

Adult Education in the Age of Artificial Intelligence: The Human Resource Development Perspective

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Abstract

As the future of teaching, learning, and workplace environment changes due to the evolution and advancement of artificial intelligence (AI) and interconnected technologies, it is required that human resource development (HRD) scholars and practitioners intervenes for a successful transition. In deploying the use of narrative review technique, which led to the evaluation of several related literatures published between 1988 and 2024 in various academic and professional platforms and connected to the study's objective, this article brings forth a new perspective which was able to interconnect the fields of HRD with that of adult education (AE) and AI. In spite of global affirmation which acknowledges HRD as a field and practice whose expertise is responsible for the development of new knowledge and reskilling of adult educators and learners, in addition to the workforce, HRD is yet to contribute to the scholarly discourse linking AE to AI in the age of digitalising learning and education, which is because of the need to adapt to new technologies through continuous enhancement of learning and development. As its intervention will help in the transformation of adult pedagogy to be in tune with today's and tomorrow's learning and work environments. With the expertise of HRD, the capabilities of adult educators and the knowledge of learners will be developed, with the intention that theoretical and practical knowledge and competencies on AI technologies will be acquired by all stakeholders in the AE domain. As a proactive discipline with a multidisciplinary outlook which transcends the social and management sciences, it is necessary to utilise its know-how for promoting awareness and developing new competencies on AI technologies among adult educators and learners, as this is required for seamless transition on integrating AI into AE teaching and learning curriculum. Through this method, AE educators and learners will have their

knowledge on Fourth Industrial Revolution (4IR) technologies developed and continuously improved, being that they are products from a generation whose knowledge on automated teaching and learning practices is limited. An intervention from HRD could possibly be through its activities such as training and development for developing awareness and reskilling, talent development for remodeling abilities and competencies to become innovative and align with current and future expectations, in addition to career development focused on increasing performance and productivity, etcetera. Resulting to a paradigm shift from traditional or manual AE approaches, to that which embraces digitalised education and prepares everyone with vested interest for the future. Additionally, as a result of the changing nature of the workplace environment, this will help to reskill and upskill adult educators and learners who are competing with the workforce from Generation Z and Alpha born into the era of advanced technologies. Aside these contributions, the implications for HRD research, theory, and practice was discussed. Future studies using empirical data from qualitative, quantitative, or mixed-method, can further investigate this study's objective. This could be among educational institutions, service industries and those in the manufacturing sectors, or small and midsize enterprises (SMEs), revealing how HRD expertise and activities is being utilised for preparing AE educators and learners along with the general workforce for the future of teaching and learning. As the outcome from such investigation may perhaps reveal intriguing facts which could not be captured in this present study. Finally, this study provided a summary of its conclusion.

Keywords: Human Resource Development, Adult Education, Adult Educators and Learners, Artificial Intelligence Technologies, Learning and Development, Teaching and Education.

Human Resource Development and Adult Education in the Age of Artificial Intelligence

Several studies have claimed that the purpose of human resource development (HRD) and that of adult education (AE) are homogeneous (Hatcher & Bowles, 2006; Jacobs, 2006; Sleezer, 2004; Sun & Sun, 2011). While HRD's objective is to enhance individual learning for personal and organisational development and efficiency through various intervention mechanisms such as training and career development, in addition to talent development which are essentials for current and anticipated roles Byrd (2023); Garavan et al (2012); McLagan (1989); Rasdi et al (2022); Osolase et al (2023); Osolase et al (2024); Smith (1998), AE also known as continuing education and through its educators, focuses on improving the knowledge, competencies, and ethical wellbeing of adult learners, by employing various methods such as self-learning and lived experiences, and could be through formal or informal lifelong learning processes (Sleezer, 2004; Yang, 2004). Training and development empower individuals and teams with the right knowledge and skillsets needed for job and organisational performance (Byrd, 2023; Jang et al., 2022; Rasdi et al., 2022), while career development helps to reinforce to strengthen the individual career prospects needed to stabilise efficiency and performance among organisations (McLagan, 1989; Rasdi et al., 2022). However, talent development establishes a route through which individuals become capable of developing their skills and competencies as a result of the several opportunities presented by organisations (Garavan et al., 2012; Garavan et al., 2023; Handfield-Jones et al., 2001). Furthermore, through the expertise of HRD scholars and practitioners, AE enables adults to continuously improve their knowledge, skillsets, and competencies Reio (2007); Rocco & Smith (2013), through methods such as training and career development, which helps to continuously reinvent their talents to be in tune with the ever constantly changing nature of teaching, learning, and workplace environment.

As a result of the evolving nature of technology in educational and workplace environments, the activities, operations, and philosophy of humans have become interweaved with digitalisation such as artificial intelligence (AI) and other of its interconnected systems (Baki et al., 2023; Kang, 2023; Poquet & Laat, 2021). From the perspectives of Ardichvili (2022); Baki et al (2023); Kang (2023); Laupichler et al (2022), AI also known as technologies of the Fourth Industrial Revolution (4IR), is explained as the ability for humans to adopt the use of computers and its accessories for decision-making, in order to resolve problems which are deemed complicated through the automation of adult teaching and learning along with workflows, as this is achieved through the transformation of knowledge and competencies which arises from deploying computers and machines in mimicking the human intellect. In addition, other similarly-situated accessories which complements the efficiency of AI, comprises of machine learning and vision, natural language processing (NLP), robotics, chatbots, computer vision, along with speech recognition and expert systems, etcetera (Ardichvili, 2022; Baki et al., 2023; Poquet & Laat, 2021; Yorks et al., 2020). Therefore, as a result of the technological advancement which brought into being AI, human interaction in learning and workplace environments and how roles are being handled, together with the educational settings for adult learning processes have overtime evolved. Necessitating the need for HRD to intervene through the use of its activities for innovative research and practice, focused on the reskilling and upskilling of adult educators and learners, along with developing innovative frameworks, systems, and processes through which knowledge, skillsets, and capabilities are improved in order to integrate AI technologies into the mainstream teaching, learning, and practice of AE.

According to Ren and Zhang (2017), in the past decade, the field of AE gradually began to incorporate AI technologies and various automated instructional methods into its learning processes, as this assisted adult educators and learners in resolving tasks that were seen as complicated or posed challenges to teaching and learning activities. A process which Kang (2023); Sands (2020) described as *“the teaching and development of intelligent knowledge and understanding among adult educators and learners.”* Furthermore, Kang (2023) affirmed that the advent of networking and mobile communication technology, resulted in the speedy acceptance of AI technologies among adult learners. As adults increasingly had access to the internet and digital archives either through individual computers or mobile phones, and could therefore go online to dispense knowledge, share their experiences, and disseminating the opinions they hold on various topics which interests them. This made the knowledge acquisition process to become seamless, which is on account of easy accessibility to contents from various digital spaces and platforms.

For instance, a study conducted by Kang (2023) in China, revealed that AI technologies has had formidable impact on AE and its learners. Because through the help of these cutting-edge technologies, adult learners became more intentional in their quest to engage in personalised learning and an educational procedure which is considered simplified. Also, was the ability for AI to transform the learning process, and the cognition of several Chinese adult learners who became well-informed in their chosen fields and professions (Kang, 2023). Kang (2023) summarises it; *“these were outcomes from a learning environment and process which encountered the digitalisation of knowledge, as the individual adult learner were able to personalise their own learning, along with the categories of contents which they had access to digitally.”* As a result of the future of learning which will be highly dependent on advanced technologies such as AI Kang (2023), to transform the transitioning process and continuously improve the knowledge and competencies of adult educators and learners, there is the need

for collaborations between scholars and practitioners of HRD and AE, as more awareness and knowledge dissemination accompanied by talent and career advancement will be achieved on a long-term basis.

Furthermore, as stated by Wu and Yuan (2019), the earliest AI implementation focused on AE process and systems which led to the development of computer programmes known as Computer-Assisted-Instruction (CAI). It was through the CAI courseware, a computer programme designed for educational training, that the Chinese Radio and Television University (CRTL) adopted remote teaching in educating its adult learners (Wu & Yuan, 2019). On account of this, adult learners who were educated through the CAI system experienced mental transformation and knowledge enhancement, as they became exposed to the automated and efficient processes related to AI technologies, when compared to the previously known instructional learning which was majorly paper-based and conducted through in-person appearance or distance education method (Kang, 2023; Wu & Yuan, 2019). Several benefits of the CAI courseware were that it enabled the Chinese adult learners to engage in the learning processes at their own needs and pace at which they were able to assimilate the learning contents. Also, through intelligent tutoring systems, adult learners were supported with additional learning contents in areas such as mathematics and statistics, while evaluation and feedback were provided to adult educators and learners on the development of course contents, its teaching, evaluation, and general performance.

A study carried out by Hassanien (2022) from the Scientific Research Group in Egypt (SRGE) revealed that by 2024, the size of the market on innovations which AI has brought to education in general including AE, will total \$6 billion, as adult educators and learners are beginning to embrace the flexibility which AI technologies has been acknowledged for. Through the intervention of HRD in optimising teaching and learning processes, and its ability to help transform the knowledge, abilities, talents, and careers of adult educators and learners, there is the possibility for the market size to increase, as more investors become attracted to the previous success stories achieved.

An investigation conducted by HolonIQ which is a market research organisation, disclosed that over the past years, AI technologies has contributed to the improvement of AE in several ways (HolonIQ, 2019; Rosen, 2019). Such as the process through which learning is conducted, the efficient appraisal and feedback method conducted by AI tutors, attracting and developing talents as a result of the flexibility in teaching and learning approaches, in addition to the training and development programmes which are carried out through innovative methods (HolonIQ, 2019; Rosen, 2019). These are considered as core areas which falls into the jurisdiction of HRD scholars and practitioners. There is the revelation by Laupichler et al. (2022), that the government of various countries have begun to realize the importance of integrating knowledge and competencies on AI technologies into AE. For instance, in order to advance the literacy level on AI in the United States, the government in 2021 established the National Artificial Intelligence Initiative Office (NAIIO) (Dawson et al., 2022). The NAIIO had as one of its core mandates to develop innovative research and create awareness on the significance of AI knowledge among adult educators and learners (Dawson et al., 2022; Laupichler et al., 2022; Xu, 2022). Similarly, other programs which had the same objective were founded by China's Ministry of Education, the Federal Ministry of Education and Research (BMBF) in Germany, along with Finland's "Elements of AI" whose purpose was to educate adult learners who lacked knowledge and competencies on AI, especially those from non-IT related disciplines and professions, such as medical doctors, lawyers, and educators responsible for transferring knowledge to adult learners (Charow et al., 2021; Laupichler et

al., 2022). In the opinion of Smith et al (2021), it was as a result of the intervention from HRD researchers and practitioners during the COVID-19 crisis, which was through the designing of e-learning templates and curriculum, that enabled adult educators, learners, the workforce, organisations, and several other institutions to enhance their knowledge, skillsets, and organisational practices for easy navigation through the unprecedented challenges brought by the pandemic.

It is undeniable that HRD and AE are interdisciplinary, integrative in its approach to teaching and learning, and often being in search of practical solutions to problems which poses challenges to workforce and organisational performance, together with that of education and the world at large (Ardichvili, 2022; Reio, 2007; Smith et al., 2021; Yang, 2004; Yorks et al., 2020). As Jang et al (2022); Yang (2004) disclosed, HRD and AE are inseparable disciplines, as they draw inspirations in concepts and theories from various social science and management related disciplines in complementing the efforts of each other, with a focus on advancing research and practice for the greater good of adult educators and learners, including the general workforce and organisations. With limited knowledge on AI technologies, adult educators and learners along with other members of the workforce who were born before the emergence of advanced technologies, will find it difficult to compete with those in the categories of Generation Z and Alpha (Culp-Roche et al., 2020; Guerra-Tamez et al., 2024; Pearcy, 2023). Therefore, with intervention from HRD, AE educators and learners will become informed and have their knowledge, competencies, abilities, talents, and careers improved, which is on account of the creative teaching and learning techniques enhanced using the mechanisms of training and development. Hence, the field of HRD is best placed to help reinvent the wheel of teaching and learning for adult educators and learners. As through this medium, knowledge, skills, and competencies on 4IR (fourth industrial revolution) technologies can be improved, helping to automate teaching and learning process of AE. Which is needed to have the knowledge, talents, and careers of all stakeholders digitalised.

For example, in their studies, Wolters et al (2024) emphasised on the need for studies to be conducted on how AI has impacted the teaching and learning methods in AE, which was required to ascertain to what extent adult educators and learners have acquired the needed knowledge and competencies on technology-based learning. In addition, Storey and Wagner (2024) acknowledged the importance of reinventing the curriculum of Technical and Vocational Education and Training (TVET), as this was a measure through which knowledge on AI could be integrated into the practical skills and competencies of adult educators and learners. To reaffirm the importance of HRD for improving the teaching and training components of TVET, McLean (2006); McLean and Akdere (2015); Mellahi (2006), along with Rasdi et al (2022) revealed that, training and development on technical and vocational education is an area in which HRD is widely known, as this is due to its expertise in innovative thinking, research, and development of practical knowledge across various sectors and industries which comprises of education. In doing this, developing the course modules, contents, and learning exercises on AE to align with those of AI, will become seamless for educators and learners, along with administrators and managers on adult education.

Through the aid of narrative reviews which is sometimes described as traditional or literature reviews, the authors of this article were able to rigorously evaluate past literatures which are interconnected with this study's objective (Byrne, 2016; Baethge et al., 2019). These comprised of academic journals, published books, and the contents from other related websites published between 1988 and 2024. Such as those in the category of SAGE, Emerald, Wiley Online Library, Springer Nature, Edward Elgar Publishing, in addition to Harvard

Business School Publishing, etcetera. According to Sukhera (2022), on account of the rigorous and practical method applied in evaluating the literature, narrative reviews enables the researchers to bring in new perspectives and understanding of the topic being investigated, as this is considered an inquisitive approach adopted by the authors for advancing the field of HRD. Therefore, to highlight the problems and proffer solutions as required through exploring the positive impact which HRD has on AE in an era of AI technologies, this study focused on several areas. For instance, the challenges which HRD scholars' and practitioners encounter in an effort to enhance the use of AI technologies among AE educators and learners, and the role of HRD in the transitioning of AE into the age of AI. In addition to this, there is the implication for HRD research, theory, and practice, as these are fundamental requirements for HRD to successfully integrate AI learning components into the lifecycle of AE.

Challenges Encountered by Human Resource Development in Enhancing the use of AI Technologies for Adult Education

Despite the several advantages on the evolvement of AE into the era of AI, various challenges have been encountered by HRD researchers and practitioners, which is in its efforts to integrate AI technologies into the teaching and learning components of AE. Because AI entails employing the use of knowledge acquired for automation of teaching and learning processes (Laupichler et al., 2022; Rosen, 2019), it is therefore logical to affirm that with the capabilities of HRD, AI components can be integrated into AE. However, this has not been achieved as a result of the several challenges which have prevented HRD scholars and professionals from contributing to the transition process, both in research and practice. For example, Jang et al. (2022); Kokkos (2015) discussed how the advancement in technology has brought discomfort to adult educators and learners, as the process towards adapting to an ever-changing teaching and learning environment has become challenging, which is due to lack in technical and practical knowledge, skillsets, and capabilities.

Previous studies have maintained that the cognitive competencies of adults' learners, along with the thought processes, sometimes encounters a setback, as increase in age has brought limitation on the ability to easily assimilate new knowledge (Kokkos, 2015). Which is attributable to the inability for adult educators to develop new course contents tailored along the objective of AI technologies (Poquet & Laat, 2021). Because of the diminishing strength of the adult brain as they grow older, it oftentimes requires innovative and creative methods in acquiring new knowledge, on the basis of the transition from paper-based or in-person teaching and learning methods (Kokkos, 2015; Poquet & Laat, 2021). At this stage, the expertise of HRD is required to establish creative abilities for adult educators and learners to transition conveniently to the age of AI. However, in this context, this has not been the case, which is due to the lack of collaborations between the fields of HRD and that of AE, as a result of both disciplines making efforts to individualise its research and practice despite having similarities in ideas, theories, and conceptualisations (Akdere & Conceicao, 2006; Hatcher & Bowles, 2006; Hwang & Yoon, 2023; Jacobs, 2006; Watkins & Marsick, 2013). These differences have over the past years limited the capabilities for HRD to intervene in integrating knowledge on AI into the teaching and learning mechanisms of AE.

There are also the challenges for adult learners to have a balance between their academics and professional or family life, as they move endlessly between each of these responsibilities, resulting to an imbalance and the inability to catch-up with the fast-moving trends which exists between these cutting-edge technologies and the educational sector (Kokkos, 2015).

The process of adult learning oftentimes requires commitment (Hatcher & Bowles, 2006; Hwang & Yoon, 2023), as new knowledge, concepts, and ideas are being brought to the fore, requiring the need for the field of HRD to intervene through research and designing of innovative mechanisms, which will enable adult learners to acquire new competencies and capabilities in an environment that is supportive and accommodating of the differences in routines and lives commitments. In addition to this, adults whether as old learners in adult education programmes or as employees in an organisation with the quest to acquire lifelong skills and competencies, often confront change as a result of being afraid that their entire life routines such as job-security, family, and social life will become disrupted and experience instability (Kokkos, 2015; Pohjola, 2022; Snyder, 2017). Therefore, having this in mind, this may lead to a situation where such adult learners become resistant to gaining new knowledge focused on adapting to the use of AI technologies. According to Byrd (2023); Garavan et al (2023); Hatcher and Bowles (2006); Hwang and Yoon (2023); Rasdi et al (2022), HRD is a field which plans for the future while transforming the present to meet up with subsequent demands, and therefore possess the capabilities to enhance learning and development through designing of course modules which are seen to be flexible and adaptable to the current conditions of adult learners and the general workforce. Furthermore, studies have affirmed that adult learners because of their experiences across various spheres of life, often prefer practical learning to gain hands-on skills which solves real life problems, when compared to learning which are theoretical or considered laced with some unrealistic or impracticable ideas (Akdere & Conceicao, 2006; Hatcher & Bowles, 2006). This has brought challenges to the field of HRD, as adult educators can sometimes prefer the old method focused on theoretical learning and conceptualisations and therefore resist change and future collaborations (Hwang & Yoon, 2023). A partnership which aims to integrate AI into the teaching and learning components of AE.

The inability to effectively manage time have also posed challenges to learning and knowledge enhancement among adult learners (Kokkos, 2015; Pohjola, 2022). This may arise from the several engagements and responsibilities which adult learners are exposed to. Situations of this nature requires an intervention from HRD, as its expertise can help to develop and establish programmes which respects the commitment of individual learners through flexible learning and development activities. However, finding a middle-ground for partnership on effecting change and transformation has been a challenge between HRD and adult educators (Hwang and Yoon, 2023; Watkins & Marsick, 2013), as issues of this nature has over the past decade limited HRDs intervention on integrating knowledge on AI into the learning systems of AE. Examples being through deploying the expertise of HRD on training and development to remodel and rework the talents and careers of adult educators and learners, in addition to AE course contents and mode of delivery. In order that the teaching and learning processes of AE can be transformed to align with the purpose and systems of AI technologies, and therefore being able to meet up with the challenges faced during the transformation phase.

Human Resource Development and the Transitioning of Adult Education into the Age of Artificial Intelligence

Human resource development (HRD) as a discipline and practice, revolves around its ability to transform workforce and organisations using its innovative and creative expertise to develop and enhance new and existing knowledge, skillsets, and capabilities (Byrd, 2023; McLagan, 1989; Rasdi et al., 2022; Smith, 1988). While the objective of adult education (AE) is identical to that of HRD, as its focus is on teaching to enhance the knowledge and

competencies of adult learners (Jacobs, 2006; Rocco & Smith, 2013). However, over the past years, HRD has contributed to the transformation of teaching and learning among educators and learners in AE programmes, along with the practice of AE across various categories of organisations, such as small scale and multinationals (Akdere & Conceicao, 2006; Hwang & Yoon, 2023; Jacobs, 2006).

Several studies have opined that it is HRD which popularised the discipline of AE, as a result of its intervention in redesigning the course contents of AE, reforming its teaching styles and practice, in addition to the several innovative research which HRD scholars contributed to the AE literature (Hwang & Yoon, 2023; Jacobs, 2014; Rocco & Smith, 2013). Further, studies have acknowledged the role which HRD researchers and practitioners have always played in the reskilling and upskilling of the competencies of adult educators. For example, Jacobs (2006); Smith et al (2021) revealed that in the absence of HRD, AE is unable to function optimally or deliver on its mandate in transforming the knowledge and abilities of adult learners, as it requires an intervention from HRD to help recreate a path for the development of new knowledge and competencies for its researchers and practitioners. Therefore, for the field of AE to have its teaching and learning components interconnected with AI technologies, it must collaborate with HRD scholars and practitioners, because the expertise of HRD is vital for successful transitioning.

According to Poquet and Laat (2021), the objective of AE will be defeated when it is unable to develop new knowledge and capabilities on AI among adult learners. As the future of learning and workplace environment will be largely influenced by advanced technologies such as those which emanated from the fourth industrial revolution (4IR). Furthermore, Laupichler et al. (2022) maintained that for AE programmes, its educators, adult learners, along with teaching contents to remain relevant in the coming decades, it must reskill its educators and learners, along with integrating knowledge on AI into its teaching modules, as this will be a requirement to participate in smart classrooms of the future. A study by Rosen (2019) emphasised that an AE teaching system which lacks AI components will become obsolete in few years to come, as new talents including careers and training and development programmes centered on AI technologies must be rapidly developed and incorporated into the teaching and learning process for adult educators and learners. These are necessities for developing and sustaining smart classrooms and workplaces which are already emerging across the globe, as they utilise various advanced technologies for teaching and learning (Kambala & Mathe, 2022). These assertions are confirmed by HRD scholars and practitioners in their various studies. From the perspective of Ardichvili (2022); Yorks et al (2020), it is the responsibility of HRD to develop the capabilities which are solely focused on AI technologies, as the future of teaching and learning including work will primarily depend on AI systems to conduct teachings, transfer new knowledge and skillsets, conducting administrative tasks, and operating machineries across several industries which includes educational institutions. This will be through various AI related systems namely internet of things (IOT), algorithms, machine and deep learning, cognitive computing and automation, robotics, decision making, recognition of speech, chatbots, and computer vision, etcetera (Charow et al., 2021; Ren & Zhang, 2017; Sands, 2020).

Based on the opinions of Ardichvili (2022); Charow et al (2021); HolonIQ (2019); Yorks et al (2020), as education gradually transitions into the era of advanced technologies, the role of training and development, talent development, and career development for improving the existing knowledge and developing new abilities, talents, and careers of adult educators is necessary. As this will enable educators to become knowledgeable on areas related to

content development and delivery on AI subjects, thereby enhancing the knowledge and competencies of adult learners, improving on personalised learning, and a return on investment (ROI) guaranteed for learners, educators, funders, and organisations. Therefore, the strategic role of HRD in spearheading the transformation and transitioning of AE into the age of 4IR technologies is mandatory. As workforce development and continuous improvement which comprises of educators and learners in the AE domain, systems change resulting to the integration of AI technologies into the teaching and practice of AE, in addition to the reinvention of knowledge, skillsets, competencies, talents, and careers which are essentials for successful transitioning of AE into the era of AI, are well acknowledged as the responsibilities of HRD researchers and practitioners.

Implications for HRD Research, Theory, and Practice

The lack of literature showing the scholarly expertise of HRD in incorporating the elements of artificial intelligence (AI) into the components of adult education (AE), remains a setback for both the field of HRD and AE. As adult educators and learners are left in the wind, which is on account of HRD not providing the required leadership for innovative research and practice. As existing literature has shown that HRD is yet to contribute its research and perspective on how AE can be transformed and made flexible and automated, through developing new competencies for educators and learners on AI technologies. As Ardichvili (2022) and Yorks et al (2020) declares, *“HRD with its leadership role on multidisciplinary research and practice, cannot shy away from employing its expertise on knowledge development and continuous learning, as this is urgently required for reskilling the workforce, educators, and learners across organisations and academic institutions on the acquisition of AI competencies and capabilities.”*

Based on the opinion of Wolters et al (2024), scholars in the management and social sciences in partnership with their peers in Information and Communication Technologies (ICT), need to collaborate and develop new theories and concepts, or possibly advance existing theories and models, which is able to build foundation for the integration of AI knowledge into the learning systems and curriculum of AE. Furthermore, a collaboration is required between HRD and AE, as there is the need for scholars and theorists from both disciplines to unite and help develop new models, theories, and concepts, or advance those already in existence. According to Akdere and Conceicao (2006) along with Reio (2007), as the nature of work and environment constantly changes, and as organisations comprising of educational institutions, adult educators and learners become more complex, it is crucial for researchers and practitioners from HRD and AE to engage in partnership for the purpose of developing new research, along with having its current theories integrated in order to achieve a unified outcome for research and practice. Through this medium, an effective path for paradigm shift will be established, focused on developing new models, knowledge, concepts, and ideas on the integration of AI technologies into AE teaching and learning components.

Recommendations for Future Research

With the emergence of AI, the future of teaching, learning, work, and conducting businesses have been redefined (Ardichvili, 2022; Yorks et al., 2020). On account of this, it is pertinent that HRD scholars in collaboration with its practitioners begin to employ its research and practice to prepare adult educators and learners for a smooth transition. To achieve this, there is the need to conduct empirical studies across different sectors and industries in public and private organisations. Such as educational institutions, service industries and those in the

manufacturing sectors, in addition to small and midsize enterprises (SMEs). Such research focusing on any geographical location, could employ qualitative, quantitative, or mixed-method. As its findings could possibly help to reveal the extent to which the expertise and practices of HRD are being used in reskilling and upskilling adult educators and learners in preparation to embrace a future in which teaching and learning, including workflows, will be significantly influenced by AI technologies. Or how far 4IR technologies has been adopted for enhancing teaching, learning, and workflows. Perhaps, as the tentacles of HRD is spread around educational institutions and organisations which often has large number of adult educators and learners across different professions and fields, this could result in a fundamental change of the future of the workplace in regards to embracing AI technologies.

Conclusion

The purpose of this article was to draw attention on the need for HRD to intervene, by utilising its expertise to develop innovative research and practical ideas which are capable of incorporating AI related technologies into the teaching and practice of adult education (AE). In addition, using training and development, talent development, and career development programmes, the study emphasised on the importance of knowledge and competencies development among educators and learners on AE, as these are primarily recognised as HRD's domain for achieving its short and long-term change and development initiatives. Through training and development which enhances existing knowledge and develops new skills and competencies on AI, the talents and careers of educators and learners on AE will receive a boost on the learning and practice of AI. Furthermore, to discuss the objective of the article, it focused on HRD and AE in an era where AI technologies have become a dominant force among educational institutions and organisations. In conclusion, the challenges encountered by HRD in enhancing the use of AI technologies were highlighted. Followed by the role of HRD in leading the way for the smooth transitioning of AE into the age of fourth industrial revolution (4IR) technologies. With the integration of HRD expertise into the learning mechanisms of AE, the process embarked in acquiring knowledge on AI among adult educators and learners will become seamless and efficient.

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