ARTIFICIAL INTELLIGENCE GUIDANCE AS WORKING MODELS FOR IMPLEMENTATION OF UPSKILLING AND RESKILLING IN ORGANIZATIONS

K.R.Padma
Assistant Professor, Department of Biotechnology, Sri Padmavati Mahila VisvaVidyalayam (Women's) University, Tirupati, AP. (Corresponding author)
Orcid no:0000-0002-6783-3248.

Abstract
Building accessible services that connect education and job services is a significant challenge for career guidance in the age of lifelong learning. This study explores how artificial intelligence (AI) can enhance career counseling in postsecondary education and the workplace. Findings from focus groups, scenario planning, and real-world experiments highlight AI's potential applications from the perspectives of institutions, guidance personnel, and students. While AI can reduce cognitive workload and improve efficiency, its rapid adoption raises concerns about job displacement, requiring organizations to implement upskilling and reskilling initiatives.AI-driven training programs offer innovative solutions for developing skills that meet evolving workforce demands. Grounded in theories of adult learning and technology adoption, this research examines how AI can customize learning experiences and boost workplace productivity. The study's unique approach assesses the relevance of upskilling and reskilling based on professional knowledge requirements to guide targeted strategies and activities. Given AI's multidisciplinary nature—spanning computer science, engineering, behavioral sciences, and more a transdisciplinary approach is essential to fully understand its implications. Soft skills also play a critical role in successful AI adoption. With the rise of Industry 5.0, future research must focus on balancing automation with human collaboration and addressing emerging workforce challenges.

Keywords: Artificial intelligence, Transdisciplinary approach, Industry 5.0, Upskilling, Career counselling.

Introduction

Global business, society, and the economy are all greatly impacted by the usage of technology, especially artificial intelligence (AI). Based on recognition, understanding, learning, and action, artificial intelligence (AI) has the potential to supplement or even replace human tasks and activities. AI is defined as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Kaplan & Haenlein, 2019). For now, machine learning (ML) is the only option available to modern AI systems. It is now possible for computers to learn from data without explicit programming because to the development of machine learning techniques and models (Mohri, 2018). According to experts, machine learning (ML) and artificial intelligence (AI) will drastically change the nature of work in the next ten years. (Rahman & Abedin, 2021; Tommasi et al., 2021). The new developments in algorithmic machine learning and autonomous decision-making will allow organizations to innovate further and optimize processes through automation. Machine

learning involves feeding large amounts of data to a computer system, which then uses statistical techniques to find patterns and relationships in the data.

The workplace of today is dynamic and ever-changing due to the world economy's quick evolution. Automation, shifting consumer demands, and technological advancements are altering sectors, opening up new opportunities, but also posing obstacles. Upskilling and reskilling activities are necessary to respond to these changes, which is one of the most important challenges facing individuals and organizations today. Organizations must give reskilling and upskilling programs top priority as artificial intelligence (AI) quickly changes the global workforce and makes sure workers have the necessary skills to succeed in an AI-driven workplace. Artificial Intelligence (AI) is generating new job categories and automating processes, requiring a combination of technical and human abilities as well as ongoing learning. Employee development is being revolutionized by AI-powered learning platforms that enable individualized learning experiences. Companies such as Bank of America, Verizon, Accenture, and Amazon have demonstrated the value of strategic investment in staff development through their successful reskilling projects. Businesses need to be proactive in order to take advantage of AI's disruptive power and maintain their inventive and competitive edge in a changing market.

The integration of artificial and natural learning may be revolutionized in the workplace by utilizing AI systems and tools (Laat et al., 2020). Artificial intelligence (AI) technologies have the potential to facilitate difficult problem-solving by offering real-time feedback and workplace learning analytics (Laat et al., 2020). A spike in the number of highly qualified workers who can use AI in an increasingly complicated environment can result from integrating AI into the workplace (Ameen et al., 2022). AI integration at work has effects on developing and acquiring new skills as well. AI technologies can help employees adopt healthier habits by automating customized changes to their work settings (Fukumura et al., 2021). Worker productivity, wellbeing, and health may all improve as a result. It's important to understand, nevertheless, that utilizing AI systems does not always result in consistently raising employee skill levels. Even if AI systems have a lot to offer the workplace, efforts to reskill and upskill staff members must go hand in hand with their utilization (Morandini et al., 2023).

Research on how employees and AI may coexist in AI-enabled workplaces is developing, despite the abundance of knowledge regarding the potential benefits of AI for workplaces. According to Table - 1, current research has tried to clarify several aspects of the expected effects of AI on labor. Contradiction is obvious in this kind of research, though. While some academics (Sarah Bankins, 2024; Arslan et al., 2021) contend that workers' fear of AI stems from the possibility of losing their jobs, others (Aleksander, 2017; Willcocks, 2020) contend that such assertions are a reflection of overstated AI capabilities. While some academics (Wu et al., 2022; Yang Shen, 2024) talk about workers enhancing AI capabilities, others (Chuang, 2020; Chuang and Graham, 2018) contend that workers become redundant in the process.

Table-1: Current analyses concerning employees and algorithms using AI

S. No	The investigation's main focus	Results	References
1	To give a general overview of artificial intelligence (AI), how it impacts work activities, how people react to these changes, and what kinds of work skills this technology will be producing in the future.	In order to guarantee that the workforce is robust and supported in the AI era, it is important to keep the consequences of AI on workers at the forefront of conversations about its use.	Sarah Bankins, (2024)
2	To strengthen the social security system, expedite the development of sophisticated domestic robots, and further overhaul the education and training system in order to fully realize the beneficial effects of artificial intelligence technology in the workplace.	AI is now promoting employment through industrial virtual agglomeration, a new and crucial channel that helps to improve worker autonomy, job appropriateness, and the willingness of businesses to share labor welfare among "cultivation areas."	Yang Shen, (2024)
3	To investigate techniques for training robots using human demos in the construction domain	An analysis of robots learning skills as human trainees in the construction sector	Wu et al. (2022)
4	To determine and combine the elements that are essential to a company's digital transformation	This review finds that key aspects for an organization's digital transformation are workers' opinions and perceptions regarding technological change, as well as their skills and training.	Trenerry et al. (2021)
5	To determine which essential HRM functions have adopted machine learning	Hiring and performance management HRM services are the primary areas where machine learning (decision trees and text-mining algorithms) is used.	Garg et al. (2021)
6	To examine the related HRM issues pertaining to the team-level interaction between AI and human workers	Human workers' fear and mistrust of working with AI, as well as job loss, are the linked HRM problems of AI-	Arslan et al. (2021)

		human interaction at the team level.	
7	To present an in-depth evaluation of the incorporation of artificial intelligence into business tactics	An organizational strategy's conceptual framework for AI integration's sources of value generation includes employee engagement as one of its focus areas.	Borges et al., (2021)
8	To recap the factors that influence human workers' "trust" in AI	Workers' emotional and cognitive confidence in workplace AI is impacted by its anthropomorphism and is influenced by its tangibility, transparency, reliability, and immediacy.	Glikson and Woolley (2020)
9	To challenge beliefs about automation and the nature of human labor in the future	While skill disruption is very likely, the exact extent of the disruption is unknown, according to this assessment, which contends that the "job loss" estimate is overstated.	Willcocks (2020)
10	To assess the progress made in functional capacity assessments using machine learning algorithms	Functional capacity assessments based on machine learning combine the advantages of robotic technologies with the knowledge and experience of human therapists.	Fong et al. (2020)
11	To analyze technological unemployment	HRD specialists must have an impact on employees' human skill development initiatives.	Chuang and Graham (2018)
12	To assess the "real" state of robotics proficiency from research facilities and the potential effects of such progress on human employment	Although robots are capable of performing some jobs in the "algorithmic" category, they are not suitable for tasks falling under the "life-need" category.	Aleksander (2017)

In an ideal world, employees and workplace AI would complement one another's advantages (Henkel et al., 2020; Raisch and Krakowski, 2021). Workers profit from the accuracy, numeric computation, and pattern recognition of AI applications in this coexistence (Klotz, 2018). While they devote their human resources to critical thinking and complicated decision-making, they educate AI to perform repetitive activities accurately (Aoki, 2021; Shrestha et al., 2021; Wilson and Daugherty, 2019). Human workers and workplace AI will coexist in workplaces until workplace AI is perfected, despite the literature currently in publication portraying AI as capable of accomplishing more than what is technologically conceivable (Aleksander, 2017). (Willcocks, 2020). Thus, it is imperative that employees and workplace AI coexist.

The first step in the research was to identify the work processes that have changed as a result of the use of AI. Participants stated that depending on the industry, different AI tools and systems have different advantages; nonetheless, time savings and better job quality were mentioned by the majority of respondents. Since professional performance is strongly linked to professional growth needs, specialists experience this pressure. The research defined an approach based on requirement relevance classes. The degree of significance of professional development and its approach are determined based on the relevance classes of requirements, along with suggestions for educational measures. Based on the respondents' reflections, three levels of importance were established for upskilling/retraining: low, medium, and high. The current study makes multiple recommendations. In order to understand how AI will change professional skills and workplaces, it first looks at current trends in research and practice. Second, it outlines tactics that organizations and employees can use to help them deal with the difficulties posed by upskilling and reskilling proclivities. Thirdly, it offers suggestions for practitioners to determine the competencies required for AI adoption, with the ultimate goal of customizing possibilities for training and development to the evolving labor market. Fourth, it emphasizes the need of using a transdisciplinary approach to produce insightful knowledge in the field of artificial intelligence and the significance of psychology in comprehending the whole range of applications of AI and how it affects society. Conclusion and recommendations for further research are provided in light of the study's findings.

AI-Assisted Skill Development

In this fiercely competitive, globally interconnected market. Artificial intelligence (AI) is becoming more and more common in TD as companies search for innovative ways to reskill their workforce. These initiatives are founded on the "tried-and-true" concepts of employee learning, emphasizing the necessity of both practical application and workplace education. According to Knowles' theory of andragogy, in order to facilitate adult self-directed learning, it is critical to highlight the problem-solving approach, examine autonomy, and determine the skill's applicability. A few examples of how to help employees perform better and influence self-directed learning are adaptive feedback, customized education, and self-directed learning. All of these requirements are typically met by AI training programs through the development of databases and data patterns that help them comprehend people.

Businesses may improve employee engagement, motivation, and retention by utilizing AI algorithms to evaluate comments, grades, and choices. The trainer may modify their classes in accordance with the requirements and preferences of their staff members (Jaiswal, 2022). Well-known ideas like Unified Theory of Acceptance and Use of Technology ("UTAUT") and Technology Acceptance Model ("TAM") have sparked conversations about using AI in training and development. These beliefs suggest that consumers are more likely to accept useful, user-friendly technology. Workers and stakeholders will embrace AI-powered training programs that address skill shortages, enhance learning outcomes, and boost productivity in the workplace (Zirar, 2023). To ensure a successful launch, businesses should evaluate how employees connect with one another at work, give the necessary tools, and encourage research, discovery, and ongoing development.(Shown in figure-1).

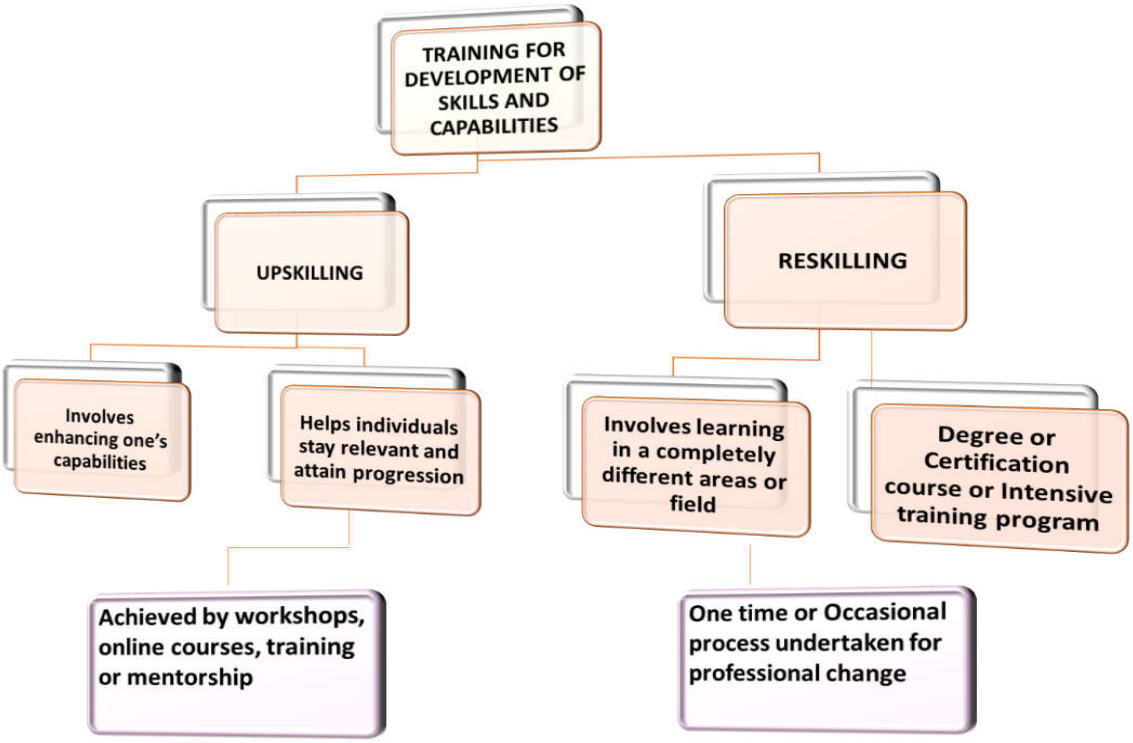

Figure-1: AI-based training's capability along with its potential for skill improvement

Enhancing and Strengthening the Capabilities of the Industry 4.0

Around the world, industry 4.0, or I4.0, is changing engineering and production. I4.0 is a virtual reality fusion system that leverages deep learning, virtualization, artificial intelligence, machine learning, hyper-converged infrastructure, cyber-physical systems, the Internet, the Internet of Things (IoT), and Industrial Internet of Things (IIoT), among other technologies, to create an intelligent production system. It is based on traditional manufacturing (Li, 2018, 2020; Xu et al., 2018; Li & Zhou, 2020; Xu et al., 2014). The three main elements that greatly influenced the development of the previous three industrial revolutions were labor, money, and technology. It is now time to consider the talent needed to achieve Industry 4.0 and beyond.

The digitization of manufacturing and the development of a cyber-physical system are being significantly altered by Industry 4.0. To make room for new production and economic value chains, Industry 4.0 combines process and production technologies, digitalizes product and service offerings, and unifies vertical and horizontal value chains. This shift will have a significant effect on higher education, which is responsible for developing talent, spearheading scientific innovation, sharing knowledge, and equipping the labor force for the future.

Adoption of AI and employment opportunities

A research plan to investigate how AI influences the interaction between socioeconomic, political, and working conditions and worker health and employment outcomes is presented by Jetha (2023) along with a discussion of the work changes in the context of AI. The impact that AI adoption has on psychological contracts, job engagement, and employee trust is the main area of interest for Braganza et al. (2021). Adoption of AI may open up new avenues for gainful job and respectable labor, according to the report. It demonstrates how workers and organizations can discover more chances in the global economy with the aid of new online platforms. While talking about the possible repercussions of adopting AI, Naudé (2021) emphasizes that these outcomes are unlikely to be utopian or apocalyptic anytime soon.

The research raises important concerns about the necessity to take into account the possible outcomes of adopting AI and warns against underestimating the long-term effects of the technology. The building sector is the main subject of Regona et al.'s (2022) investigation of the potential and obstacles associated with AI adoption. AI's consequences for employability in the healthcare ecosystem are the main topic of Jain et al.'s 2021 study. The benefits and drawbacks of using AI in hiring and selection procedures are examined by Ore and Sposato (2022). Through automation, the study demonstrates how AI may support the proper completion of repetitive tasks. The effect that AI applications have on the way healthcare professionals design their jobs is examined by Tursunbayeva and Renkema (2022). The adoption of AI will have an impact on labor markets, workplaces, and the health, safety, well-being, and equity of workers, as highlighted by Jetha (2023).

Table-2: The skills needed for implementing AI in the workplace

Human	Teamwork, collaboration, emotional intelligence, delegation, negotiating, managing people, and collaborating with others	(Aleksander, 2017; Banziger et al., 2018; Gekara and Nguyen, 2018; Klotz, 2016, 2018; Kokina and Blanchette, 2019; Makarius et al., 2020; Richards, 2017; Sousa and Wilks, 2018; Sowa et al., 2021; Stahl et al., 2021)
Technical	From IT literacy to machine-based digital technologies, including 3D printing, artificial intelligence, nanotechnology, virtual reality, digitization, robotics, and natural language processing	(Balsmeier and Woerter, 2019; Gekara and Nguyen, 2018; Siau and Wang, 2018; Sousa and Wilks, 2018)
Conceptual	Critical analysis and thinking, initiative and creativity, judgment and decision-making, synthesis and analysis of facts, sense-making, and cognitive flexibility	(Banziger et al., 2018; Bhattacharyya and Nair, 2019; Botha, 2019; Chuang, 2020; Davenport and Ronanki, 2018; Desouza et al., 2020; Gekara and Nguyen, 2018)

Continual upskilling and reskilling to promote a mutually beneficial arrangement with workforce AI

The popular representation of AI technologies as "a very young boy" highlights the drawbacks that currently exist in the workplace, which extend beyond technological innovation. These drawbacks include the financial investment required by an organization to train these systems and the distinctions between "algorithmic" and "life-need" AI (Aleksander, 2017; Banziger et al., 2018; Ransbotham, 2020). Additionally, if an organization doesn't invest in its employees' skills and knowledge, it will be less likely to get a meaningful return on investment from workplace AI (Ransbotham, 2020). According to Cheatham et al. (2020) and Hupfer (2020), investments in reskilling and upskilling employees serve two purposes: (i) motivating employees to contribute to the functioning of these systems, and (ii) equipping employees to produce quantifiable outcomes from these systems.

A more technologically advanced workforce necessitates the use of appropriate training techniques to help employees adapt their abilities, take on new duties, become more adaptable, and live with AI systems (Chuang, 2020). A symbiotic relationship between workers and AI systems can be achieved through early attention to education, ongoing training, and worker reskilling in the workplace (Aleksander, 2017). However, McKinsey & Company asserts that different stakeholders have different goals in mind when it comes to "education and reskilling" and "early focus" on workplace AI (Illanes et al., 2018).

Although companies can employ employees with the required skill set, recent study (Grimpe et al., 2022) shows that the strong demand for qualified people would prevent them from doing so even if they so choose. These individuals are more drawn to an organization's training opportunities than its cash incentives, according to this line of research. To draw in these kinds of people, an organization can offer continuing training; this kind of training is also expected to keep its personnel current. Additionally, continuous training will equip an organization's personnel to participate in the critical AI system training. This theory promotes knowledge growth by establishing AI in the workplace through continual training, such as upskilling and reskilling. (Shown in figure-2).

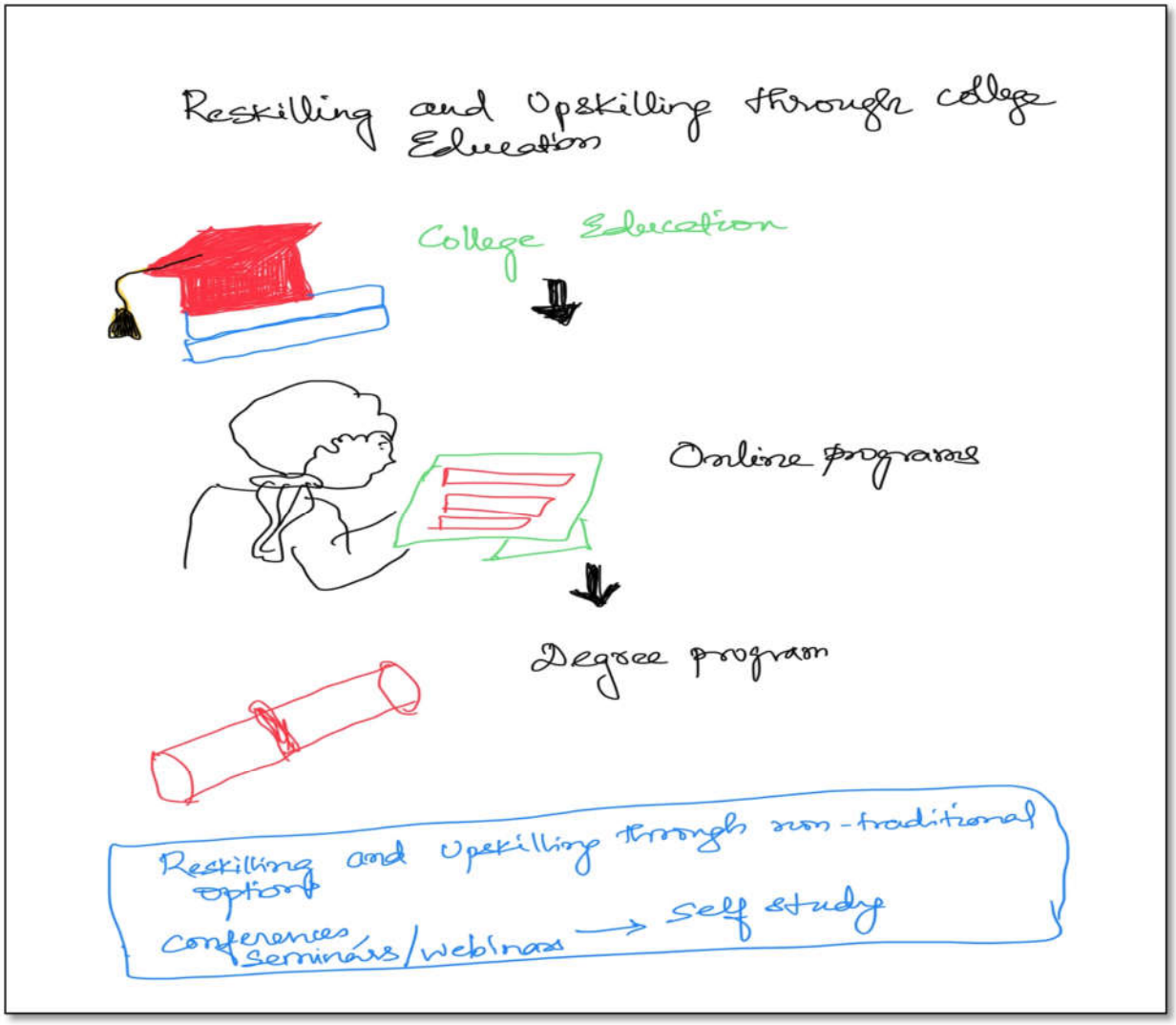

Figure-2: Upskilling and Reskilling the Workforce to Make It Ready for Industry 4.0

New Advancements in human skills and AI

The application of artificial intelligence (AI) in business and the workplace has seen a number of recent advancements. Data input, document management, customer support, and accounting were among the back-office tasks that AI-based solutions historically automated by using NLP and AI to comprehend and simulate human interaction with computer systems (Butler, 2016; Jaiswal et al., 2022)."Generative AI" is a significant ground-changer. Systems that create original data or content as opposed to merely processing or analyzing preexisting data are referred to as generative AI. Based on a set of data, these systems are able to learn and produce new material that shares similarities with the input data in terms of style and meaning (Jovanovic & Camp-bell, 2022).

A machine learning model that has been trained on a sizable image dataset is one instance of generative AI. After that, the model can produce fresh, unique photographs with a style that resembles the training set. Creating realistic visuals and text, as well as developing novel medications or materials, are just a few of the many uses for generative AI. Additionally, human transversal abilities like communication, problem-solving, and conflict resolution are mimicked or replaced by generative AI systems. An AI system equipped with natural language processing (NLP) skills, for instance, may comprehend interactions with customers, decipher their feelings, and respond in a kind and accommodating manner (Jaiswal et al., 2022). Additionally, by gaining knowledge from customer interactions, it may gradually enhance its responses and offer individualized customer care that is catered to the specific requirements of each client.

Certain human abilities, like creativity, problem-solving, and reasoning, can be replicated by other generative AI systems. ChatGPT is one instance of this, which generates dialogues that seem human via natural language generation. These AI systems, which combine computer vision and natural language processing (NLP) to create graphics from text descriptions (like DALL-E 2), can replicate or even replace human creativity and thought processes. They also use techniques like sentiment analysis. These systems have the ability to grow in accuracy by learning from their errors. They can also generate imaginative visuals that go beyond the text query's parameters. "Edge AI" is a representation of another recent advancement. Edge computing, or edge AI, is the application of AI technologies that have their processing capacity at a network's edge.

Moreover, AI is essential for paving the path for "Industry 5.0." Industry 5.0 describes the automation and data sharing trend that is currently occurring in manufacturing technologies, such as cyber-physical systems, artificial intelligence (AI), and the Internet of Things (IoT). Al Mubarak (2022) examines the advantages and disadvantages of human-machine interactions in the context of Industry 5.0 through a study of the literature, with a particular emphasis on work-based learning. The author makes the case that technology can support human labor, increasing productivity and efficiency while also creating chances for career security and upskilling. But in order to actually reap these benefits, managerial changes will need to be made to address ethical, psychological, and legal concerns.

Ethics and Threats of AI in Career Counseling

According to Tsekleves et al. (2017), guiding professionals were urged to identify some unintended and adverse effects of the service concepts they and their colleagues had proposed, following their projected encounter with AI scenarios. These remarks highlighted the dangers of overusing or misusing AI (Floridi et al., 2018). There was no worry expressed by any of the participants regarding possible underuse, which creates opportunity costs because the advantages of technology would not be realized (Floridi et al., 2018).

Concerns about quality, control, shifting roles, privacy, confidentiality, and equality in career counseling services were voiced by staff members. They also mentioned the skills and resources needed to deliver AI-enabled services. Less direct comments regarding moral dilemmas were expressed by students. Students expressed a desire for transparency when they received comments regarding AI-powered suggestions during trials, specifically raising concerns about the data used and the algorithms' workings. In the realm of education, policy efforts have recently focused on sustainable development and the concerns connected with artificial intelligence (Pedró et al., 2019; European Commission, 2021). The specific dynamics and potential of AI in career guidance are not yet covered by this. The European Commission's latest AI ethics guidelines (n.d.) could be used as a model to set common standards for AI developers and advisory personnel.

Conclusion

The current state of technology and its effects on society present numerous educational challenges. In addition to developing AI to better comprehend the education domain, there is a need to prepare organizations, staff, and students for AI-enabled education. Human-computer interaction, robotics, computer science, psychology, and teamwork were all incorporated into this multidisciplinary review. The future of the worker-AI relationship and the necessary competencies for worker-AI coexistence in the workplace suggest that workplace AI will replace low- and moderate-level knowledge-centered tasks. Even now-mastered worker skills like "analytical decision-making" are predicted to change over the next 20 years to be replaced by intelligent systems. However, this is dependent on an organization's capacity to consistently implement AI applications in the workplace. The outcomes of this study can be used to develop and create technology-assisted career advisory services and to track the adoption and effectiveness of AI interventions. The planning of intelligent technology use and ongoing evaluation of it are supported by this concept. The advancement ought to align with the digitalization tactics employed in tertiary education and the roadmaps for artificial intelligence. This study mapped out potential areas for future research as well as the criteria and opportunities for utilizing AI in career counseling. With its ability to expand and change services and methods, technology is more than just a tool for advice. Depending on user demands, staff competencies, and organizational capacity to leverage technology, AI can assist students and staff in a variety of ways within career guidance services.

Acknowledgments

Dr.K.R. Padma solely drafted the paper. The author is thankful to the Department of Biotechnology Sri Padmavati Mahila Visvavidyalayam (Women's University), Tirupati-India for constant support.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

References

Aleksander, I., (2017). Partners of humans: a realistic assessment of the role of robots in the foreseeable future. J. Inf. Technol.; London 32 (1), 1–9.

Ameen, N., Sharma, G.D., Tarba, S., Rao, A. and Chopra, R., (2022). Toward advancing theory on creativity in marketing and artificial intelligence. Psychology & Marketing, [e-journal] 39(9), pp. 1802-1825. https://doi.org/10.1002/mar.21699.

Aoki, N., (2021). The importance of the assurance that "humans are still in the decision loop" for public trust in artificial intelligence: evidence from an online experiment. Comput. Hum. Behav. 114 https://doi.org/10.1016/j.chb.2020.106572. Scopus.

Arslan, A., Cooper, C., Khan, Z., Golgeci, I., Ali, I., (2021). Artificial intelligence and human workers interaction at team level: a conceptual assessment of the challenges and potential HRM strategies. Int. J. Manpow. https://doi.org/10.1108/IJM-01- 2021-0052.

Balsmeier, B., Woerter, M., (2019). Is this time different? How digitalization influences job creation and destruction. Res. Pol. 48 (8), 103765 https://doi.org/10.1016/j. respol.2019.03.010.

Banziger, T., Kunz, A., Wegener, K., (2018). Optimizing human–robot task allocation using a simulation tool based on standardized work descriptions. J. Intell. Manuf. https:// doi.org/10.1007/s10845-018-1411-1.

Bhattacharyya, S.S., Nair, S., (2019). Explicating the future of work: perspectives from India. J. Manag. Dev. 38 (3), 175–194. https://doi.org/10.1108/JMD-01-2019- 0032.

Borges, A.F.S., Laurindo, F.J.B., Spínola, M.M., Gonçalves, R.F., Mattos, C.A., (2021). The strategic use of artificial intelligence in the digital era: systematic literature review and future research directions. Int. J. Inf. Manag. 57, 102225 https://doi.org/10.1016/j.ijinfomgt.2020.102225.

Botha, A.P., (2019). A mind model for intelligent machine innovation using future thinking principles. J. Manuf. Technol. Manag. 30 (8), 1250–1264. https://doi.org/10.1108/ JMTM-01-2018-0021.

Braganza, A., Chen, W., Canhoto, A. and Sap, S., (2021). Productive employment and decent work: The impact of AI adoption on psychological contracts, job engagement and employee trust. Journal of Business Research, [e-journal] 131, article no. 485-494. https://doi.org/10.1016/j.jbusres.2020.08.018.

Butler, D. (2016). Tomorrow's world: Technological change is accelerating today at an unprecedented speed and could create a world we can barely begin to imagine. Nature, 530(7591), 398-402. https://doi.org/10.1038/530398a.

Chuang, S., Graham, C.M., (2018). Embracing the sobering reality of technological influences on jobs, employment and human resource development: a systematic literature review. Eur. J. Training Dev. 42 (7/8), 400–416. https://doi.org/10.1108/EJTD-03-2018-0030.

Chuang, S., (2020). An empirical study of displaceable job skills in the age of robots. Eur. J. Training Dev. https://doi.org/10.1108/EJTD-10-2019-0183.

Cheatham, B., Cosmas, A., Mehta, N., Shah, D., (2020). How to Build AI with (and for) Everyone in Your Organization. McKinsey & Company shorturl.at/mquF2.

Davenport, T., Ronanki, R., (2018). Artificial intelligence for the real world. Harv. Bus. Rev. 96 (1), 108–116.

Desouza, K.C., Dawson, G.S., Chenok, D., (2020). Designing, developing, and deploying artificial intelligence systems: lessons from and for the public sector. Bus. Horiz. 63 (2), 205–213. https://doi.org/10.1016/j.bushor.2019.11.004.

European Commission (2021). Proposal for a Regulation laying down harmonised rules on Artificial Intelligence. COM (2021) 206. https://digitalstrategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rulesartificial-intelligence.

Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Charezand, P.,Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P., & Vavena, E. (2018). AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. Minds & Machines, 28, 689–707.https://doi.org/10.1007/s11023-018-9482-5.

Fong, J., Ocampo, R., Gross, D.P., Tavakoli, M., (2020). Intelligent robotics incorporating machine learning algorithms for improving functional capacity evaluation and occupational rehabilitation. J. Occup. Rehabil. 30 (3), 362–370. https://doi.org/ 10.1007/s10926-020-09888-w.

Fukumura, Y.E., Gray, J.M., Lucas, G.M., Becerik-Gerber, B. and Roll, S.C., (2021). Worker Perspectives on Incorporating Artificial Intelligence into Office Workspaces: Implications for the Future of Office Work. International Journal of Environmental Research and Public Health, [e-journal] 18(4), article no. 1690. https://doi.org/ 10.3390/ijerph18041690.

Garg, S., Sinha, S., Kar, A.K., Mani, M., (2021). A review of machine learning applications in human resource management. Int. J. Prod. Perform. Manag. https://doi.org/10.1108/IJPPM-08-2020-0427. *ahead-of-print*(ahead-of-print).

Gekara, V.O., Nguyen, V.-X.T., (2018). New technologies and the transformation of work and skills: a study of computerisation and automation of Australian container terminals. New Technol. Work. Employ. 33 (3), 219–233. https://doi.org/10.1111/ntwe.12118.

Glikson, E., Woolley, A.W., (2020). Human trust in artificial intelligence: review of empirical research. Acad. Manag. Ann. 14 (2), 627–660. https://doi.org/10.5465/ annals.2018.0057.

Grimpe, C., Sofka, W., Kaiser, U., (2022). Competing for digital human capital: the retention effect of digital expertise in MNC subsidiaries. J. Int. Bus. Stud. https://doi.org/10.1057/s41267-021-00493-4.

Henkel, A.P., Bromuri, S., Iren, D., Urovi, V., (2020). Half human, half machine –augmenting service employees with AI for interpersonal emotion regulation. J. Serv. Manag. 31 (2), 247–265. https://doi.org/10.1108/JOSM-05-2019-0160.

Hupfer, S., (2020). Talent and workforce effects in the age of AI. Deloitte shorturl.at/ lpvC3.

Illanes, P., Lund, S., Mourshed, M., Rutherford, S., Tyreman, M., (2018). Retraining and Reskilling Workers in the Age of Automation. McKinsey Global Institute shorturl.at/DEQ79.

Jain, M., Goel, A., Sinha, S. and Dhir, S., (2021). Employability implications of artificial intelligence in healthcare ecosystem: responding with readiness. Foresight, [e-journal] 23(1), pp. 73-94. https://doi.org/10.1108/FS-04-2020-0038.

Jaiswal, A., Arun, C. J., & Varma, A. (2022). Rebooting employees: Upskilling for artificial intelligence in multi-national corporations. International Journal of Human Resource Management, 33(6), 1179-1208. https://doi.org/10.1080/09585192.2021.1891114

Jetha, A., Bakhtari, H., Rosella, L.C., Gignac, M.A.M., Biswas, A., Shahidi, F.V., Smith, B.T., Smith, M.J., Mustard, C., Khan, N., Arrandale, V.H., Loewen, P.J., Zuberi, D., Dennerlein, J.T., Bonaccio, S., Wu, N., Irvin, E. and Smith, P.M., (2023). Artificial intelligence and the work–health interface: A research agenda for a technologically transforming world of work. American Journal of Industrial Medicine, [e-journal] 66(10), pp. 815-830. https://doi.org/10.1002/ajim.23517.

Jovanovic, M., & Campbell, M. (2022). Generative artificial intelligence: Trends and prospects. Computer, 55(10), 107-112. https://doi.org/10.1109/MC.2022.3192720.

Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. Business Horizons, 62(1), 15-25. https://doi.org/10.1016/j.bushor.2018.08.004.

Klotz, F., (2016). Are you ready for robot colleagues? MIT Sloan Manag. Rev. 58 (1). Cambridge.

Klotz, F., (2018). How AI can amplify human competencies. MIT Sloan Manag. Rev. 60 (1),14–15.

Kokina, J., Blanchette, S., (2019). Early evidence of digital labor in accounting: innovation with robotic process automation. Int. J. Account. Inf. Syst. 35, 100431 https://doi.org/10.1016/j.accinf.2019.100431.

Laat, M D; Joksimovic S; Ifenthaler D. (2020). Artificial intelligence, real-time feedback and workplace learning analytics to support in situ complex problem-solving: a commentary. Emerald Publishing. International Journal of Information and Learning Technology. 37(5):267-277. DOI:10.1108/IJILT-03-2020-0026.

Li, S., Da Xu, L., & Zhao, S. (2018). 5G internet of things: A survey. *Journal of Industrial Information Integration, 10*, 1–9.

Li, L. (2020). Education supply chain in the era of Industry 4.0. Systems. Research and Behavioral Science, 37(4), 579–592.

Li, L., & Zhou, H. (2020). A survey of blockchain with applications in maritime and shipping industry. Inf Syst E-Bus Manage. https://doi. org/ 10. 1007/ s10257- 020- 00480-6.

Makarius, E.E., Mukherjee, D., Fox, J.D., Fox, A.K., (2020). Rising with the machines: a sociotechnical framework for bringing artificial intelligence into the organization. J. Bus. Res. 120, 262–273. https://doi.org/10.1016/j.jbusres.2020.07.045. Scopus.

Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2018). *Foundations of machine learning*. MIT press. https://mit-press.mit.edu/9780262039406/foundations-of-machine-learning/.

Morandini, S., Fraboni, F., De Angelis, M., Puzzo, G., Giusino, D. and Pietrantoni, L., 2023. The Impact of Artificial Intelligence on Workers' Skills: Upskilling and Reskilling in Organisations. Informing Science: The International Journal of an Emerging Transdiscipline, [e-journal] 26, pp. 039-068. https://doi.org/10.28945/5078.

Naudé, W., (2021). Artificial intelligence: neither Utopian nor apocalyptic impacts soon. Economics of Innovation and New Technology, [e-journal] 30(1), pp. 1-23. https://doi.org/10.1080/10438599.2020.1839173.

Ore, O. and Sposato, M., (2022). Opportunities and risks of artificial intelligence in recruitment and selection. International Journal of Organizational Analysis, [e-journal] 30(6), pp. 1771-1782. https://doi.org/10.1108/IJOA-07-2020-2291.

Pedró, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial Intelligence in education: Challenges and opportunities for sustainable development. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000366994.

Rahman, A., & Abedin, M. J. (2021). The fourth industrial revolution and private commercial banks: The good, bad and ugly. International Journal of Organizational Analysis 29(5), 1287-1301. https://doi.org/10.1108/IJOA-05-2020-2218.

Raisch, S., Krakowski, S., 2021. Artificial intelligence and management: the automation–augmentation paradox. Acad. Manag. Rev. 46 (1), 192–210. https://doi.org/10.5465/amr.2018.0072.

Ransbotham, S., (2020). Reskilling Talent to Shrink Technology Gaps. MIT Sloan Management Review. https://sloanreview.mit.edu/article/reskilling-talent-to-shrink-technology-gaps/.

Regona, M., Yigitcanlar, T., Xia, B. and Li, R.Y.M., (2022). Opportunities and Adoption Challenges of AI in the Construction Industry: A PRISMA Review. Journal of Open Innovation: Technology, Market, and Complexity, [e-journal] 8(1), article no. 45. https://doi.org/10.3390/joitmc8010045.

Richards, D., (2017). Escape from the factory of the robot monsters: agents of change. Team Perform. Manag.: Int. J. 23 (1/2), 96–108. https://doi.org/10.1108/TPM-10-2015-0052.

Sarah Bankins, Xinyu Hu, Yunyun Yuan. (2024). Artificial Intelligence, Workers, and Future of Work Skills. Current Opinion in Psychology. 1-10. https://doi.org/10.1016/j.copsyc.2024.101828.

Shrestha, Y.R., Krishna, V., von Krogh, G., (2021). Augmenting organizational decisionmaking with deep learning algorithms: principles, promises, and challenges. J. Bus. Res. 123, 588–603. https://doi.org/10.1016/j.jbusres.2020.09.068.

Siau, K., Wang, W., (2018). Building trust in artificial intelligence, machine learning, and robotics. Cutter Bus. Technol. J. 31 (2), 47–53.

Sousa, M.J., Wilks, D., (2018). Sustainable skills for the world of work in the digital age. Syst. Res. Behav. Sci. 35 (4), 399–405. https://doi.org/10.1002/sres.2540.

Sowa, K., Przegalinska, A., Ciechanowski, L., (2021). Cobots in knowledge work: human – AI collaboration in managerial professions. J. Bus. Res. 125, 135–142. https://doi.org/10.1016/j.jbusres.2020.11.038.

Stahl, B.C., Andreou, A., Brey, P., Hatzakis, T., Kirichenko, A., Macnish, K., Laulh´e Shaelou, S., Patel, A., Ryan, M., Wright, D., (2020). Artificial intelligence for human flourishing – beyond principles for machine learning. J. Bus. Res. https://doi.org/ 10.1016/j.jbusres.2020.11.030.
Tsekleves, E., Darby, A., Whicher, A., & Swiatek, P. (2017). Co-designing design fictions: A new approach for debating and priming future healthcare technologies and services. Archives of Design Research, 30(2), 5–21.https://doi.org/10.15187/adr.2017.05.30.2.5.

Tommasi, F., Perini, M., & Sartori, R. (2021). Multilevel comprehension for labor market inclusion: A qualita-tive study on experts' perspectives on Industry 4.0 competences. Education+ Training, 64(2), 177-189. https://doi.org/10.1108/ET-04-2021-0146.

Trenerry, B., Chng, S., Wang, Y., Suhaila, Z.S., Lim, S.S., Lu, H.Y., Oh, P.H., (2021). Preparing workplaces for digital transformation: an integrative review and framework of multi-level factors. Front. Psychol. 12, 620766 https://doi.org/10.3389/fpsyg.2021.620766.

Tursunbayeva, A. and Renkema, M., (2023). Artificial intelligence in health-care: implications for the job design of healthcare professionals. Asia Pacific Journal of Human Resources, [e-journal] 61(4), pp. 845-887. https://doi.org/10.1111/1744-7941.12325.

Xu, L., Xu, E., & Li, L. (2018). Industry 4.0: state of the art and future trends. *International Journal of Production Research, 56*(8),2941–2962.

Xu, L., He, W., & Li, S. (2014). Internet of things in industries: A survey. *IEEE Transactions on Industrial Informatics, 10*(4), 2233–2243.

Wilson, H.J., Daugherty, P.R., (2019). Creating the symbiotic AI workforce of the future. MIT Sloan Manag. Rev. 61 (1), 1–4. https://sloanreview.mit.edu/article/creating-th e-symbiotic-ai-workforce-of-the-future/.

Willcocks, L., (2020). Robo-Apocalypse cancelled? Reframing the automation and future of work debate. J. Inf. Technol. 35 (4), 286–302. https://doi.org/10.1177/ 0268396220925830.

Wu, H., Li, H., Fang, X., Luo, X., (2022). A survey on teaching workplace skills to construction robots. Expert Syst. Appl. 205, 117658 https://doi.org/10.1016/j.eswa.2022.117658.

Yang Shen & Xiuwu Zhang. (2024). The impact of artificial intelligence on employment: the role of virtual agglomeration. Humanities and Social Sciences Communications. https://doi.org/10.1057/s41599-024-02647-9.

Zirar, A., Ali, S. I., & Islam, N. (2023). Worker and workplace Artificial Intelligence (AI) coexistence: Emerging themes and research agenda. Technovation, 124, 102747. https://www.sciencedirect.com/science/article/pii/S0166497223000585.