Artificial Intelligence (AI) Adoption in the Medical Education during the Digital Era: A Review Article

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ABSTRACT

This study explains the essentials of artificial intelligence (AI) in medical education during the digital era. This article contains a comprehensive systematic review and content analysis. The literature and previous studies were obtained from various research articles on EBSCO, Google Scholar, Scopus, Web of Science, and ScienceDirect. The criteria for inclusion were studies that clearly defined artificial intelligence related to the medical education sector and were published in English with peer-reviewed. Five independent reviewers evaluated search results, extracted data, and the quality of the studies to summarise and report the findings. The results reveal that as the practice of medicine enters the era of AI, the use of data to improve clinical decision-making will increase, thereby increasing the need for skilled medicine-machine interaction. As the rate of medical knowledge growth accelerates, technologies such as AI are required to enable healthcare professionals to apply the knowledge in practice effectively. Medical professionals must receive adequate training on this new technology, its advantages to improving cost, quality, and access to healthcare, and its disadvantages, such as lack of transparency and liability. AI must be seamlessly integrated into the curriculum's various facets. The recommendation is to address the current state of education on AI in the medical curriculum. Moreover, both quantitative and qualitative studies are necessary for further research.

Keywords: *artificial intelligence, medical education, digital era, TAM, intention to use*

1. INTRODUCTION
1.1. Background of the Study
Artificial intelligence (AI) is a critical technology that has transformed personal and professional lives. Artificial refers to something created by humans, and intelligence refers to the ability to think for oneself, resulting in the definition of artificial intelligence as "thinking

power created by humans" (Nowak et al., 2018; Limna et al., 2021). Many AI-powered technologies have been developed with the potential to significantly improve the economy by improving the quality of life in many sectors, such as healthcare (Puaschunder, 2019; Sitthipon et al., 2022), tourism and hospitality (Tong-On et al., 2021; Limna, 2022), as well as education (Wogu et al., 2018; Yang, 2019). AI plays an essential role in the education sector because of its potential to support learning in a variety of contexts. Artificial intelligence (AI) has gained prominence in the educational community in recent years. AI in education has demonstrated technological advances, theoretical innovations, and successful pedagogical impact through diverse applications such as intelligent tutors for content delivery, feedback provision, and progress supervision (Limna et al., 2022). Changes brought about by the evolution of Industry 4.0 and Society 5.0 will continue to impact all facets of human life. The modern lifestyle increasingly emphasises efficiency and practicability. Industry 4.0 and Society 5.0 encourage the emergence of various new consumer services, such as online transportation, food delivery applications, e-commerce, etc., to meet daily needs. YouTubers, vloggers, copywriters, social media officers, and content writers are new types of work that have emerged in recent years due to the digital era (Sudibjo et al., 2019; Phetnoi et al., 2021). In the digital age, education has become a new challenge for teachers to address. If the learning system still employs a traditional approach, it may lag the modern education system. In the digital age, learning and teaching are conducted in the classroom and via digital media, online, and teleconference. However, the students must be governed by their teachers for them to select positive aspects of technological progress. And as the primary role, teachers must be vigilant and more thoughtful than students in technical matters (Fanreza, 2018). Thus, the studies about AI in education are crucial in the digital era, especially AI adoption in medical education. It is needed to find the appropriate strategies for AI adoption for medical education explained by the TAM model.

2. LITERATURE REVIEW
2.1. Teaching and Learning During the Digital Era
In today's education, technology must be embraced. Teachers must incorporate it into their students' education. The students and teachers are currently teaching and learning via the transformation of education in the digital era (Hashim, 2018). The digital revolution is altering works, organisations, and daily routines. It transforms how students play, access information, communicate and learn. However, this revolution has not yet changed most classroom teaching and learning processes. Education plays a crucial role in enhancing competitiveness and reducing unemployment, and what can policymakers do to maximise the benefits of emerging technologies in education while minimising their disadvantages (Lonka & Cho, 2015). It revolutionises how students play, information search, communicate, learn, relearn, and unlearn. Nonetheless, this revolution has permeated the education sector, including the school, college, and university levels. Currently, the educators discuss using interactive whiteboards, hybrid, or blended learning, flipped classrooms, digital libraries, etc., concerning teaching and learning processes (Sharma, 2018). Artificial Intelligence (AI) expertise will become increasingly crucial for careers in science and engineering. The innovative educational project for teachers and students is based on fundamental artificial intelligence concepts. AI-course with theoretical and practical components covering major topics (problem-solving, search, planning, graphs, data structures, automata, agent systems, and machine learning) is essential (Burgsteiner et al., 2016). AI can expedite individualised education and support for students with special needs. Among the most promising applications at the system level is predictive analysis to reduce dropout rates and evaluate new skill sets.

AI and digitalisation have also increased the demand for complex skills that are difficult to automate, such as creativity and critical thinking. To realise the full potential of AI, stakeholders must have faith not only in the technology itself but also in how humans will employ it. It creates new policy challenges surrounding "trustworthy AI," including the privacy and security of data and the potential misuse of data that leads to discrimination against individuals or groups (Vincent-Lancrin & van der Vlies, 2020). The priority directions for the transformation of education will enable the successful adaptation of the education system, notably higher education, to the needs of the information society (Kovalev, 2018). Therefore, teaching and learning in the digital era relate to technology and innovation, also in medical education.

2.2. The Essentials of Artificial Intelligence (AI) in Medical Education

Teaching paradigms in medical schools and residencies are currently undergoing a shift. The increasing quantity of medical information and research makes it challenging for medical education to maintain an up-to-date curriculum. As patients become increasingly concerned that medical students and residents are "practising" on them, the emphasis of clinical medicine is shifting from bedside teaching and education to patient safety and quality. Educators have responded to these challenges by reorganising curricula, creating small-group sessions, and promoting self-directed learning and independent research. Despite this, there is still a disconnect between the classroom and the clinical environment (Okuda et al., 2009). The information overload crisis among learners is exacerbated by physicians now collaborating with and managing artificial intelligence (AI) applications that aggregate data, generate diagnostic and treatment recommendations, and assign confidence ratings to requests. Therefore, medical school curricula should be revised to emphasise knowledge management (rather than information acquisition), the effective use of artificial intelligence, enhanced communication, and the cultivation of empathy (Wartman & Combs, 2019). The AI era will likely profoundly affect the current healthcare system. Electronic Medical Records (EMRs) that allow for the storage, processing, and interpretation of large amounts of data indicate a great potential for improvement in health care. Devices are likely to outperform humans significantly cognitively, and physicians must prepare to practice in a technologically enhanced environment to accept this reality. In the not-too-distant future, AI will likely play a pivotal role in health care, with everything revolving around its mechanics. The era of artificial intelligence envisions new roles for physicians, and health professionals must realise the importance of interacting with these machines efficiently. Psychology and empathy should play a central role in patient care, and medical students should be equipped with these relevant skills (Srivastava & Waghmare, 2020). Artificial intelligence (AI) has emerged rapidly as a field poised to impact nearly every aspect of medicine, particularly radiology (Lindqwister et al., 2021). Additionally, using artificial intelligence (AI) in dentistry is a reality. Using haptic gloves to allow dental students to feel virtual objects while practising suturing or giving a nerve block is a significant advancement; this can significantly improve the students' technique over time and provide immediate feedback regarding needle point insertion, for example. Although initial costs for such systems may appear high, the hardware is cost-effective in the long run (Locurcio, 2022).

2.3. TAM Model and Intentions to Use Artificial Intelligence (AI) in Medical Education

AI in medicine will generate numerous application opportunities to enhance patient care, provide real-time data analytics, and enable continuous patient monitoring. Clinicians and health informaticians should familiarise themselves with machines and deep learning. In

addition, they must have a solid foundation in data analytics and visualisation to use, evaluate, and develop AI applications in clinical practice (Sapci & Sapci, 2020). The Technology Acceptance Model (TAM) addresses the factors, specifically perceived ease of use, perceived usefulness, attitude toward use, and behavioural intention to use. It revealed that managerial, organisational, operational, and IT infrastructure factors positively impact the perceived ease of use and usefulness of AI projects in medical education (Alhashmi et al., 2020). Two relevant beliefs are identified by TAM: perceived ease of use and perceived usefulness. Perceived ease of use is the extent to which an individual believes that using the system will be effortless. In contrast, perceived usefulness is the extent to which an individual believes using the system will improve job performance. According to the TAM, the usage of information technology is influenced by behavioural intention to use the technology, which is jointly determined by perceived usefulness and attitude toward technology usage. TAM model was used to explore the factors affecting the intention to use telecare systems (Su et al., 2013). Therefore, AI adoption in medical usage could be related to the factors of the TAM model affecting intentions to use AI in medical education.

3. RESEARCH METHODOLOGY

Narrative synthesis is the systematic review and synthesis of findings from multiple studies that heavily rely on words and text to summarise and explain the synthesis's findings (Jaipong et al., 2022; Limna, 2022). Therefore, in this review article, a narrative synthesis and a systematic literature review were conducted to identify management models using the document-based method and content analysis. The literature and data were obtained from EBSCO, Google Scholar, Scopus, Web of Science, and ScienceDirect databases published in English. Moreover, they were peer-reviewed from purposive sampling by information collected between May 30 and July 15, 2022. A list of AI, big data analytics and medical education keywords was developed for data searching.

4. RESULTS

Physicians now collaborate with and manage artificial intelligence (AI) applications that aggregate data, generate diagnostic and treatment recommendations, and assign confidence ratings to requests, exacerbating the information overload crisis among learners. Therefore, medical school curricula should be revised to emphasise knowledge management (rather than information acquisition), the efficient application of artificial intelligence, improved communication, and the cultivation of empathy. The AI era is likely to significantly impact the current healthcare system. Electronic Medical Records (EMRs) that permit the storage, processing, and interpretation of large amounts of data indicate a significant opportunity for healthcare improvement. Cognitively, devices are likely to significantly outperform humans, and physicians must be prepared to practice in a technologically advanced environment. Shortly, AI will likely play a central role in health care, with everything revolving around its mechanics. The era of artificial intelligence will create new roles for physicians, and health professionals must recognise the significance of interacting with these machines effectively. Psychology and empathy should play a central role in patient care, and medical students should be equipped with the requisite competencies. Artificial intelligence (AI) has emerged rapidly as a field poised to influence virtually every aspect of medicine, including radiology. Moreover, using artificial intelligence (AI) in dentistry is feasible. Utilising haptic gloves to allow dental students to feel virtual objects while practising suturing or administering a nerve block is a significant advancement; this can significantly improve the students' technique over

time and provide immediate feedback regarding, for instance, needlepoint insertion. Although initial costs may appear high for such systems, the hardware is cost-effective over time.

5. CONCLUSION

The Technology Acceptance Model (TAM) addresses these factors: perceived ease of use, perceived usefulness, attitude toward use, and intention to use. It was confirmed that managerial, organisational, operational, and IT infrastructure factors positively impact AI projects' perceived usefulness and ease of use in medical education. TAM identifies two relevant beliefs: perceived ease of use and perceived usefulness. Perceived ease of use is the degree to which a user believes that using the system will be simple. In contrast, perceived usefulness is the extent to which a person believes using the system will enhance job performance. According to the TAM, information technology usage is influenced by behavioural intention to use the technology, jointly determined by perceived usefulness and attitude toward technology usage. The TAM model was utilised to investigate the factors influencing the intention to utilise telecare systems and AI adoption in medical education. Therefore, AI adoption in medical applications is related to the TAM model's factors influencing intentions to use AI in medical education.

6. RECOMMENDATION

This systematic review may not explain the relationship between the TAM model and the intention to use AI in medical education. Therefore, it is recommended to investigate qualitative and quantitative approaches to clarify the intention to use AI in medical education in further research.

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