Operational Research in Engineering Sciences: Theory and Applications
Vol. 7, Issue 2, 2024, pp. 355-372
ISSN: 2620-1607
eISSN: 2620-1747
DOI: https://doi.org/10.31181/oresta/070217

LEVERAGING ARTIFICIAL INTELLIGENCE IN VIRTUAL EDUCATION: A DECISION SCIENCES PERSPECTIVE ON CHALLENGES AND OPPORTUNITIES

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Received: 11 February 2024
Accepted: 10 June 2024
First Online: 30 June 2024

Research Paper

Abstract: *The study focused on the role of decision sciences in enhancing education outcomes through integrating artificial intelligence (AI) with the Internet of Things (IoT). The objective was to explore how AI applications and related challenges influence university students' decision-making processes in virtual education which aligns with the decision sciences framework of improving efficiency and accuracy through data and predictive analytics. For this purpose, quantitative data was collected from 100 students through survey instruments using a purposive sampling technique. The descriptive results show that AI can modify content which could promote collaborative learning and also increase the ability of decision making. In other contexts, challenges, like over reliance on AI, limited awareness towards AI, and ethical issues show deeper insights into the curriculum. The integration of IOT offered a promising solution through providing real-time data collection and feedback which could address concerns about bias, over-reliance, and critical thinking. The study with findings contributed that incorporating AI and IoT into educational curriculums could increase decision making, and resource allocation while addressing challenges like over reliance and bias. Research limitations and future directions were also discussed at the end of the study.*

Keywords: *E-learning; Decision Making; Internet of Things; Artificial Intelligence; Virtual Learning.*

1. Introduction

In the field of decision sciences, data driven insights and evidence based choices play a critical role in enhancing efficiency, optimizing processes, and improving

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outcomes (Storey et al., 2024). Decision sciences focus on leveraging data, analytics, and mathematical modeling to drive effective decision making across different sectors (Brous & Janssen, 2020). Within this context, Internet of things (IOT) is known as a system wireless network consisting of thousands of devices to share, collect, create, and receive various kinds of information (Laghari et al., 2021). The IOT has created a space that people use to create new information physical constraints and communicate in a variety of ways (Kassab et al., 2020). Digital solutions have been exponentially adopted in many sectors due to broadband connection access and rapid technological development (Al-Emran et al., 2020). E-learning platforms emerged early in the 21st century. This is the reason, IoT is made up of these devices, anything from small sensors to cellphones, sensors to huge systems that link them, or physical objects that extend their qualities into virtual space. It is a blessing for learning that ensures a better and collaborative learning future in schools and an ever-changing dynamic in learning and holding online classes (Jan & Khan, 2021). The adaptation of digital tools promotes inclusive education as well as more efficient and comprehensive traditional educational systems. In a nutshell, IoT has revolutionized the world of education (Jan & Khan, 2021).

The application of artificial intelligence (AI) in virtual learning has reaped significant attention in recent decades as a unique technology in the education sector. By offering several facilities, such as data analytics, decision intelligence, intelligent communication, and automated systems, AI has been able to improve online education and learning processes through advanced algorithms and models (Zhai et al., 2021). Due to the simulations done by the student with a teacher, AI can have better virtual training efficiency and increase academic progress (Chen et al., 2022). AI technology has been deployed to improve student evaluation in virtual education, and this technology not only saves teaching time for professors but also ensures fast and continuous evaluation of students (Savaş, 2021). Combining virtual reality technology with artificial intelligence creates a better and deeper learning experience in virtual education for students (Vincent-Lancrin & Van der Vlies, 2020).

A major challenge in AI based virtual learning is to provide personalized learning for each student. To overcome the above challenge, the learning process is optimized based on individuals' different needs, abilities, and learning approaches (Xu & Ouyang, 2022). In virtual learning, most students struggle with some problems, such as reduced concentration and lack of involvement (Gao et al., 2021). A fundamental challenge is to apply AI to design and present content and tasks capable of attracting and stimulating students (Ouyang et al., 2022). Furthermore, accurately identifying strengths and weaknesses, predicting achievement, and providing appropriate feedback are some of the challenges facing accurate student performance measurement and assessment (Alam, 2022). Given the abovementioned challenges, the application of AI in virtual learning is an essential applied research area since it presents new opportunities and necessitates fundamental advances in their realization (Sun et al., 2021). Virtual learning emerged as an effective method for knowledge and information transfer to students and researchers worldwide in tandem with the rapid advancement of technology (Seo et al., 2021). AI technology helps improve the developed virtual learning process and student educational and learning experiences (Seo et al., 2021). A combination of AI and virtual learning poses a challenge for future education studies and developments.

Previous studies show that virtual education has been used dramatically with the

use of AI in virtual education has increased learning and improved educational efficiency. Through studying the findings of the research, the continuous use of AI system in the field of e-learning has created many challenges and problems (Ali & Abdel-Haq, 2021). The use of AI has been approved in many fields. The most important of which is to use in the discussion of virtual education and academic progress (Baidoo-Anu & Ansah, 2023). According to the mentioned contents, one of the most important needs of using artificial intelligence in the field of electronic education is the ability to personalize education for each student (Mhlanga, 2023). By designing new systems in the field of artificial intelligence, students can understand and examine their academic and educational deficiencies for each student according to the needs of each student (Dogan et al., 2023). Modern educational systems that use AI have solved the existing challenges and improved the education and academic progress of students (Jin et al., 2023).

Despite the significant body of literature on AI applications in education, several empirical gaps existed in the previous literature particularly in the context of virtual education. Prior studies have largely focused on AI implementations in traditional classroom settings rather than fully virtual learning environments. For example, Vinay (2023) explored the potential of AI driven tutoring systems in physical classrooms but offered limited insights into their impact on remote or virtual learning contexts, leaving a gap in understanding AI's role in digital only platforms. Similarly, Wardat et al. (2024) examined AI's potential to personalize learning content in mixed-mode education but did not address the specific challenges or benefits presented by AI in fully virtual settings, such as online universities or remote learning platforms. Moreover, while many studies have concentrated solely on AI, the integration of AI with the Internet of Things (IoT) remains underexplored in education (Alhumaid et al., 2023; Wang et al., 2023). The combination of these technologies can offer enhanced data-driven insights and real-time feedback mechanisms that are crucial for virtual learning (Mogavi et al., 2023). These previous studies little attention to IOT and AI and have little empirical evidence which leaves a gap. Therefore, this study has mainly focused on the integration of AI and IoT in one study with adoption and challenges in the context of virtual education. Furthermore, most research to date has relied heavily on content analysis or qualitative methodologies (Alhumaid et al., 2023; Ali et al., 2024; Mogavi et al., 2023), with few studies adopting quantitative approaches to measure AI's effectiveness or integration within virtual education environments. Moreover, previous studies also mainly focused on the impact of AI technology adoption or challenges in separate studies. Have rarely both dimensions been studied concurrently within a single framework (Alhumaid et al., 2023; Ali et al., 2024; Mogavi et al., 2023). This narrow scope limits an understanding of how AI systems, especially when integrated with IoT, can address challenges while simultaneously driving adoption in virtual education. Bridging this gap would provide a more nuanced view of how AI and IoT collectively enhance educational delivery, student engagement, and institutional efficiency. Thus, based on this study the following two research questions have been formulated.

Question.1 How is Artificial Intelligence being applied to enhance the learning experience and educational outcomes in virtual education environments?

Question.2 What are the primary challenges faced by learners when integrating Artificial Intelligence into virtual education platforms?

This research has important implications as it attempts to address the important gap in understanding the role of artificial intelligence (AI) in a fully virtual learning environment, which is built upon its integration with the Internet of Things (IoT) will emphasize integration. -Provide transformational insights into improving feedback strategies, personalization and instructional delivery, ultimately increasing student engagement and organizational effectiveness in online learning The course also contributes by means of measuring the impact of AI on virtual learning outcomes, and providing empirical clarity beyond the primary qualitative focus previous research. Furthermore, examining both the adoption and implementation challenges of AI in an integrated framework would provide a comprehensive view of its capabilities and limitations, and provide better strategies for effective integration in a virtual teaching environment. The study was further divided into five chapters, literature review where both of theoretical and empirical studies discussed. Next chapter was related to research methodology where discussed about the research design and research approach. Next chapter discussed about the data analysis and results. Last chapter consisted of discussion and implications of the study.

2. Literature Review

Decision sciences is an interdisciplinary discipline that focuses on the use of quantitative data and analytical techniques to support decision making in business and organizational settings encompassing mathematics, statistics, data analysis, and business science together to solve complex problems (Storey et al., 2024). Artificial intelligence (AI) is emerging as a subfield in decision science, enhancing decision-making processes with advanced algorithms and machine learning models to analyze big data, identify patterns, and make and execute decisions with precision works well (Yousaf et al., 2023). AI is the simulation of human mental processes by machines, especially computer systems which is enabling tasks such as learning, reasoning, problem solving and decision making etc. It encompasses various technologies such as machine learning, nature in speech processing and robotics (Hajkowicz et al., 2023). AI will play a central role in decision science for education through personalizing learning experiences, predicting student performance, and optimizing the allocation of educational resources, enhancing faculty and staff decision making (Teng et al., 2023).

Combining the internet of things (IoT) with artificial intelligence (AI) to provide improved decision making in the educational environment is widely accepted IoT enables real time data collection through touch devices together such as on smart sensors, wearables, and connected learning devices (Seungjik, 2024). These information can offer treasured insights into pupil behaviors, career plans, and course options. AI algorithms may want to then examine this massive statistics set to deliver a customised learning enjoy, making choices primarily based on each student's desires (Meylani, 2024). In choice sciences, capacity of AI to investigate massive data sets and monitor styles for choice making at person and organizational ranges. It can pick out progress, become aware of ability gaining knowledge of gaps, and advise private interventions (Gupta et al., 2022). This integration allows for a more flexible, responsive learning environment that not only meets the needs of the individual student but also provides quality education options in institutions (Sharda et al., 2021).

Moreover, the integration of IoT and AI can significantly enhance decision making in the management of educational institutions (Ahuja & Bala, 2021). IoT provides real-time data from classrooms, universities and the internet, while AI analyzes this data to make predictions and drive decisions on resource allocation, curriculum and design (Mohanty et al., 2023). This data driven approach helps to the instructors to make more effective decisions that help to improve the operational efficiency (Trung et al., 2021).

This is further argued that AI could helped to indentify the students patterns about the success and learning material allocation (Wangoo & Reddy, 2020). Additionally, AI systems, when supported by IoT can address ethical concerns such as data privacy, fairness, and transparency by enabling greater monitoring and accountability in decision-making processes (Kamruzzaman et al., 2023). Through improving the accuracy and speed of decision-making, AI and IoT together improve the overall management of educational environments, which makes them more efficient and effective needs of students and teachers (Ahuja & Bala, 2021).

Besides, other research have also proven the blessings of the use of AI in schooling in improving the student's learning (Zhai et al., 2021). They in addition emphasized that AI is an crucial component's to enhance the career of the students. İpek. İpek et al (2023) also in addition recommended that mathematical intelligence instructions also create upgrades that offer customized educational support that's substantially improve efficiency. Alhumaid et al (2023) also confirmed that AI algorithms should track scholar development and modify studying as a consequence in favored ways, and so growing comprehension and academic retention. Khreisat et al (2024) Additionally investigated using AI as a virtual assistant in on line guidance and discovered that those equipment assist boom student interplay and engagement. AI applications simulate real-international scenarios and provide instant support. In addition to this in addition research additionally investigated and that they observed that AI will increase the educational achievement of students (Yu et al., 2023). These studies highlighted that AI affords the capability to create dynamic, attractive gaining knowledge of reviews that encourage active involvement and preserve student hobby which results in improve the instructional achievement.

The role of AI in providing more efficient and effective information and analysis is another key area which is identified by (Yu et al., 2023). They found that competent feedback mechanisms to monitor students' progress and accordingly helped them to improve their academic records. Additionally, Yu & Guo, (2023) also highlighted that AI's ability to monitor students' learning journeys and detect performance improvements over time has been shown to help teachers to make decisions. Yu & Guo, (2023) highlighted that how AI-enabled learning analytics can improve teaching methods by providing insights into student performance, thus enabling more effective teaching and learning. Together, these findings demonstrate how AI-driven assessment and feedback mechanisms improve the learning process by making it timely, personalized, and tailored to students' individual needs.

With the adoption of AI in education, still there are various challenges which are emerged which could affect the education. One of the challenge in the adoption of AI is over reliance on AI tools that minimize the critical thinking of the individual (Bozkurt & Sharma, 2023). The creativity among the students is another challenge of AI in education (Mitan, 2024) that could hinder the academic success of students.

Bozkurt and Sharma (2023) Also highlighted that how AI can preserve present biases in instructional research, with unequal results for sure agencies of college students, in particular those from marginalized backgrounds. These biases can undermine the impartiality of AI and restriction their ability to sell equal educational possibilities. In addition, lack of identification of AI decision making tactics has raised issues about the accountability and reliability of AI structures used in education as counseled by (Verma et al., 2023), The "black field" nature of many AI algorithms, in which the good judgment behind choices isn't really defined, can cause a lack of agree with between teachers and college students. This loss of facts is a particular hassle when the use of AI tools use it to assess scholar overall performance or provide personalized guidelines which could create a reliability and fairness troubles (Rane et al., 2023). Furthermore, there are enormous differences in the education and competencies required for instructors to efficaciously integrate AI into their coaching practices. Many instructors lack the technical capabilities vital to recognize AI systems, which hinders the effective use of these tools within the lecture room (Abulibdeh et al., 2024). Comprehensive techniques which include transparent AI, lowering bias, and appropriate expert development for teachers are had to meet those challenges.

After reviewing the previous literature, it is inferred that AI applications with IOT are important concerns that could increase the student's academic success. Seeking this significance, extant studies have focused on concentrated solely on AI, the integration of AI with the IoT remains underexplored in education. The combination of these technologies could offer enhanced data-driven insights and real time feedback mechanisms that are crucial for virtual learning. However, there is a scarcity of empirical evidence examining the synergy of AI and IoT in educational applications, leaving a gap in comprehensive studies that assess their joint impact on learning outcomes, resource allocation, and security. Additionally, most research to date has relied heavily on content analysis or qualitative methodologies with few studies adopting quantitative approaches to measure AI's effectiveness or integration within virtual education environments. These previous studies enforced that there is a need for the study of AI applications with AI challenges in the context of virtual education students.

3. Research Methodology

The research aimed to test the application of artificial intelligence in the field of virtual education and its challenges. For this purpose, a quantitative research approach was employed where data was collected through a survey instrument. Quantitative research lies in its ability to provide objective, measurable data that can be generalized to larger populations. It allows for statistical analysis and hypothesis testing, enhancing the reliability and replicability of findings (Guetterman et al., 2015). The study employed a cross-sectional research design through which data were collected at one point through a questionnaire. Cross-sectional research is the ability to visualize data simultaneously so that relationships and differences between groups can be better analyzed (Rindfleisch et al., 2008). The study is descriptive in nature. Descriptive research is a research method that involves collecting, analyzing, and presenting data to describe a phenomenon, population, or situation. It's often used to identify characteristics, frequencies, trends, and categories (Nick, 2007). Therefore, the current study is descriptive.

3.1 Questionnaire Description

The questionnaire was adapted from previous studies where it was already tested. The AI application was adapted from the study of (Alhumaid et al., 2023; Kuleto et al., 2021), where this variable was measured through 11 items. Furthermore, AI challenges were measured by three dimensions challenges of privacy and data security, challenges of ethical consideration, and challenges of over-reliance. Each dimension is measured by three items (Jie & Kamrozzaman, 2024). These items were measured on a point Likert Scale where 1 ranked for strongly disagree and 5 for strongly agree.

3.2 Population and Sampling

The total population of the study is 200 students (Table 1). For this research, we selected 100 students out of 200 students from among the available statistical population of the university, and for this purpose, 50 of them were trained using virtual training under artificial intelligence and the next 50 were trained traditionally. We compared the data and the obtained results with each other. The sample was selected using a purposive sampling technique (Campbell et al., 2020). This is considered appropriate where data is collected from specific persons.

Table 1: Statistical population

Unit	The size of the statistical population	The size of the sample population
Individual	200	100

3.3 Demographic Characteristics

Table 2 predicted values show the demographic characteristics of the study. The demographic data reveals that the statistical population consists primarily of men (75%) compared to women (25%). Education levels vary, with the majority holding a diploma (55%), followed by a smaller proportion with a bachelor's degree (35%) and a minimal percentage with a master's degree (10%). Age distribution shows that the largest group falls between 25-34 years (40%), with younger individuals aged 18-24 making up 20%, and older age groups, 35-44 and 45+, comprising 25% and 15%, respectively. Regarding qualification levels, half of the population is at the entry level (50%), with fewer individuals at mid-level (35%) and senior level positions (15%). This demographic breakdown highlights a workforce that is relatively young and mostly qualified at entry to mid-levels, with a majority holding diploma-level education. Above results are predicted in Table 2 below.

Table 2: Gender segregation of the statistical population

Category	Subcategory	Population (%)
Gender	Men	75
	Women	25
Education	Diploma	55
	Bachelor's Degree	35
	Master's Degree	10
Age	18-24 years	20
	25-34 years	40
	35-44 years	25
	45+ years	15
Qualification	Entry Level	50
	Mid-Level	35
	Senior Level	15

4. Data Analysis and Results

4.1 Reliability Analysis

This section shown the reliability of the construct which was addressed from factor loadings and Cronbach's alpha which offers a insight in the reliability and relationship strengths between items and factors (Hair Jr et al., 2020). The factor loadings normally ranges from 0 to 1 with a values of 0.5 or above considered acceptable for indicating a strong relationship with the underlying construct, while values below 0.4 may suggest weaker associations (Hair Jr et al., 2020). In the current study, most items exhibit factor loadings above 0.7 which is indicating a strong relationship with their respective factors, demonstrating solid construct validity. The Cronbach's alpha values reflect the internal consistency of the grouped items, with thresholds of 0.7 and above typically denoting acceptable reliability, and values of 0.8 or higher often indicating good reliability (Peters, 2014). In the current study, alpha values ranges between 0.75 and 0.85 which is suggesting satisfactory to strong reliability for each factor group, providing evidence of the measures of internal consistency and reliability. The above results are predicted in Table 3.

Table 3: Reliability Results

Description	Factor Loading	Cronbach's Alpha
AI and IoT Personalization & Decision-Making		0.851
AI with IoT personalize content in real-time based on individual needs.	0.712	
IoT-powered AI provides feedback to help students develop decision-making skills.	0.823	
AI with IoT enable real-time collaboration, fostering teamwork and decision-making.	0.739	
AI and IoT help maintain alumni connections through data-driven insights.	0.724	
IoT-enabled AI enhances security and data protection in virtual education.	0.871	
AI and IoT optimize administrative processes and resource allocation in real-time.	0.681	
AI and IoT improve data sharing and evidence-based decision-making.	0.662	
IoT-powered AI provides flexible research environments for educational studies.	0.813	
AI support data-driven strategies and decision sciences research.	0.753	
AI with IoT enhance learning outcomes through personalized, data-driven strategies.	0.823	
AI with IoT improve decision-making processes and educational effectiveness.	0.643	
Challenges of Over-Reliance on AI Tools		0.789
Over-reliance on AI tools for completing online assignments	0.721	
Difficulty in solving complex problems using AI in virtual learning	0.629	
Frequently using AI for quick responses without fully understanding	0.627	
Challenges Related to Lack of Understanding		0.753
Unaware of the limitations and potential errors of AI tools	0.898	
Unaware of the potential biases in AI algorithms	0.722	
Lack of knowledge on how to critically evaluate the outputs of AI tools	0.871	
Lack of confidence in using AI tools effectively in virtual education	0.892	
Ethical Considerations in Virtual Education		0.791
Lack of transparency in AI decision-making processes	0.789	

Table 3: Reliability Results (Cont….)

Description	Factor Loading	Cronbach's Alpha
Concerns about AI's impact on academic integrity	0.782	
Biases in AI Algorithms Affecting Personalized Learning Experiences	0.732	
Concerns about fairness in AI algorithms in assessment and content delivery	0.732	

4.2 Descriptive Analysis

The descriptive analysis conducted in two questions. The first question results shown high level of perceived effectiveness and readiness for the application of AI in virtual education, particularly from a decision sciences perspective. The mean values for the AI applications range from 3.53 (AIA2) to 4.93 (AI2), indicating a positive perception of AI's potential to enhance various aspects of virtual education, such as personalized learning, skill development, collaboration, and research environments. For instance, AI applications aimed at enhancing skills (AI2) and providing a flexible research environment (AI8) received the highest mean scores of 4.93 and 4.80, respectively. The standard deviations range from 0.90 to 0.96, suggesting a moderate level of consensus among respondents on these applications. The variability in responses, especially for items like AI1 (SD = 0.92) and AIA2 (SD = 0.91), reflects diverse perspectives on AI's role in areas like customized learning and platform modernization, while still showing general alignment in favor of AI integration in educational settings. The above results are predicted in Table 4 below.

Table 4: AI application in virtual Learning

Description	Mean	Standard Deviation
AI with IoT personalize content in real-time based on individual needs.	4.061	0.921
IoT-powered AI provides feedback to help students develop decision-making skills.	4.932	0.932
AI with IoT enable real-time collaboration, fostering teamwork and decision-making.	4.621	0.942
AI and IoT help maintain alumni connections through data-driven insights.	4.420	0.961
IoT-enabled AI enhances security and data protection in virtual education.	3.731	0.921
AI and IoT optimize administrative processes and resource allocation in real-time.	3.731	0.942
AI and IoT improve data sharing and evidence-based decision-making.	3.592	0.951
IoT-powered AI provides flexible research environments for educational studies.	4.831	0.923
AI support data-driven strategies and decision sciences research.	4.412	0.953
AI with IoT enhance learning outcomes through personalized, data-driven strategies.	4.562	0.912
AI with IoT improve decision-making processes and educational effectiveness.	3.532	0.912

The second question's results show the challenges of AI adoption. The second question results have shown that over-reliance on AI tools for completing assignments appears to be a significant issue, with participants reporting a moderate level of reliance on AI for tasks such as problem-solving and receiving quick responses

without fully understanding the content (mean scores of 3.812, 3.632, and 3.413, respectively). This indicates that while AI is seen as helpful, there is also concern about students potentially bypassing critical thinking and deeper engagement with the material. Furthermore, the survey reveals a general lack of understanding and awareness about AI, with students expressing uncertainty about the limitations, errors, and biases inherent in AI systems (mean scores ranging from 3.223 to 3.532). The relatively low scores in areas such as critical evaluation of AI outputs and confidence in effectively using AI tools suggest that students might not feel fully equipped to navigate AI technology or fully grasp its implications in virtual education.

Furthermore, with respect to ethical considerations, the study highlights the concerns about concerns about transparency and fairness in AI systems used for virtual education. While the mean score for the lack of transparency in AI decision-making processes was moderately high (3.732), reflecting some concerns about how decisions are made by AI tools, the scores for issues related to academic integrity, biases, and fairness in AI algorithms were also significant (mean scores between 3.531 and 3.931). Students are involved approximately the ability effect of AI on academic honesty and how biases in AI algorithms might affect personalized getting to know reviews and fairness in tests. These issues factor to a broader want for schooling on the ethical implications of AI and the way it can be used responsibly in educational settings. The outcomes emphasize the importance of ensuring that AI systems in digital training aren't most effective powerful but additionally transparent, independent, and honest, to foster agree with and engagement from students. The above effects are predicted in Table 5 underneath.

Table 5: Challenges of AI

Survey Item	Mean	Standard Deviation
Challenges of Over-Reliance on AI Tools in Virtual Education		
Over-reliance on AI tools for completing online assignments	3.812	0.953
Difficulty in solving complex problems using AI in virtual learning	3.632	0.981
Frequently using AI for quick responses without fully understanding	3.413	0.913
Challenges Related to Lack of Understanding and Awareness in Virtual Education		
Unaware of the limitations and potential errors of AI tools	3.223	0.991
Unaware of the potential biases in AI algorithms	3.532	0.933
Lack of knowledge on how to critically evaluate the outputs of AI tools	3.231	0.902
Lack of confidence in using AI tools effectively in virtual education	3.331	0.821
Challenges of Ethical Considerations in Virtual Education		
Lack of transparency in AI decision-making processes	3.732	0.921
Concerns about AI's impact on academic integrity	3.931	0.863
Biases in AI Algorithms Affecting Personalized Learning Experiences	3.631	0.841
Concerns about fairness in AI algorithms in assessment and content delivery	3.531	0.993

5. Discussion

Decision sciences is an interdisciplinary discipline that focuses on the use of quantitative data and analytical techniques to support the decision-making process in education sector through encompassing mathematics, statistics, and data analysis to solve difficult problems (Storey et al., 2024). The literature supported that artificial

intelligence (AI) is the part of decision sciences. AI integrated with the Internet of Things (IoT) enhances decision-making processes through real-time data collection and analysis from connected devices in the education sector (Jeyaraman et al., 2023). This integration of decision science supports data-driven approaches use, predictive analytics, and automation, improving efficiency and accuracy in decision making to the students. AI algorithms could analyze large amounts of IoT data to reveal patterns, predict trends predict to improve the students results. The importance of this integration lies in its ability to enable smarter, faster, more informed decision making in education sector sector which could help to drive innovation and performance efficiency. Therefore, seeking the significance of AI for students, current study aim to test the AI applications and challenges in the universities. For this purpose, data collected from 100 students which were awared from AI education system.

The first question findings shown that growing adoption of AI as a transformative tool in virtual education. Students in particular as AI can improve content to meet individual learning needs, which is crucial to enhancing their educational experience. This corresponds with the increasing use of AI in the decision sciences, where AI helps in driven data analytics is increasingly being used to develop customized learning strategies. Furthermore, student's appreciation of the role of AI in a collaborative learning environment further supports its value in teamwork and decision making skills essential for success in today's educational environment. These results reflect students' positive attitudes towards the impact of AI on learning and indicate that AI implementation is seen as effective in improving educational outcomes. However, data also highlight areas where students feel the potential of AI is under realized especially in terms of its application to organizational systems. These findings shown that students expressed concerns about the role of AI in efficiency, resource allocation, and safety is suggesting that these aspects need to be continuously developed to meet all AI requirements in virtual education. The integration of AI into the IoT could address these gaps through enabling real time data collection and predictive analytics. The ability of AI and IoT to provide insights into modeling and development could improve decision making in virtual education which is ensuring resources and data security which are better manageable. This could ultimately lead to more informed and accurate decision making by the students and institutional level, and bringing AI to virtual learning environments. The study results are consistent with the study (Aziz et al., 2024; Igbokwe, 2023) where they also found that AI applications could enhance the academic success of the students.

The second question result further highlighted the challenges of the students face when using AI tools for virtual education, from over-reliance to misunderstandings and ethical concerns. Over-reliance on AI tools to complete online tutorials and frequent use of AI to respond quickly without fully understanding the results are common issues. These challenges suggest that students may be independent will rely too heavily on AI, hindering critical thinking and problem-solving skills. The difficulty in using AI to solve complex problems further reinforces the need to better understand AI tools and integrate them into the curriculum Furthermore, many students report being unaware of AI potential limitations and shortcomings of tools, which may overestimate their potential in AI design Because of the challenges in understanding biases, This lack of critical participation is exacerbated by uncertainty about how to use it well in therefore AI of teaching. The results are consistent with the findings of (Jafari & Keykha, 2024; Kuleto et al., 2021).

The IOT integration with AI have various solutions to handle the challenges (Trung et al., 2021). The IOT helps to increase the AI capability through providing a real time data and also giving feedback to the students through the connected devices which allow to the students in better understandings of context. IoT-powered sensors could help to monitor how students interact with AI devices which provide insight into their behavior and help identify when over reliance is occurring that provide a more transparent environment for data consumption role. With the real-time feedback provided by the IoT, AI systems could be continuously adapted and optimized to deliver authentic and unbiased personalized learning experiences. This integration could also drive insights high in AI decision-making processes has addressed ethical concerns about academic integrity and fairness. Thus, integration of AI and IoT has the potential to address both practical challenges and ethical considerations related to the use of AI in virtual education, and enable effective and equitable learning grade. These findings emphasized that educational institutions should integrate IOT services in increasing the academic success of the students.

6. Contributions

The research consisted of various theoretical and practical after understandings of the AI and IOT in the virtual education. The AI integration with the IOT introduces a new pathway in the decision making related to education with a strong emphasis on data driven methods. In the context of decision sciences, the study results reinforced the significance of AI in creating individualized learning experiences and raise collaborative student decision-making. This theoretical perspective suggests that AI, when combined with IoT could increase the decision making process through providing real time contextual information that informs learning processes. Furthermore, the study highlights the importance of a greater understanding of the limitations and biases of AI tools, which are crucial to developing a more critical approach to their use in educational settings. The study could also help to develop a research framework to other researchers in conducting their research that could help to improve academic success of the students.

Practically, this study also contributed to enforce that educational institutions should focus on AI integrations with IoT to enhance learning experiences, resources, and decision-making. In other context, study also contributed to address challenges such as over-reliance on AI and lack of understanding of its shortcomings need to be addressed. Educational institutions should implement comprehensive training programs to help students and faculty engage more effectively with AI tools, with an emphasis on problem solving and critical thinking. Additionally, study findings also contributed that integration of IoT and AI could optimize operational efficiencies, improve resource allocation, address and monitor concerns about transparency, fairness and bias in AI algorithms to integrate these data protections. This integration will enable organizations to create effective, transparent and ethical virtual educational environments. The study could also help to the educationist to know the importance of AI in the education sector to increase their student's success and to meet completive advantage of the institutions.

7. Limitations and Future Directions

Study with significant findings still have various limitations that could be addressed in future study to increase the study scope. Firstly, study limited on descriptive analysis which have limited scope as compare to inferential study. Therefore, future study could be explored on inferential statistics to increase the study scope. Secondly, study covered only the quantitative aspect of the study while ignored qualitative aspect. Therefore, future study could be explored on mixed methods approach to increase the generalizability of the study. Thirdly, study not focused on hypothesis testing which limited the generalizability of the findings. Future research could be explored with independent and dependent variable on Structural Equation model to increase the study scope. Lastly, study focused on virtual learning while ignored others education like music education, EFL etc. Further research could be explored on these two aspects to cover the area of new research.

8. Conclusion

The research mainly focused on the role of decision sciences in increasing educational outcomes by providing various data-driven approaches and analytical techniques, especially through integrating artificial intelligence (AI) with the Internet of Things (IoT). The objective was to explore how AI applications and related challenges influence university students' decision-making processes in virtual education settings, aligning with the Decision Sciences framework of improving efficiency and accuracy through data and predictive analytics. For this purpose, survey instruments using a purposive sampling technique and quantitative data were collected from 100 students who know about AI and virtual learning systems. The descriptive analysis shows that AI has the potential to modify educational content, promote collaborative learning, and enhance decision-making skills. However, challenges such as over-reliance on AI, ethical issues, and limited awareness of AI's limitations emerged, indicating the need for deeper integration into curricula. IoT integration offers a promising solution through enabling real-time data collection and feedback which addresses concerns about bias, over-reliance, and critical thinking. The study with findings contributed that incorporating AI and IoT into educational curricula can improve decision-making, resource allocation, and ethical considerations while addressing challenges like over-reliance and bias. The study also discussed the research limitation that could explored the new research area in the future.

Funding

“This research received no external funding”

Conflicts of Interest

“The authors declare no conflict of interest.”

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