examples, research tool.
- Assist with structuring.
- Creative opportunities for youth sermons.

The quantitative and qualitative data underline the impact of digitalisation and AI on the congregation. In the development of digital ecclesiology, it is important to "... fully recognise and appreciate the potential of a church that is both online and offline, we must stop viewing the digital or hybrid church as antithetical to the idea of being the 'Church'" (Campbell & Dyer 2022). The relationship between a congregation and the digital could be viewed in different ways. Campbell and Dyer (2022) identify three options:

- *Bridging* means that online and offline are different contexts or spheres, and they engage from time to time. This implies that they interact at some point and aim to build new practices.
- *Blending* will lead to the opportunity to build new expressions of the congregation. The online community may be expanded by experimenting with group meetings on social platforms. A hybrid strategy may be followed with online and offline interactions.

- *Merging* would refer to a fully integrated worship experience and being part of a faith community. This could lead to a new spiritual journey through digital connectivity, and this "experimentation will push our definitions of what it means to be church by moving beyond a space or event-centred model of church to imagine new relational understandings of being the people of God together in this moment."

Artificial intelligence and its use by the leadership of congregations

Perspectives from the literature and insights from the presentation of qualitative empirical findings suggest that AI offers several advantages in areas such as communication, engagement, and ministry tasks. The discussions, observations, and interpretations conclude that AI should be used ethically, with clear intentions. It is important to recognise that AI should support human activities rather than serving as a replacement for human abilities; it should complement them. Additionally, a key observation is that AI can never replace the core values of ministry.

It would, therefore, be irresponsible for congregations to advise or preach against using AI. Instead, a leaf should be taken from the Industry 5.0 approach, namely, that humanity should find its meaningful role within an AI-based and informed world of work. At the very same time, a congregation should emphasise AI within the human world, instead of humans in the world of AI. This calls for new approaches in the administration of congregations, their ministries, the calling that humans have in the world of work, guidance on the role of humans in a technological world, ethical behaviour and responsibility towards any new development. By implication, pastoral consideration, workplace habits, and social responsibility should be addressed by congregations.

Another important observation from the research results is that whilst congregations seem to be familiar with digitisation, digitalisation should be more optimised. From a workplace perspective, is it unthinkable that congregations in the context of the 21st century world of work are still functioning within the limitations of yesterday's office practices?

Orientation to the discussion

In the exploratory conversations with the congregations, it appeared that, although ministers still have an important guiding role, leadership teams that represent members of the congregations are responsible for considering, implementing, and using potential AI strategies. The minister is, therefore, not the only one who should solely guide and decide on using possible AI platforms.

Perspectives for existing and developing practices

Arising from conversations with the various leadership teams of the congregations and further informed by insights from literature, the following perspectives seemed important for the leadership in congregations when considering and establishing best practices for using artificial intelligence within the context of the congregation.

Firstly, fostering and facilitating in-depth conversations on technology: Ongoing conversations concerning the developing nature of technology are an important orientation to using AI (Hamman, 2022). Such conversations should explore the broader background of the various industrial and technological revolutions (Campbell & Cheong, 2023). Participants should be introduced to the background of a critical evaluation of the philosophical-theoretical origin of AI and, amongst others, the difference between AI and digitalisation.

Secondly, for possible use of AI, it is important to explore the scope of the concept in full, to confirm the already existing use thereof, and to explore future possibilities (Lennox, 2024). In this regard, the consultation with and the participation of specialists in these exploratory discussions are of extreme importance.

Thirdly, it is strongly recommended that an AI policy be implemented to explore its possible uses in the congregation. It stands to reason that the congregation leadership must take the initiative herein. Moore (2024: n.p.), therefore, rightfully indicates that, because we already find ourselves in an AI-informed world, every congregation needs to have a policy document guiding its use of AI-informed ministerial practices.

Future perspectives – theology training and the exploration of artificial intelligence

In providing possible future perspectives regarding AI training to consider for theological training, the feedback of ministers from the participating congregations was considered. The participants agreed that AI platforms can support the minister in their ministry. It is important to distinguish between the different tasks of the minister in determining the contributions of AI-associated applications. Without fear of contradiction, the contribution of AI applications to administrative and management functions is generally desirable and acceptable. In other functions, such as, for example, preaching, can also play a supportive and contributory role in the analysis of information and sources.

However, this should be managed and negotiated so that spiritual inspiration and aspects of creativity still fulfil the primary role of creating liturgies and sermons, amongst others. Regarding theological training, the theme of AI should, in all its aspects, form part of the development of the theology curriculum. In exploring different aspects of AI, students should be exposed in such a way as to discern the possible use of AI. In cultivating this, both the advantages and disadvantages of AI must be explored. For example, in exploring and identifying the preconceptions inherent in the creation of the algorithms of AI, together with a sensitivity for possibly creating manipulated realities, an ethical consciousness can be cultivated for the use of AI.

Hamman (2022: n.p.) has already extensively described ethical and pastoral considerations in discerning the dynamics of functions of so-called biases within AI systems. As an example of this sensitivity for biases operating in AI, the phenomenon of speed can be indicated. A bias of speed is created in the idea to equate progress and to cut down on time. A pastoral virtue would then be to create insight into this characteristic in developing and fostering the pastoral virtue of patience to develop the ability to timely consider every situation, while acknowledging the demands of reality.

Perspectives for developing practices

The research project and contribution confirm the reality of AI. This is also part of congregational practice within different fields and with different forms. This recognition facilitates a nuanced understanding of AI to confirm its advantages and disadvantages. The justified and sustainable nature of AI recognises its evolutionary and developing nature. The following markers are provided to negotiate the further use of AI within the context of congregations.

Best practices for developing practices

Tapping into the experience of discussion partners coming from the participating congregations, emphasis was placed on the theological guidance required, encouraging members to consider what it means to be created in God's image, even in a world where AI is playing an increasingly greater role. Congregations have a key role to play in equipping members to address the challenges of AI from a perspective of faith, and to build a just and compassionate society in which technology plays a serving role rather than controlling human lives. The following important aspects from the interaction with congregations and literature were identified:

Firstly, the drafting of policy: The exploratory conversations with congregations seemed to indicate that the formulation and implementation of a policy / framework / guidelines for the use of AI are essential for good congregation practice. In communicating such a policy, guidelines are provided to both the congregation management and the members for an accountable and ethical use of AI within all the fields of congregational functioning, as noted earlier in the contribution (Moore 2024: n.p.).

Secondly, the establishment of think tanks: In developing AI in the congregation, think tanks and workshops involving as many members as possible are essential. Specialists in the congregation should facilitate such workshops. The latter should benefit all members, for example, by being exposed to existing artificial intelligence practices. In the workshops held with the participating congregations, it was obvious how various specialists who demonstrated their expertise empowered other participants to develop their practices.

Thirdly, the facilitation of differentiation: The literature and the participants agree that differentiation in the use of AI is important. On the one hand, it can make a positive contribution to a variety of congregational practices. On the other hand, it is also important that AI does not become such an important role player that it replaces other aspects. For example, although AI can make a definite contribution to the development of a worship service (Roso, 2023:3-10), it may never replace the key significance of the worship service. The recognition of the personal and relationship-driven aspect in the management of AI facilitates this differentiation.

"Up close and personal" – Personal and relationship-driven aspects

In facilitating the use of artificial intelligence within the context of a congregation, both the literature and exploratory conversations with congregations confirm that the focus on the human character, especially as expressed in personal relationships, is non-negotiable. The personal and truly human relationship should be the hinge that facilitates the functionality of AI within congregations. In the consultation with the congregations, this important aspect was also confirmed by the participants, indicating that AI must not replace people. The congregations' initiative strengthens relationships and emphasises the value of personal interaction. Members can be encouraged to use technology in a balanced manner.

Relevance for the new world of work

Acemoglu and Johnson (2023) comment that there are inherently two pathways for AI. The first is the *automation path,* with the belief that AI can perform at least the same task as humans, or even better. The second is to find a *new space for humans*' tasks and abilities. According to them, AI has the potential to significantly enhance opportunities for positive human-complementary change. For this to happen, there are at least three requirements. First, management should recognise that workers are a vital resource. Their productivity must be enhanced, access to information should be improved, and training should be

prioritised. Second, the focus should be on supporting workers rather than solely emphasising automation and surveillance tools. Third, workers should have a say in how technology is implemented. These accomplishments may not come easily, but they can. To realise this, congregations have a meaningful input to the AI-based and informed based on the congregations' unique characteristics. Three voices echo into what congregations should focus on.

During its General Synod in 2024, the Church of England publicly affirmed the place of work as a key component in "human flourishing" in an AI-driven work environment. In the public affirmation, two noteworthy comments are that work is closely related to human dignity and purpose, and that work is more than a tool or a way to earn a living. Another important comment was that the theological value of work should be interpreted anew in the public space. This announcement reflects on the importance of ethics in AI, the need to avoid exploiting poor people, and the devaluation of humanity.

Henley (2023) argues that congregations can play a meaningful role in equipping congregation members to participate in the world of work. A starting point for congregations is to maintain the link between spiritual values and technological complexity. For him, the transcendent and the immanent must be seen as a linkage, not as two separate and competing dimensions. Wisdom has been a virtue forever. Yet in the cyber-dominated world, wisdom has been replaced by data. The enormity of data generation and the speed at which it comes will impact decision-making. Congregations can be reminded of how important it is to reflect on what they are doing – personally and in the workplace. The central role of people in decision-making cannot be overridden: "People do more than process information; they link data with personal experience, taking information to a depth, machines cannot replicate" (Henley, 2023: n.p.)

Decisions require reason. Henley refers to the Hebrew word "*chokmah*", translated in the Old Testament as wisdom. Wisdom encompasses the knowledge gained from a wide variety of human experiences. In classical Greek, the word "*sophia*" translates to wisdom, which embodies the concept of good judgement that

allows individuals to manage their circumstances effectively. AI cannot contribute to wisdom in decision-making. What should be avoided, is that people are subjected to machines. This will embody a new form of slavery, which contradicts what humans are about. Apart from the importance of humans in decision-making, work as a calling should not be neglected either. There is another side that should also be prevented, and that is where humans see themselves as creators of a new universe and that they alone will be the lawgivers of this universe. Congregations should also avoid the perception of unlimited progress, which is not without consequences. The bottom line is that people are created in the image of their Creator. When everything is left to machines, they (the machines) become the new *imago hominis* (image of man) and are now the masters of the workplace.

Privara (2020) comments on the impact of AI on employment and equality. The world of work is changing because of robotisation and automation (one specific application of AI). This change will result in the loss of jobs, the way in which people work, the meaning, social and financial benefits of work. If machines and automation are becoming the new workforce, it can create an imbalance of power and wealth. This will be at odds with religion's view on equality. Apart from this, AI also poses challenges. The result is that an ever-growing small group of people will dominate the workplace, which will harm human dignity. No society needs domination or to be excluded. Although AI, like any other new technological development and revolution before it, holds tremendous advantages. Congregations should guard against a new humanity dominated by technology or a humanity subjected to technology.

This has implications not only for the workplace in general, but also for the core business of a congregation. Moreover, congregations should equip individuals to protect against ongoing threats to privacy and human dignity, job losses, and stagnant wages, which are often viewed as a necessary "price" for "progress." Equally important is for congregations not to resist any new development. Privara (2020) argues that the issue lies not with the technology, which is "value-neutral," but with the politics and policies associated with this technology. People should be guided to understand their role in societal development.

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Chapter 12

Ethics for an AI-Based and Informed World of Work

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Abstract

Artificial intelligence (AI) has overwhelmingly changed the world of work and will continue to impact work processes. With pervasive implementation of AI technology to automate tasks, assess organisational risks, extrapolate scenarios and initiate conative behaviour, the need has arisen to comprehend the ethical concerns around AI usage in the organisational context. Ethical dilemmas, inter alia, safety, privacy, data protection, freedom, autonomy, human dignity, fairness and justice, as well as accountability, to name a few, are being questioned because AI systems have

emphasised the need for ethical guidelines. Ethics in the new world of work in the dawn of digitisation, requires a principlist and explicability approach to ethics, contributing to AI ethics as a topic of interest. To address the plethora of ethical anomalies, work and professional codes should be taken into consideration, as the individual is first responsible for ethics in the work context. Besides personal responsibility, sustainable and strong institutions are prerequisites to championing AI ethics. Therefore, institutions should recognise and understand how AI impacts and could transform all aspects of the organisation and be intentional in their responses, practices and strategies to address such ethical concerns effectively in an open, transparent and responsible manner. To this end, institutions should develop or adopt a proactive ethical governance framework that ensures that AI in organisations aligns with human-centric values, maintains and fosters employee trust and wellness and adheres to regulatory standards.

An overview of the AI workspace

Against the background of the book, entitled *The Influence of Artificial Intelligence (AI) on the World of Work*, three observations confirm the need for ethics in the AI workspace. The *first* observation emphasises the morality, work and professional ethics of people contributing to the development of AI digital technologies and devices. This is well phrased by Walsh (2022), asking the question of whether machines and robots can behave responsibly. After all, these devices are created by humans. Hence, the question arises as to the ethical framework of AI digital technologies and devices. A second observation is how the (potential) morality of AI tools will be accepted and evaluated. Johansen (2024) reports on an Australian study emphasising whether it is acceptable for robots to represent untruths. Surprisingly, forecasting depends on the value system of the developers.

A third observation goes to the heart of responsible citizenship, or better phrased, "responsible AI citizenship", namely, the social contract in which individuals commit to improving life and living in society. This can be linked to the universally accepted United Nations Bill of Rights (1948). A report from Stellenbosch University's Innovation Policy Labs (2025) discusses two important aspects that can benefit society. Firstly, responsible AI emphasises the need for policies, governance structures, and processes to ensure

that AI is developed and used ethically. Secondly, transformative policymaking aims to revolutionise the design and implementation of policies. While the capabilities of AI cannot be ignored, these capabilities must be utilised ethically for the benefit of society.

Furthermore, a new world of work driven by and based on AI demands an innovative orientation to what kind of work and professional ethics are prerequisites to meet the demands of AI in the workplace. As AI technologies become prevalent, the question emphasising ethical decision-making has emerged as a topical area of interest (Yu *et al.,* 2018). *Work ethics* is customarily associated with the *individual's* value-based orientation towards the world of work, whereas *professional ethics* is defined as the values required by the *working environment* to be ethical, namely, integrity, objectivity, confidentiality, competence, and behaviour. A basic understanding of relevant ethics concepts is the first step towards shaping the ethical orientation required for an AI-based and driven workplace.

Relevant ethical concepts for the workplace

Ethics is generally known as the choice between *right* and *wrong*, *good* and *bad*. Ethics is also choosing between *two rights* (known as conflict of interest, borderline situations, or compromise). Ethics differs from morality, which refers to a personal orientation towards right and wrong. Ethics is neither law nor religion, although law and religion influence ethical views. It is generally accepted that the first dictum of ethics is "no harm" (after Hippocrates, the "father" of medicine). Although aimed at bioethics, Beauchamp and Childress' advocacy of respect for *autonomy, non-maleficence, beneficence, and justice* can be regarded as the backbone of all ethics (Rawbone, 2015) and deemed a **principlist** approach to ethics (Allhoff, 2011).

In addition to the principlist approach, a fifth principle, **explicability,** is recommended for the new world of digital technologies such as AI (Coghlan *et al.,* 2023). According to Coghlan *et al.,* (2023), explicability consists of two sub-principles, namely *transparency* and *accountability*. Transparency in AI usage involves helping users to understand how intelligent digital technologies function, while accountability defines who is ethically and legally responsible for any negative outcomes resulting from the use thereof.

A valuable development within ethics is applied ethics. Here, ethical principles are applied to real-life problems. The success of

ethics relies on strong ethical principles and guidelines (viz., policy) and applications. The latter often becomes more challenging. Few individuals feel, or will admit, that unethical decisions have been made or that unethical actions have been taken. The individuals mentioned believe that the actions taken are fair and justified, based on internalised moral compasses, beliefs and values. *In this chapter, it is proposed that both normative and applied ethics be followed in the discussion.* For the sake of clarity, normative ethics is a philosophical discipline emphasising how an individual should behave towards others (Cointé *et al.*, 2016). However, Allhoff (2011) explains that applied ethics theoretically consists of professional and environmental ethics and should be judged on a case-by-case basis or applied to a particular case (viz., case judgements). These two perspectives can deepen the discussions, as normative ethics asks what makes an action right or wrong, whilst applied ethics asks whether an action or activity presents norms and values.

What should always be remembered is that ethics is never context-free. Similarly, "total" objectivity is never possible, as individuals are influenced by internalised frames of reference, inter alia, world and life views, culture, personal orientation and identity. Values are phrased and influenced by an individual's orientations, experiences and expectations.

The rationale for understanding ethics for an AI-based and informed world of work is guided by the emphasis on the attainment of the Sustainable Development Goals (SDGs). To this end, various professions have codes of professional conduct that focus on professional behaviour in the workplace. Work and professional ethics should contribute to SDG 16, which focuses on peace, justice, and strong institutions. In addition to that, SDG 8 emphasises decent work and economic growth, which is a cornerstone, considering that AI is implemented in the work context and should, therefore, contribute to decent work. These basic ethical concepts for the AI workplace will assist in identifying ethical challenges in the workplace.

Ethical challenges in a changing work environment

Poisat *et al.*, (2024) note that there are noteworthy fluctuations in terms of the world of work ascribed to technological advancements. Technological advancements such as AI are often aimed at

increasing productivity and system efficiencies. For the sake of clarity, AI can be defined as systems designed to interpret environmental cues and, based on these inputs, continue to address problems, assess risks, extrapolate predictions and initiate action (Shaw, 2019). Per se, AI could automate tasks, analyse vast data sets, make predictive decisions and communicate with humans. AI technologies subsume, for example, machine learning, language processing, and computer vision, which have brought about significant development and cost reduction (Huang *et al.,* 2023).

The challenge is whether the application of automation assists in achieving the desired results, and who is accountable if the AI intervention fails or causes harm. With "intelligence" now offered as a service, the use of AI in changing work environments has great potential for both risks and benefits. Understanding the risks and potential pitfalls is key to ensuring the appropriate use of AI. Consequently, Shaw (2019:2) expounds that the fundamental concern with AI technologies is that carefully designed algorithms make decisions on environmental inputs derived from a "flawed, imperfect, unpredictable, and idiosyncratic" reality. Additionally, AI technologies can be used to harm others (Huang *et al.,* 2023) and cause significant organisational damage, for example, cyberattacks. As a result, it has been proposed that a determining factor guiding the extent to which autonomous systems are permitted to interact with humans subsumes ethics (Yu *et al.,* 2018).

Nonetheless, an all-encompassing ethical predicament is that the rapid pace of technological change and adoption often outpaces the development of skills, ethical guidelines and regulatory frameworks to ensure the appropriate use of these technologies. Rodriquez-Bustelo *et al.*, (2020) expound that a major concern is the potential mismatch between available and required skills for the workforce of the future. Considering ethical dilemmas, the following are noted; namely, failure, fairness, bias, privacy, and other ethical AI anomalies (Yampolskiy, 2019). Huang *et al.,* (2023) put forward a conceptual framework emphasising a systems approach to AI ethical challenges, emphasising the micro-, macro- and meso-levels of complexity (see Figure 12.1).

In accordance with the model presented, aspects that are vital in the context of the new world of work subsume micro-level

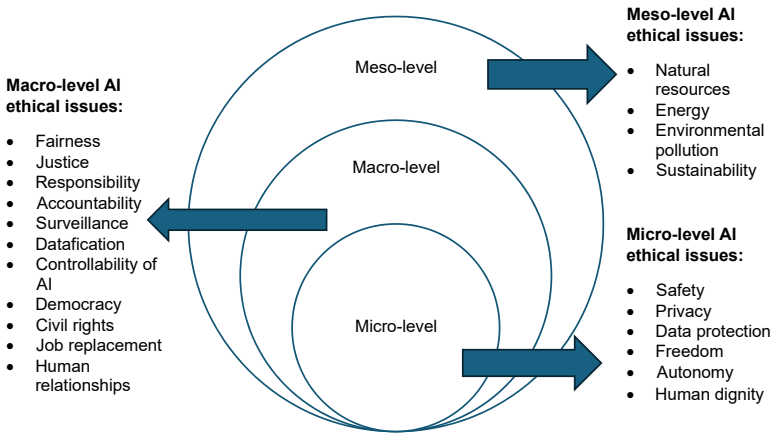


Figure 12.1: Micro-, macro- and meso-levels of complexity
Source: Huang *et al.*, (2023:803)

ethical concerns. Micro-level ethical concerns include individual safety, privacy, data protection, especially personal data, freedom, autonomy and human dignity. Moreover, job replacement and human relationships should be considered, bearing in mind the new world of work. Elaborating on the aforementioned, Leslie (2019) explains that potential ethical risks ascribed to AI usage include, for example, bias and discrimination, perpetuating the preconceptions and biases of the AI system developers. Furthermore, AI systems complicate the designation of responsibility and accountability, especially when outcomes are algorithmically generated (Leslie, 2019). Non-transparent, unexplained or unjustifiable outcomes could also be problematic because the human agent cannot comprehend the decision-making process.

Privacy threats are posed by AI systems because of the development and implementation thereof (Leslie, 2019). For example, cloud-based storage or using platforms in the organisation which are open to the public and can be accessed by various agents outside of the organisation. Irresponsible data management, poor design and questionable implementation can result in unreliable, unsafe outcomes that have been compromised in terms of quality (Leslie, 2019). Lastly, isolation and disintegration of human-to-human interaction and social connections have been identified as adverse effects. In systematised

and cohesive societies, social cohesion is fundamentally guided by trust, empathy and mutual understanding, which might be at risk ascribed to excessive automation (Leslie, 2019). The last-mentioned is especially concerning because a central tenet of the Constitution of South Africa (RSA, 1996) subsumes social cohesion as mentioned in the preamble. As a result, the disintegration of social cohesion ascribed to the overuse of AI technologies could potentially influence democracy and civil rights.

More specifically, AI technologies amplify the ethical challenge of trust. Trust is a fundamental part of human relationships - the building block of psychological safety in interpersonal relationships, be it collegial, team-related, reporting lines, societal or personal. Brene Brown's well-known BRAVING model breaks down trust into the principles of Boundaries, Reliability, Accountability, Vault, Integrity, Non-Judgement and Generosity (Brown, 2015). The increasing fear and complexities of the unknowns concerning the use of AI pose a great risk to conserving trusting relationships in various contexts of life and working environments.

In addition to the above, it is important to understand how AI and other technological changes psychologically impact employees. The most complex system subsumes human beings, and most individuals do not read the manual to this machine before operating it; nonetheless, how implementing AI affects individual physiology and psychology is of paramount importance. For example, understanding that instant messaging has been proven to be no substitute for human interaction in terms of the release of oxytocin (the bonding hormone), and cortisol (the stress hormone), two foundational hormones in terms of physiological and psychological well-being (Seltzer *et al.,* 2012). Or the power of a now-frowned-upon handshake, a simple touch such as a brief hug or shared moment of laughter, as a trigger for releasing oxytocin and building a pathway to trust (Sobrea, 2024), which is lost when AI technologies are over-relied upon.

Besides, AI-powered productivity tools often include close surveillance and tracking of employees. Understandably, employees might experience feelings of reduced privacy and

autonomy, with constant scrutiny, increasing job-related stress and reducing workplace morale. A sense of reduced autonomy, redundancy and loss of control might adversely influence job satisfaction and fulfilment. However, if used correctly, AI can enhance productivity and, with it, an individual sense of agency and can empower employees to reach new heights in individual work and career trajectories. Thoughtful consideration of the use of AI technologies and ensuring alignment with human-centred values can, thus, aid in improving both ethical practices and psychological well-being.

Considering the stated discussion, the notion of AI ethics has emerged. AI ethics has been defined as a set of principles or norms (as universally accepted guidelines), values (own position giving expression to principles and norms), and techniques (application) based on widely accepted standards of right and wrong to guide moral conduct in the development and use of AI technologies.

Work and professional ethics and codes

A central question that arises is, why do work and professional ethical codes exist? In essence, all ethical codes link back to core ethical values. Thus, an individual or group of individuals, such as a profession or organisation, might often be faced with similar ethical decisions and dilemmas based on the variables and situations that are dealt with daily. In these cases, work and professional codes can serve as guides highlighting the specific situational variables, considerations and possible solutions to assist practitioners and specialists in a specific field to make the so-called "right" decision. One of the foundational ethical frameworks for AI was put forward by the United Nations Educational, Scientific and Cultural Organization (UNESCO), entitled *Recommendations on the Ethics of Artificial Intelligence*. Published in 2022, the framework provides a global standard for AI ethics to its 194 member states. UNESCO (2022) aims to contribute to peace and security by promoting international cooperation in education, sciences, culture, communication and information, amongst others. The code highlights the need for a dynamic understanding of AI and a human rights approach to AI.

The ten principles for a human-rights-centred approach to AI include:

(i) proportionality and do no harm
(ii) safety and security
(iii) right to privacy and data protection
(iv) multi-stakeholder and adaptive governance and collaboration
(v) responsibility and accountability
(vi) transparency and explainability
(vii) human oversight and determination
(viii) sustainability
(ix) awareness and literacy
(x) fairness and non-discrimination.

It, therefore, follows that professional codes should be based on the above (or similar) principles, focusing on how the listed principles could be applied in specific circumstances within a range of occupations. Howbeit, implementing the listed principles should also take into consideration fluctuations in the world of work which are occurring ascribed to technological advancements (Poisat *et al.*, 2016). In addition to the potential mismatch between available and required skills for the workforce of the future, which is a major concern (Rodriquez-Bustelo *et al.*, 2020).

Sustainable and strong institutions

The use of AI has brought enormous efficiencies and advancement to the world of work, but has simultaneously also created uncertainty and ethical concerns. Institutions that recognise and understand how AI impacts and transforms all aspects of the organisational universe will be well-placed to address such ethical concerns effectively in an open, transparent and responsible manner.

AI offers unprecedented opportunities, efficiency, innovation and productivity, but also inherently presents ethical challenges and concerns that can impact employee rights, morale and wellness, decision transparency, privacy, job security and organisational reputation and legitimacy. It further impacts the organisation's business model and decision-making practices. Sustainable and Accountable Institutions are, according to SDG16,

those that have targets, systems and processes addressing issues related to governance, accountability, human rights and the rule of law. Organisations that recognise and understand the ethical concerns that can result from an AI-based world of work and address those concerns in a responsible, transparent and accountable manner will succeed and be respected in the world of work and society at large.

Ethical concerns resulting from AI have become an important research area not only in academia but also an important topic of concern for individuals, organisations and society at large. Various studies and surveys have been conducted on ethics and AI in the workplace. In a recent study, Coovadia (2023) identified, through a comprehensive systematic literature review, supported by empirical evidence from business leaders, the following as the major ethical concerns for AI in the world of work, namely, Transparency, Machine Bias, Privacy, Beneficial AI and Responsible AI. These AI ethical concerns are like those identified in various studies and opinion pieces by scholars as well as professionals in the workplace.

Sustainable and Accountable Institutions will be those that are aware of, constantly monitor and actively address, those ethical concerns through a proactive ethical governance framework that ensures that AI in organisations aligns with human-centric values, maintains and fosters employee trust and wellness and adheres to regulatory standards. Focus areas of such a framework, as identified by Coovadia (2023), for which policies and procedures should be in place and that are continuously monitored, are discussed below.

Transparency and accountability

Transparency and accountability from an ethical perspective in an AI-based world of work can be defined as an organisation's willingness to have its AI processes and algorithms monitored and reported on to its stakeholders. An ethical concern resulting from AI is the potential for so-called "black box" decision-making, where algorithms make decisions without clear and interpretable reasoning. Organisations should address this risk by fostering transparency and accountability through explainable AI that provides insight into how and why decisions are reached, as well

as implementing audit trails for critical decisions that will support continuous monitoring and reporting. By creating standards for AI interpretability and accountability, organisations can reduce bias, enhance fairness and reinforce employees' trust in AI-driven processes, which will further enhance stakeholder confidence.

Mitigating machine bias and discrimination and ensuring fairness

Transparency and accountability from an ethical perspective in an AI-based world of work can be defined as unfairness and discrimination present in an algorithm that disadvantages or advantages an individual or group over another. An ethical concern resulting from AI is the potential that systems can be trained on data or factors that are biased or reflect inequities, whether from a historical, representation, measurement, evaluation or aggregation perspective. Organisations should address this ethical concern by implementing a debiasing strategy that includes technical and operational aspects, such as using AI models to identify and minimise any biases embedded within them. This involves selecting diverse, representative data and testing systems against bias in all relevant decision-making areas in the business. Organisations should further establish protocols for regular monitoring, reviews and adjustments to address any ethical concerns that arise. Training staff on how to use AI responsibly and ethically can further help in identifying and mitigating bias at an organisational level.

Privacy and data security

Privacy and data security from an ethical perspective in an AI-based world of work can be defined as the right to reject, as well as demand, the limitation of the processing of personal information, with the ability to seclude information, as well as the right to rectify and delete personal information. As AI often requires large volumes of data, this extends to a wide range of information and personal data that are stored on personal digital devices, data centres or the cloud. Organisations should address this ethical concern by implementing measures to ensure that personal data is safeguarded to maintain trust and comply with

data protection laws. Such measures should include organisations seeking out the best available technology that facilitates privacy by design, and which is built into the technology, such as data anonymisation, encryption, and secure access protocols. It is also essential to communicate transparently with data owners about what data is being collected, how it is used, and for what purpose.

Beneficial AI and fostering human-centric values

Beneficial AI from an ethical perspective can be defined as AI relating to principles such as human dignity, creating no harm, sustainability and fostering trust. It can also be said that AI systems should be aligned with human moral values and ethical principles, protecting human dignity through sustainable AI. AI in the workplace can have a significant impact on employee morale and wellness, and often raises concerns about job losses, skills obsolescence and redundancies. Employees also often feel added pressure to perform better and faster in an AI-based world of work. Organisations should address this ethical concern by prioritising the well-being of their employees by preparing them for changes in the workplace because of AI. This would involve actions and programmes such as upskilling and reskilling employees to empower them to take on new technology-augmented roles or create pathways to alternative or redesigned jobs. There should also be regular and transparent communication with employees regarding how AI deployment will affect them in the workplace to assess their needs and anxieties and foster an inclusive culture where employees feel supported during transitions.

Responsible AI

Responsible AI can be defined as creating trustworthy and accountable AI systems. This entails, from an ethical perspective, creating trust and confidence in the algorithms as well as holding organisations responsible for the actions of the AI system when they are not following the required standards or protocols. Organisations should adopt ethical AI policies and establish ethical AI frameworks that outline principles for responsible AI use and include mechanisms for ongoing oversight of AI in the world of work. These comments could be deemed foundational for an ethical code for the AI-based and informed world of work.

Values and ethical code for an AI-based and informed world of work

Professionals in the workplace have often received specific training to be specialists in their respective areas. However, with technology advancing at a rapid pace, professionals can easily be left behind if they do not keep up to date with technological changes that affect their area of specialisation. Similarly, the incorrect use of technologies can have dire results. The problem is often that professionals have blind spots, viz, "don't know what they don't know". Digital transformation also creates the new challenge of professionals overly relying on what intelligent technologies can (or should) do and not ultimately taking responsibility and accountability for using these, often ignoring the ethical and psychological impacts. Cultivating a curious mindset, open to learning and adapting, is crucial to overcoming this dilemma. The upskilling of professionals and professional codes can also not be overemphasised. Levels of education, digital literacy and exposure to technologies can greatly assist with overcoming ethical challenges with the use of AI.

Coghlan *et al.,* (2023) make four recommendations for the use of intelligent digital technologies, such as AI, that can be applied in many contexts. Firstly, carefully weigh the potential benefits and risks of the use of these technologies. Secondly, seeking and disclosing evidential support for the technologies being used and basing decisions of use on this data instead of taking an experimental route with unknown outcomes. Thirdly, not overly relying on technology in terms of ensuring that data is collected, stored and used appropriately, but rather ensuring human responsibility and accountability. Lastly, a principle that may be more applicable to the psychological field is considering the possible disclosure of crimes (and adverse information) and how these will be dealt with by intelligent technologies such as AI.

In accordance with the views and perspectives presented, values for an AI-based and informed world of work can be identified and formulated, which can be utilised to draft guidelines for an AI-based and informed world of work. Figure 12.2 presents an ethical framework for an AI-based and informed world of work.

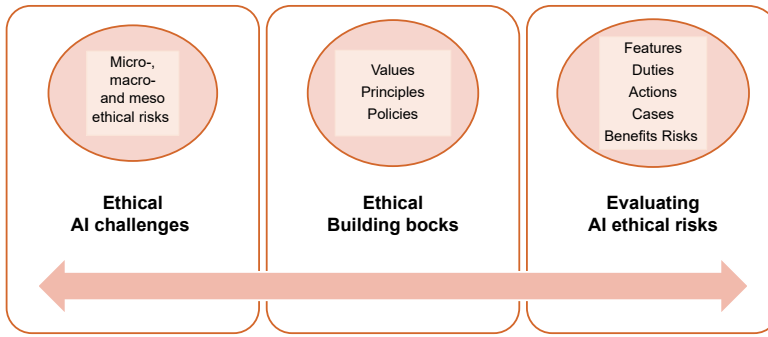


Figure 12.2: Ethics for an AI-based and informed world of work framework

Considering Figure 12.2, the ethical risks have been elaborated on earlier in the chapter, inter alia, safety and privacy, data protection, freedom and autonomy, human dignity, fairness and justice, responsibility and accountability, surveillance, datafication, democracy, civil rights and human relations. The values that could be considered subsume respect, connection, care and protection (Leslie, 2019), while the principles include fairness, accountability, sustainability and transparency, to mention a few (Leslie, 2019). How to evaluate AI ethical risks could emphasise, for example, the features of AI technologies, the duties that the AI technologies are responsible for, the actions that denote whether an action satisfies or violates the mentioned values and principles, and cases could be used to compare the collective ethical impact (Yu *et al.*, 2018).

Summary and observations

In this chapter, the central argument was that five principles can inform ethical behaviour in the AI workspace, namely, *to do good, exercise no harm, respect justice and autonomy and apply explicability* (transparency and accountability). These principles can be labelled as a principlist approach applied to the new world of digital technologies and devices such as AI. A new world of work driven by and based on AI demands a new orientation to what kind of work and professional ethics are prerequisites to meet the demands of AI in the workplace. This orientation was

based on normative and applied ethics. The perspectives offered, and the constructed arguments, were in the context of SDG 16, in particular, the focus on strong institutions.

Three eminent ethical challenges are (a) considering ethical dilemmas, (b) unbiased decision-making and (c) decisions promoting the common good. A conceptual framework emphasising a systems approach to AI ethical challenges highlighting the micro-, macro- and meso-levels of complexity when dealing with ethical issues. When dealing with these issues, creating trust should always be a transferable aim.

Any work or professional ethics should be based on "responsible AI." Responsible AI can be defined as creating trustworthy and accountable AI systems. This entails, from an ethical perspective, creating trust and confidence in the algorithms as well as holding organisations responsible for actions of the AI system when these systems are not following the required standards or protocols. This chapter concludes by offering an ethical framework for an AI-based and informed world of work. The three pillars of this framework are useful, as ethical risks linked to AI challenges should be considered. Agreed-upon principles, people's values and guiding principles assist with making decisions and mitigating risks. An important feature of this framework is evaluating how ethical risks are dealt with. The advantage of this approach is that ethics not only identifies relevant principles but also assesses what are the outcome and impact of the ethical decisions made for a particular situation.

The significance of this framework is informed by the principlist approach. The relevance thereof is that the universality of principles informing work and professional ethics should be acknowledged, that person-based values will inform the application of ethical principles and that addressing ethical risk can live up to people being responsible in an AI-based workspace.

Concluding remarks

From these observations, the following guidelines can be offered:

- All approaches to AI should be grounded in sound ethical principles. These should include the principlist values of beneficence, non-maleficence, justice, and autonomy, and a fifth

principle of explicability, consisting of transparency and accountability.

- The rapidly changing and evolving AI landscape poses an ethical challenge, as it often outpaces the training and updating of professional and other guidelines. To mitigate this, professionals need to proactively upskill and inform themselves regarding AI's implications in their fields of specialisation.
- A suggested approach to incorporating AI responsibly would be to weigh the potential benefits and risks of utilising these technologies before implementation. This can be achieved by first seeking and disclosing evidential support and following an evidence-based decision-making process instead of taking an experimental route with unknown outcomes. Second, do not overly rely on technology, but rather ensure human responsibility and accountability.
- Although AI could potentially substitute numerous manual tasks and even subsume intelligence, one should be cognisant of the fact that humans are complex psychological beings who require certain human interactions, such as a simple touch or laughter, and a foundation of trust, for example, work relationships, to optimally function and successfully incorporate AI in the world of work. Thoughtful consideration of the use of AI technologies and ensuring alignment with human-centred values can thus aid in improving both ethical practices and psychological well-being.
- Institutions should recognise and understand how AI impacts and can transform all aspects of the organisation and be intentional in their responses, practices and strategies to address such ethical concerns in an open, transparent and responsible manner.
- Institutions should develop or adopt a proactive ethical governance framework that ensures that AI in organisations aligns with human-centric values, maintains and fosters employee trust and wellness and adheres to regulatory standards.
- Organisational standard operating procedures should be developed before AI technology implementation, elucidating the functions, benefits and potential risks associated with AI implementation. Subsequently, a mitigation framework should be developed to address possible AI risks.

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Discussion Piece

So, What about AI?

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Artificial intelligence (AI) generates content by learning from what already exists. Because of this, it often reproduces patterns rather than creating something entirely new. In areas like music, for example, AI-generated tracks tend to follow recognisable formulas: similar voices, chord progressions, beats, and overall structure. This repetition makes AI-created music increasingly identifiable, and while producers can already spot it, audiences will likely notice these patterns as well.

Although AI is advancing rapidly and unpredictably, two things are certain:

- First, it is here to stay, and
- Second, it will continue improving by consuming more data.

However, this introduces a significant risk. AI begins by learning from human-created content, but as it scales, it will inevitably reach a point where it increasingly learns from content that it has generated itself. This creates a feedback loop in which the source material becomes less original and more repetitive over time. In such a system, the principle of GIGO (garbage in, garbage out) becomes a real concern. If input quality declines or becomes overly homogenised, the output will follow. Instead of evolving, AI could begin to recycle and reinforce its own limitations, producing work that feels derivative, flattened, or lacking in true innovation.

The development of "better AI" depends on human-created ideas, experiences, and originality. True innovation comes from **lived experiences** like solving problems, feeling inspired,

dreaming and thinking. These are uniquely human processes that AI does not possess.

This is why there's no need to feel threatened. AI's source must be human-generated content if it wants to improve. Humans will always be the source of new ideas that AI relies on. Even the very use of AI requires human direction. Someone must create the prompt, guide the output and shape the result.

Rather than replacing creativity, AI opens new opportunities in creative spaces. This is not often spoken about, but it increases accessibility for people who may not have traditional tools, musicians without studios, and artists without materials. Used correctly, it can expand creative expression rather than limit it.

In the end, AI is a tool and not a replacement. As long as humans continue to live, imagine and create, originality, meaning and expression will always come from us.

Conclusion

AI and the World of Work – Implications and Considerations

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Looking back

The post-COVID-19 pandemic era has significantly transformed work habits and patterns. Advances in technology have facilitated remote work and enabled virtual collaboration amongst teams. A notable illustration of this shift is the growth of e-health services. In addition to these developments, artificial intelligence (AI) has introduced a range of new opportunities and challenges in the workplace. These changes emphasise the evolving landscape of work and the significant role that technology plays in shaping it. By doing so, a new world of work emerges that is continuously moving away from the traditional view of the world of work. Industry 5.0 developments, indeed, create a new world of work.

This book focuses on "AI and the World of Work" rather than "AI in the World of Work." The latter emphasises the direct application of AI tools to automate, augment, and transform specific tasks within the workplace. In contrast, "AI and the World of Work" examines a broader perspective, exploring AI's societal and economic effects on labour markets, human-machine relationships, skills development, and policy considerations.

The objective of this book is to contribute to a crucial discussion on how AI will change the way in which humans work and what competencies are needed for the future workplace. Although it was not possible to investigate all industries or

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identify all competencies, several matters relevant to the book's focus could be identified.

The world of work is not only about organisational change but also about employee preparedness and different work behaviours. Chapter 10 reminded us that the new world of work is based on remote and hybrid work models. These models are further characterised by the availability of real-time data analytics, decentralised decision-making, and increasing process automation. Chapter 1 commented that the new world of work is characterised by digital technologies, increased workforce diversity, changing organisational structures, evolving work methods, heightened business innovation, increased competition within markets, and flexible work arrangements. The new world of work is not only different in the working space but is also supported by tools that make work easier but also more complex. What should not be ignored are the disruptions caused by globalisation.

The integration of AI into the workplace brings a myriad of benefits that are reshaping how organisations function. In Chapter 2, we explored the profound impact of AI on talent management, illustrating how advanced technologies have revolutionised each phase of the employment lifecycle, from recruitment to onboarding, training, and employee development. These AI-driven solutions not only streamline processes but also possess the sophisticated capability to predict potential retention risks. By analysing patterns and trends, they provide invaluable insights into employee engagement and satisfaction levels, enabling organisations to address potential issues proactively before they escalate into costly turnover. Chapter 3 delves deeper into how AI continues to enhance workplace dynamics. One fascinating aspect is the rise of affective computing, a field increasingly embraced by businesses and marketers alike. This technology seeks to decode the complexities of consumer behaviour, recognising that many decisions are shaped by unconscious emotional responses. By gaining a deeper understanding of these emotional drivers, companies can tailor their approaches to better identify with their audience.

Chapter 6 sheds light on the evolving landscape of Industry 5.0 and the Fifth Industrial Revolution (5IR), highlighting the

crucial role that they play in the future of work. In this new paradigm, humans need to carve out their own space while also learning how to collaborate effectively with technology, which is now seen as a vital team member or colleague. Embracing this cohesive partnership between man and machine will ultimately redefine productivity and innovation in the workplace.

Industries such as tourism and hospitality proved to be vulnerable during the COVID-19 pandemic, as discussed in Chapters 8 and 9. The demands of the new world of work pose challenges for workers for at least two reasons. First, there is the question of whether employees are adequately equipped for this new working environment. This raises a further concern about whether future employees will be trained to meet these evolving demands. Second, there is a fear that technology could overpower humans in the workplace, leading to the possibility of human jobs being replaced by machines. Chapter 11 brings us back to the enduring question of the meaning and purpose of work, which remains relevant today.

AI undoubtedly brings and will continue to bring more advances to the world of work, with the healthcare industry being just one example (Chapter 7). The same applies to other industries. The approach to AI in the workplace and its contribution to shaping new working environments place the spotlight on higher education and training. Surprisingly enough, universities are not only educating and training for the future workplace, but they are also industries. Chapter 5 not only highlighted how universities are preparing future employees for their workplaces but also raised a potential concern about what can happen when the academic leadership is not prepared to deal with these new developments. Scholarship, as the hallmark of higher education, should also change in the wake of an AI-based and informed education. Chapter 6 outlined what a new approach to higher education should be. Both chapters, like others, alert that industries should change to accommodate these developments, as these industries constitute the new world of work. To confirm this perspective, Chapter 5 envisages that future professorial responsibilities may not only include teaching, research, and community engagement but also be shaped and extended in significant ways by AI / GenAI as part of the academic world of work.

An important contribution emerged from Chapter 1, in which it is documented that despite the potential and benefits of AI for the workplace, it is not without concerns, challenges, and, therefore, limitations.

Almost all chapters emphasise the importance of ethics in the workplace. Not only whose ethics is important, but also that ethics serve as the backbone for the new world of work. Chapter 12 added value to this discussion with its human-rights-centred approach to AI. Chapter 11 emphasised that industries should not only identify guidelines for the responsible use of AI within the workplace but also develop guidelines that could be adopted by other industries as well.

A perspective that should not be ignored is the close connection between AI and sustainability, as projected in Chapter 4. AI technologies impact the economic, social and ecological systems on a global scale, thus becoming an important lever for sustainable development. What should be added to this discussion is the need for decent work and economic growth as captured in Sustainable Development Goal 3. Whilst AI can make a meaningful contribution towards this SGG, the values guiding the very same SDG should also guide the development and application of AI to the workplace.

Observations

This book fits into the broader domain of human resource management. As stated in the book's orientation, three lenses were used to look at AI in the world of work. Through these lenses, it was observed that AI and its enabling technologies are a reality in the new world of work. AI has changed how organisations operate as well as the competencies expected from individual employees. This necessitates learning organisations that use technology to reinvent themselves in a highly complex and competitive environment.

Individual employees need to be open to cultivating a mindset where continuous upskilling and reskilling become part of their orientation and mindset. Continuous learning should be expected from individual employees. Flexibility and adaptability are also imperative in an ever-changing and interconnected work environment.

AI and its enabling technologies are aimed at enhancing the effectiveness and efficiency of organisations. This does not exclude the human element, as humans should control technology and not vice versa. AI technologies are "human-powered".

From this book, eight prominent observations can be offered:

- The importance of human-centredness in an AI-based and informed environment – humans cannot be replaced.
- Skills and competencies relevant to the future workplace – curricula should be aligned with the changing working environment.
- AI is a transformation agent to continuously improve the world of work through lifelong learning – a value that is much needed in a changing working environment.
- Although the inception of AI initiatives may not always originate from leadership, once these initiatives are underway, it is imperative that leaders take the helm and guide them diligently.
- The future workplace requires technology as a collaborator and co-worker. Teamwork will take on a different dynamic.
- Industry 5.0 requirements should inform education and training. This development represents the next phase in industrial evolution, focusing on collaboration between humans and advanced technologies, like robots and Internet of Things devices.
- AI enables the advancement of multi- and trans-disciplinary research.
- A new work ethic is needed, founded on principles like autonomy, non-maleficence, beneficence, and justice. Additionally, there should be an emphasis on explicability, which specifically addresses transparency and accountability.

Pointers

As stated earlier in this summary, Chapter 12 provided ten principles for a human-rights-centred approach to AI. These principles are:

(i) Proportionality and Do No Harm
(ii) Safety and Security

(iii) Right to Privacy and Data Protection
(iv) Multi-stakeholder and Adaptive Governance and Collaboration
(v) Responsibility and Accountability
(vi) Transparency and Explainability
(vii) Human Oversight and Determination
(viii) Sustainability
(ix) Awareness and Literacy
(x) Fairness and Non-discrimination.

4. Looking Forward

Because of the pervasive impact of AI on the new world of work, it was not possible to focus on all areas of work in a single book. By considering the various views presented in the book, it can be confirmed that AI and its enabling technologies are a reality in the new world of work. AI has changed the ways that organisations operate as well as the competencies expected from individual employees. This necessitates learning organisations that use technology to reinvent themselves in a highly complex and competitive environment.

Employees must be open to cultivating a growth mindset where continuous upskilling and reskilling become part of their orientation and mindset. Continuous learning should be expected from individual employees. Flexibility and adaptability are also imperative in an ever-changing and interconnected work environment. This refutes the orientation where employees were not required to think or question the tasks allocated to them.

AI and its enabling technologies are aimed at enhancing the effectiveness and efficiency of organisations. This does not exclude the human element, as humans control technology and not vice versa. This assertion is supported by Deloitte (2024), which reiterates that AI technologies are "human-powered".

The takeaway message is that humans should not lose *control* over their *control* (after Gabriël Marcel's play "*Le monde cassé*", translated as "The broken world").

References

Deloitte. 2024. *Global Human Capital Trends.* [Online]. Available at: https://www2.deloitte.com/us/en/insights/focus/human-capital-trends.html [Accessed: 4 April 2025].

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UJ Press

Change occurs at the speed of technological devices.

It is undeniable that artificial intelligence (AI) will continue to shape the workplace, leading to a new world of work. While industries, whether small or large, local or international, face challenges due to technological advancements, a central question remains: What should the role of humans be in this "new" world of work? Furthermore, what should the relationship between humans and technology look like?

This book, which includes various perspectives, thought pieces, twelve chapters, and directives authored by 30 national and international contributors from universities and societies, explores the impact of AI on the world of work through three distinct lenses:

Foundational Lens: This section examines the evolving landscape of the modern workforce, highlighting the transformative shifts that are reshaping our understanding of work itself and showcasing how generative AI and emerging technologies affect the workplace.

Strategic Lens: This part emphasises the essential role of education in equipping students with the skills and knowledge necessary to thrive in this new era of work, preparing them to meet the demands of a constantly changing job market.

Operational Lens: This division provides deeper insights into various industries, analysing how they are affected by the dynamics of AI in the workplace.

Offering multi-disciplinary perspectives alongside global insights, this book discusses AI's transformation of work and, by extension, our lives. While it presents several guidelines, the focus remains on ensuring that human beings are not dominated by technology. Instead, technology should act as a co-partner in the workplace.

This book aims to help you determine humans' role in the workplace.

The book is highly recommended for academics who are preparing students for the workforce while also being influenced by developments within that very workplace.

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