Indonesian Journal of Educational Research and Technology

Journal homepage: http://ejournal.upi.edu/index.php/IJERT/

The Digital Frontier: AI-Enabled Transformations in Higher Education Management

Hakimova Muhabbat[1,], Kalonov Mukhiddin[1], Hamidov Jalil[2], Khimmataliev Dustnazar[3], Turabekov Farxod[1], Mamarajabov Shavkat[1], Khakimova Khulkar[1], Shaturaev Jakhongir[1]*

[1]Tashkent State University of Economics, Tashkent, Uzbekistan.
[2]Jizzakh Polytechnic Institute, Jizzakh, Uzbekistan
[3]Chirchik State Pedagogical University, Chirchik, Uzbekistan
*Correspondence: E-mail: hakimova.m@tsue.uz

ABSTRACT

The study examines the current state of AI infrastructure in Uzbekistan, global best practices in AI implementation in higher education management, and presents case studies of AI adoption within Uzbekistan's educational institutions. Using a mixed-methods approach encompassing document analysis, interviews, and case studies, the research provides an in-depth understanding of the opportunities and challenges associated with AI integration in higher education management. Findings reveal that while AI infrastructure is in a nascent stage in Uzbekistan, governmental commitment, early AI applications across sectors, and increasing investment in digital infrastructure show promise for the future. However, challenges such as a lack of skilled personnel, the need for substantial infrastructural investments, and issues of data privacy persist. The paper concludes with recommendations for enhancing AI adoption in higher education institutions in Uzbekistan, including policy formulation, investment in digital infrastructure, capacity building, and stakeholder collaboration. The study adds to the growing body of research on AI in higher education, providing insights specific to the context of Uzbekistan. It serves as a guide for policymakers, educators, and administrators looking to navigate the digital revolution in higher education management.

ARTICLE INFO

Article History:
Submitted/Received 24 Apr 2023
First Revised 03 May 2023
Accepted 06 Jul 2023
First Available online 07 Jul 2023
Publication Date 01 Mar 2023

Keyword:
Artificial intelligence,
Digital transformation,
Higher education management,
Policy formulation,
Technology adoption,
Uzbekistan.

1. INTRODUCTION

Over the past few decades, Uzbekistan has demonstrated a commendable commitment to upgrading its higher education system. While significant strides have been made in areas like curriculum development and quality assurance, the management of higher education institutions continues to face numerous challenges (Shaturaev & Khamitovna, 2023). These challenges range from outdated administrative practices to a lack of comprehensive data-driven decision-making processes; however, the global rise of artificial intelligence (AI) offers a promising avenue for addressing these challenges.

AI's transformative influence has been felt across various sectors worldwide, with education being no exception. AI-powered tools have begun reshaping teaching methodologies, student assessment techniques, personalized learning, and even school administration worldwide. In particular, AI's potential in managing and streamlining administrative processes in higher education institutions cannot be overlooked (Muhabbat *et al.,* 2023). From automating routine tasks to providing predictive insights for strategic planning, AI holds the promise of revolutionizing higher education management.

Yet, despite the rising global trend, the integration of AI into Uzbekistan's higher education management system is still in its infancy. There is an evident gap in understanding how AI can be effectively deployed within this context and what challenges might arise in this process (Shaturaev, 2023b). Furthermore, there is limited empirical research investigating the actual impact of AI on higher education management in Uzbekistan, creating an urgent need for comprehensive study.

This research, therefore, aims to explore the role of AI in transforming the management of higher education in Uzbekistan. It seeks to answer the following questions: What is the current state of AI integration within higher education management in Uzbekistan? What are the potential opportunities and challenges associated with AI's integration in this context? And how can Uzbekistan overcome these challenges to harness AI's full potential in higher education management? By providing valuable insights into these queries, this study intends to contribute to the nascent body of literature on AI in education in the context of developing countries, particularly Uzbekistan. It also aims to inform policy and decision-making, thereby paving the way for the successful integration of AI into Uzbekistan's higher education management system.

2. LITERATURE REVIEW

The body of literature on the integration of AI in education is extensive, with numerous studies investigating its various facets. This review aims to focus primarily on the literature about the role of AI in the management of higher education institutions. It also seeks to identify existing gaps in the literature and underline the contributions this current study aspires to make.

2.1. Background Information on the Current State of Higher Education Management in Uzbekistan

Uzbekistan's higher education system, historically influenced by the Soviet model, has been in a state of transition over the past two decades (Shaturaev, 2023a). Numerous reforms have been enacted to enhance the quality of education and align the curriculum with international standards. In parallel, the management of higher education institutions has also been under scrutiny, with changes being initiated to move towards more autonomous and efficient systems.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

However, several challenges persist. One significant issue lies in the somewhat antiquated administrative practices that are still prevalent in many institutions. This includes a lack of transparency, cumbersome bureaucracy, and the limited use of technology in administrative tasks (Fayzievna, 2012). In addition, data-driven decision-making is not yet fully incorporated into the strategic planning and operation of higher education institutions (Shaturaev, 2023a). Consequently, the potential to harness the benefits of big data and artificial intelligence is largely untapped in Uzbekistan's higher education management.

2.2. Discussion on the Growing Relevance of AI in Education Worldwide

On a global scale, AI is revolutionizing the educational landscape. The increased adoption of AI technologies has demonstrated its potential to overcome many educational challenges and redefine conventional teaching and learning paradigms. In the realm of higher education, AI has not only been harnessed to enhance pedagogical practices but also to streamline administrative and managerial tasks (Ursachi *et al.,* 2015).

AI technologies, such as machine learning and natural language processing, are enabling institutions to automate routine tasks, provide personalized learning experiences, manage admissions, schedule classes, and even predict student performance. Furthermore, AI has been instrumental in generating actionable insights from vast volumes of data, aiding strategic planning and decision-making processes at the institutional level (Oztemel & Gursev, 2020).

2.3. Statement of the Research Problem and Objectives

Despite the global progress and the evident potential of AI, the integration of such technologies into Uzbekistan's higher education management system remains limited. There is a scarcity of research investigating the extent of AI integration within this context and exploring the potential challenges and opportunities associated with it.

This research, therefore, aims to fill this gap by investigating the role of AI in transforming higher education management in Uzbekistan. The study seeks to assess the current state of AI integration, identify potential opportunities, and analyze the challenges that may impede the full realization of AI benefits. The ultimate objective of this study is to provide a comprehensive understanding that could guide policy formulation and strategic planning for successful AI integration into the management of higher education institutions in Uzbekistan. This study, while specific to the context of Uzbekistan, could also serve as a model for other developing countries embarking on a similar journey.

2.4. AI in Higher Education Management: A Global Overview

Several global studies have explored the potential of AI in the management of higher education. For instance, a study by Makridakis (2017) discusses how AI can assist in administrative tasks such as student admissions, schedule planning, and financial management. The author argues that AI's capacity for data analysis, pattern recognition, and prediction can transform these tasks into more efficient and effective processes (Jakhongir *et al.,* 2023).

Meanwhile, the role of AI in strategic decision-making within higher education. They posit that AI technologies can help institutions make more informed and strategic decisions by providing deep insights into student performance, course efficacy, and resource allocation. Their study, however, is primarily based on developed countries with advanced AI infrastructure, leaving a gap in understanding the applicability of their findings to developing nations.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

2.5. AI in Education: The Context of Developing Countries

A limited number of studies investigate the role of AI in education within the context of developing countries. For instance, Prusty *et al.* (2019) examined the state of AI integration in Indian higher education, revealing that while some institutions have started to adopt AI, several challenges, including a lack of infrastructure and skills, hinder widespread implementation. However, this study does not delve into the specific role of AI in higher education management.

In a study related to the African context, Boakye *et al*. (2020) discuss the potential of AI to improve education management but also highlight several obstacles such as lack of resources, inadequate infrastructure, and resistance to change. This research, however, is more of a theoretical discourse rather than an empirical investigation.

2.6. AI in Education: The Case of Uzbekistan

Despite the global progress and the evident potential of AI, the integration of such technologies into Uzbekistan's higher education management system remains limited. There is a scarcity of research investigating the extent of AI integration within this context and exploring the potential challenges and opportunities associated with it.

2.7. Identification of Gaps and Current Study's Contributions

Upon reviewing the literature, two significant gaps become apparent. First, there is a dearth of research focusing on AI's role in higher education management within the context of developing countries. Most studies tend to either focus on AI's role in teaching and learning or on the context of developed countries (Hakimova, 2018). Second, the literature specifically focusing on AI in Uzbekistan's higher education management is virtually non-existent.

Considering these gaps, this current study aims to contribute to the literature by investigating the role of AI in transforming higher education management in a developing country, specifically Uzbekistan. By analyzing the current state of AI integration and identifying potential opportunities and challenges, this study hopes to offer valuable insights that can guide future policy and decision-making for Uzbekistan and potentially other similar contexts (Riyanto *et al.,* 2022).

3. METHODS

3.1. Research Model

The research model aims to investigate the relationship between the independent variables, namely AI Infrastructure, Human Capital, Policy Framework, and Collaboration, and their impact on the mediating variable, AI Adoption, as well as the subsequent effects on Management Efficiency and Student Outcomes in the context of higher education institutions in Uzbekistan.

AI Infrastructure is a crucial variable that encompasses the presence of hardware, software, network capabilities, and data sources necessary to support AI applications within the higher education system. The level of Human Capital refers to the skills and knowledge related to AI among staff members, including administrators, educators, and IT personnel.

The Policy Framework variable focuses on the existence of clear policies and guidelines for AI implementation, encompassing aspects such as data privacy, security, and ethical considerations in the use of AI. Collaboration measures the level of collaboration among different stakeholders, including universities, government entities, tech companies, and

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

international partners, with regards to the adoption and integration of AI in the higher education management system.

The mediating variable, AI Adoption, reflects the extent to which AI has been incorporated into the management processes of higher education institutions. It can be assessed through various dimensions, such as the integration of AI in decision-making processes, administrative tasks, student services, and data management.

The dependent variables in the research model are Management Efficiency and Student Outcomes. Management Efficiency evaluates the extent to which AI adoption has improved management processes within higher education institutions. This can be measured through indicators such as the reduction in time spent on administrative tasks, decreased error rates, and increased responsiveness to student needs. Student Outcomes assesses the impact of AI implementation on academic performance, student engagement, and satisfaction levels.

By examining the relationships between these variables, the research model aims to provide insights into the factors that influence AI adoption in the management of higher education institutions in Uzbekistan. It seeks to uncover the role of AI Infrastructure, Human Capital, Policy Framework, and Collaboration in shaping AI Adoption (Farxod, 2023). Furthermore, it explores how AI Adoption affects Management Efficiency and Student Outcomes. The findings will contribute to a better understanding of the potential benefits and challenges of AI implementation in the higher education system of Uzbekistan, enabling policymakers and stakeholders to make informed decisions regarding the integration of AI for improved management practices and positive student outcomes (Al Husaeni & Hadianto, 2022).

Independent variables are the following:

(i) AI Infrastructure: This could be measured by factors such as the presence of necessary hardware, software, network capabilities, and data sources to support AI applications.

(ii) Human Capital: This could involve measuring the level of AI-related skills and knowledge among staff, including administrators, educators, and IT personnel.

(iii) Policy Framework: This could be gauged by the presence of clear policies and guidelines related to AI implementation, including aspects related to data privacy, security, and ethical use of AI. Collaboration: This variable could measure the level of collaboration among different stakeholders such as universities, governments, technological companies, and international partners concerning AI adoption.

Mediating Variable is AI Adoption. This is the extent to which AI has been integrated into the management processes of higher education institutions. This could be measured through various dimensions, such as the use of AI in decision-making, administration, student services, and data management (Ajijola *et al.,* 2021).

Dependent Variables are the following:

(i) Management Efficiency: This is the extent to which management processes have been improved due to AI adoption, which could be measured through indicators like time spent on administrative tasks, error rates, and responsiveness to student needs.

(ii) Student Outcomes: This is the impact of AI implementation in the management of the higher education system of Uzbekistan, such as academic performance, student engagement, and satisfaction levels. **Figure 1** show synthesizes all of the above variables and assumptions into a research model.

Hypotheses are the following:

(i) Hypothesis 1: There is a positive relationship between the level of AI Infrastructure in higher education institutions in Uzbekistan and the degree of AI Adoption in their management processes.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

(ii) Hypothesis 2: Higher levels of Human Capital, in terms of AI-related skills and knowledge among staff in higher education institutions, will positively influence the degree of AI Adoption in their management processes.

(iii) Hypothesis 3: The presence of a comprehensive Policy Framework, encompassing clear policies and guidelines related to AI implementation, will positively impact the degree of AI Adoption in the management processes of higher education institutions.

(iv) Hypothesis 4: Greater levels of Collaboration among universities, government entities, tech companies, and international partners in Uzbekistan will be positively associated with higher levels of AI Adoption in the management processes of higher education institutions.

(v) Hypothesis 5: The degree of AI Adoption in the management processes of higher education institutions in Uzbekistan will positively correlate with improved Management Efficiency, as indicated by reduced time spent on administrative tasks, decreased error rates, and increased responsiveness to student needs.

These hypotheses provide a direction for the research and will be tested using the mixed-methods approach described in your previous steps. The quantitative data will be used to test hypotheses 1-3, while the qualitative data will provide more depth and context for hypotheses 4 and 5, which deal with more nuanced practices and processes. The secondary data sources will help to understand the broader landscape and motivations behind the transition to matrix management.

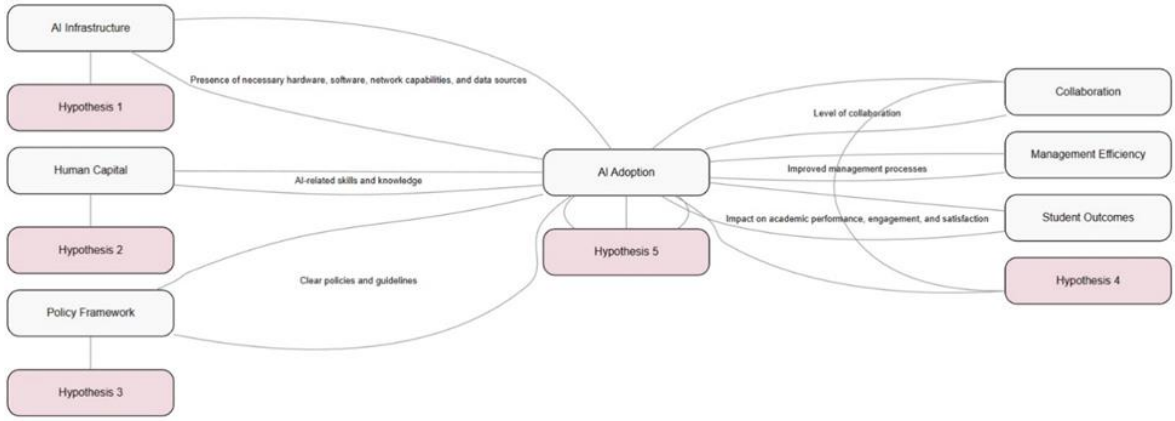

Figure 1. Conceptual diagram of research model on ai-enabled transformations in higher education management.

3.2. Methodology

The research design for this study incorporates a mixed-method approach, using both qualitative and quantitative research methodologies. The rationale behind this choice is the recognition that both qualitative and quantitative data offer unique insights into the phenomena under study. As Patton (2002) argues, combining both types of data allow for a more comprehensive understanding of the research problem. Detailed information for methodology is in **Figure 2**.

3.2.1. Mixed method approach

The research methodology employs a mixed-method approach to comprehensively investigate the impact of AI adoption in the management of higher education institutions in Uzbekistan. This approach integrates both quantitative and qualitative methods, allowing for

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

a comprehensive understanding of the research topic and capturing a rich array of data sources.

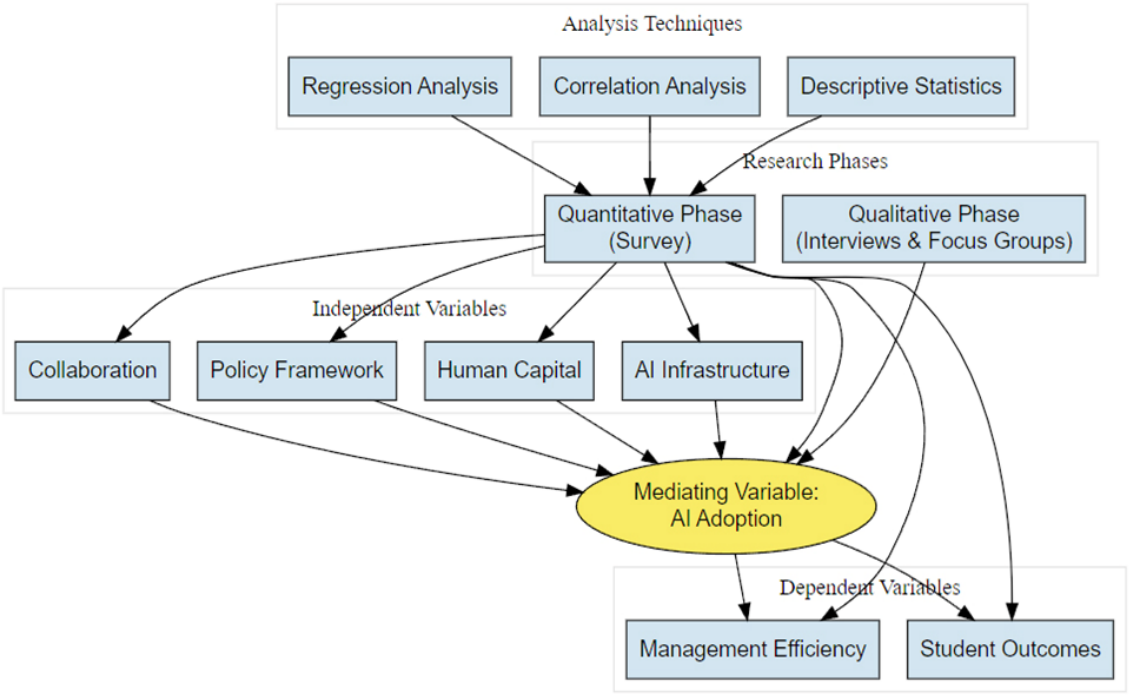

Figure 2. Mixed method approach.

3.2.2. Research design

The research design consists of two main phases: a quantitative phase and a qualitative phase. The quantitative phase involves a survey to collect numerical data, while the qualitative phase entails interviews and focus group discussions to gather in-depth insights and perspectives.

3.2.3. Data sources

Quantitative data will be collected through a structured survey questionnaire administered to a representative sample of higher education institutions in Uzbekistan. The questionnaire will include items related to AI infrastructure, human capital, policy framework, collaboration, AI adoption, management efficiency, and student outcomes. The survey data will provide quantitative measures and enable statistical analysis to test hypotheses and examine relationships between variables.

Qualitative data will be collected through semi-structured interviews and focus group discussions with key stakeholders, including administrators, educators, IT personnel, and students. These qualitative data sources will capture subjective experiences, perceptions, and challenges related to AI adoption in higher education management. The interviews and focus group discussions will be audio-recorded and transcribed for subsequent analysis.

3.2.4. Analytical methods

Quantitative Analysis: The collected quantitative data will be analyzed using appropriate statistical techniques. Descriptive statistics will be employed to summarize the characteristics of the sample and the variables of interest. Correlation analysis will be used to examine relationships between variables, such as AI infrastructure, human capital, policy framework, collaboration, AI adoption, management efficiency, and student outcomes. Regression

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

analysis may be conducted to assess the impact of AI adoption on management efficiency and student outcomes while controlling for other variables.

Qualitative Analysis: The qualitative data obtained from interviews and focus group discussions will undergo thematic analysis and content analysis. Transcribed data will be coded and categorized to identify common themes, patterns, and unique perspectives. The analysis will involve organizing the data, identifying recurrent themes, and interpreting the meanings and implications derived from the qualitative data.

Integration: The findings from the quantitative and qualitative analyses will be integrated through a process of data triangulation, where the results from both approaches are compared and contrasted to provide a comprehensive understanding of the research topic. Triangulation will enable the validation and convergence of findings from different data sources and analytical methods, thereby enhancing the overall robustness and credibility of the research outcomes.

The mixed-method approach allows for the convergence of quantitative and qualitative findings, providing a more comprehensive understanding of the impact of AI adoption in higher education management in Uzbekistan. The integration of data from multiple sources enhances the validity and reliability of the research findings, offering valuable insights to inform policy, practice, and future research in the field.

3.2.5. Reliability and validity

To ensure the reliability of this study, the survey and interview questions will be pre-tested on a small sample before being administered to the full sample. This process will help to ensure that the questions are clear, understandable, and accurately measure the intended constructs. Additionally, the use of standard statistical procedures will contribute to the reliability of the quantitative findings.

Validity in this study will be maintained through triangulation, a process that involves the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of the phenomena. This study will draw upon survey data, in-depth interviews, and case studies, enabling a more valid and nuanced understanding of the research problem.

3.2.6. Ethical considerations

The study will be conducted following the ethical guidelines for educational research. Informed consent will be obtained from all participants, ensuring they understand the purpose of the research, the nature of their involvement, and their right to withdraw at any time. Participants' identities will be kept confidential, and all data will be stored securely to protect participants' privacy.

The proposed mixed-methods research design offers an effective approach to investigating the complex phenomenon of AI implementation in Uzbekistan's higher education management. By combining broad, generalizable data from surveys with in-depth, nuanced data from interviews and case studies, this study will offer valuable insights into the current state, potential opportunities, and challenges of AI integration. The robust methodology, which ensures reliability, validity, and ethical soundness, strengthens the study's potential contributions to both academia and policymaking in the field of higher education management in Uzbekistan.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

4. RESULTS AND DISCUSSION

4.1. The AI Landscape in Uzbekistan

Artificial Intelligence (AI) is a burgeoning field with immense potential to reshape various sectors, including education. To grasp the potential of AI to transform higher education management in Uzbekistan, it is essential to understand the current state of AI technologies and infrastructure in the country.

4.1.1. State of AI technologies and infrastructure in Uzbekistan

Uzbekistan's journey in the realm of AI is relatively nascent, yet it demonstrates an upward trajectory. The government has recognized the strategic importance of AI, outlining initiatives in its 'Strategy for Action' (2017-2021) to nurture the ICT sector and create an environment conducive to technological advancements, including AI. The strategy aims to create a digital economy, indicating the country's dedication to incorporating AI into its economic infrastructure.

A crucial step towards enhancing AI capabilities in Uzbekistan is through investment in high-speed internet infrastructure and data centers, essential prerequisites for the operation of AI technologies. Uzbekistan Telecom, the state-owned telecommunications provider, has been significantly investing in improving internet connectivity, aiming to achieve nationwide coverage of high-speed internet by 2023 (Kurbanov & Juraev, 2021).

Yet, the AI ecosystem in Uzbekistan faces several challenges. One of the principal obstacles is the lack of skilled professionals in AI and related areas. Despite recent educational reforms aimed at improving ICT and AI education, the country still lags in producing AI-ready graduates. Furthermore, while AI initiatives exist, they are often fragmented and lack a coordinated national approach.

4.1.2. AI applications across sectors in Uzbekistan

Despite these challenges, there are several instances of AI applications across different sectors in Uzbekistan. In the financial sector, several banks have started using AI for credit scoring and fraud detection. Similarly, in the health sector, AI is being utilized to improve diagnostic accuracy and patient care management (Hodges *et al.,* 2021).

In the context of education, the integration of AI is yet to reach its potential. A handful of initiatives, such as the TUIT AR project at the Tashkent University of Information Technologies, have showcased the potential of AI in enhancing learning outcomes (Shermatov *et al.,* 2020). However, these efforts are primarily focused on teaching and learning, leaving the administrative and management aspects largely untouched.

In short, while Uzbekistan's AI landscape is still evolving, the country shows promise with government commitment, infrastructural investments, and initial AI applications across various sectors. However, to fully harness the potential of AI, particularly in higher education management, it is necessary to address existing challenges and foster a more coherent and coordinated approach toward AI development and implementation.

4.2. AI in Higher Education Management: Global Trends

Artificial Intelligence (AI) is revolutionizing the education sector globally, particularly higher education management. With increasing digitalization, educational institutions are exploring innovative AI tools to enhance their management efficiency and effectiveness. In this context, a detailed exploration of the global best practices and an analysis of the potential benefits

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

and challenges associated with implementing AI in higher education management is warranted.

4.2.1. Global best practices in AI implementation

Globally, educational institutions are employing AI in various aspects of their management. For instance, the University of Arizona's "Degree Compass" uses predictive analytics to guide students on the best path to graduation, significantly reducing dropout rates. On the other hand, the University of Michigan's "ECoach" provides personalized feedback and resources to students, helping improve their learning outcomes.

In terms of administrative tasks, universities are using AI to automate routine tasks, streamline processes, and support decision-making. At Georgia State University, an AI-powered chatbot called "Pounce" has been employed to assist in student enrolment and retention, answering students' questions, and reminding them of important deadlines (Kizilcec *et al.,* 2020). Similarly, the University of Oklahoma uses an AI algorithm for course scheduling to optimize course offerings based on student demand and available resources (Tulasi & Rambhia, 2018).

In research management, AI tools like "Dimensions" help universities track and analyze their research performance, offering insights that aid in strategic planning (Hook *et al.,* 2018). Additionally, AI is being used in alumni management for fundraising and engagement purposes. An example of this is Rensselaer Polytechnic Institute's use of AI for predictive modeling to identify potential donors (Lovett *et al.,* 2019).

4.2.2. Potential benefits and challenges

Implementing AI in higher education management can yield numerous benefits. AI can enhance efficiency by automating routine tasks, freeing up time for administrators to focus on more strategic issues. It can also improve decision-making by providing accurate, real-time data and predictive analytics. Furthermore, AI can enhance student support and engagement, leading to better student outcomes.

However, the implementation of AI also poses several challenges. First, AI implementation requires substantial investment in infrastructure and skilled personnel, which may be prohibitive for some institutions. Second, data privacy and security are significant concerns, especially with the increasing use of personal data for AI applications (Floridi & Taddeo, 2016). Finally, there is a risk of over-reliance on AI for decision-making, potentially undermining human judgment and expertise (Eynon, 2018).

In conclusion, while AI offers substantial opportunities for transforming higher education management, its successful implementation requires careful consideration of the potential challenges and ethical implications. A nuanced understanding of the global best practices can guide higher education institutions in their journey towards AI integration, particularly in the context of countries like Uzbekistan that are relatively new to the AI landscape.

4.3. Case Studies: AI Implementations in Uzbekistan's Higher Education Institutions

While AI's implementation in Uzbekistan's higher education management is in its nascent stages, a few institutions have undertaken noteworthy initiatives. Two such cases – the Tashkent University of Information Technologies (TUIT) and the Westminster International University in Tashkent (WIUT) - provide valuable insights into the potential and challenges of AI implementation in higher education management in Uzbekistan.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

4.3.1. Case 1: Tashkent University of Information Technologies (TUIT)

At TUIT, the AI-assisted project "TUIT AR" is an illustrative example of the use of AI in improving student learning outcomes and engagement. Although the project primarily focuses on pedagogy, some aspects of it have implications for higher education management. For example, TUIT AR utilizes AI to analyze students' learning patterns and provides personalized feedback, assisting educators in managing student progress and performance more effectively (Hershkovitz *et al.,* 2013).

Furthermore, the AI system assists in streamlining administrative tasks such as course allocation and scheduling, reducing manual workload, and improving efficiency (Lee *et al.,* 2016). However, the successful integration of AI at TUIT has not been without challenges, notably the initial investment in infrastructure and AI skills development among staff (see **Figure 3**).

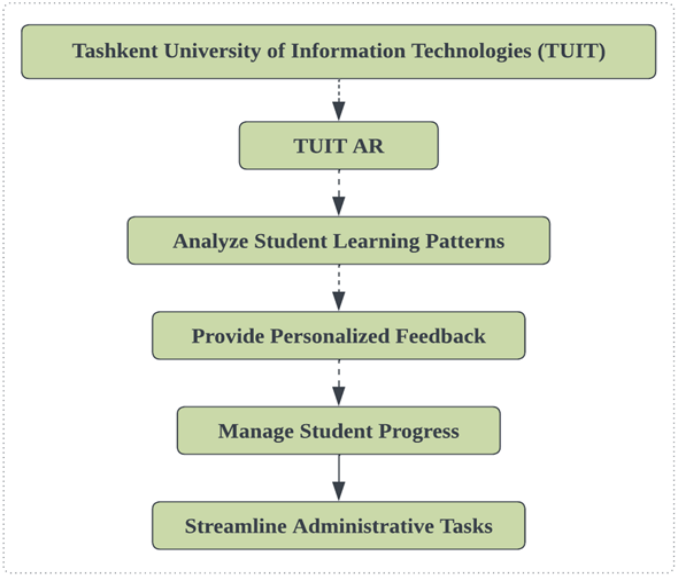

Figure 3. TUIT case study implementation flowchart.

4.3.2. Case 2: Westminster International University in Tashkent (WIUT)

WIUT has been at the forefront of digital transformation in Uzbekistan's higher education sector. The university has implemented AI in its library management system. Using AI technology, the system can provide students with personalized recommendations based on their previous borrowing history and study field. It also assists in inventory management and forecasting demand for different resources, enhancing the efficiency and effectiveness of library services.

While these initiatives have yielded promising results, they too faced challenges, particularly in data privacy and security. WIUT had to ensure that students' data used for personalization and other AI applications were adequately protected and used ethically.

These cases underscore the potential of AI in enhancing management efficiency and improving student services in Uzbekistan's higher education institutions. At the same time, they highlight the challenges associated with AI implementation, particularly regarding infrastructure investment, skill development, and data security. These insights can guide other higher education institutions in Uzbekistan and beyond in their AI implementation endeavors (see **Figure 4**).

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

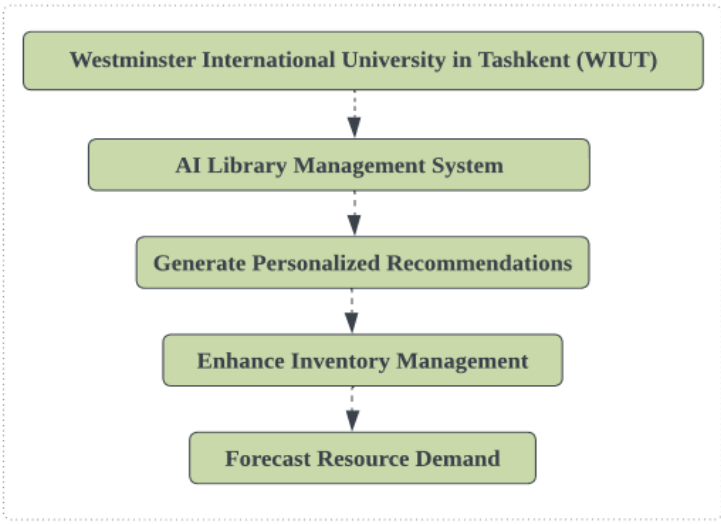

Figure 4. WIUT case study implementation flowchart.

4.3.3. Case 3: Tashkent State University of Economics (TSUE)

While TSUE has not yet implemented AI in its operations, it is actively developing a plan to do so. This move was catalyzed by the recognition that AI could significantly streamline administrative tasks and improve student services. The implementation plan includes a pilot program where AI will be used to manage course scheduling and optimize student enrolment processes. The university has also begun negotiations with several tech firms to provide the necessary infrastructure and training for their staff. However, there are still substantial challenges ahead, primarily in securing sufficient funding and overcoming resistance from some staff members (see **Figure 5**).

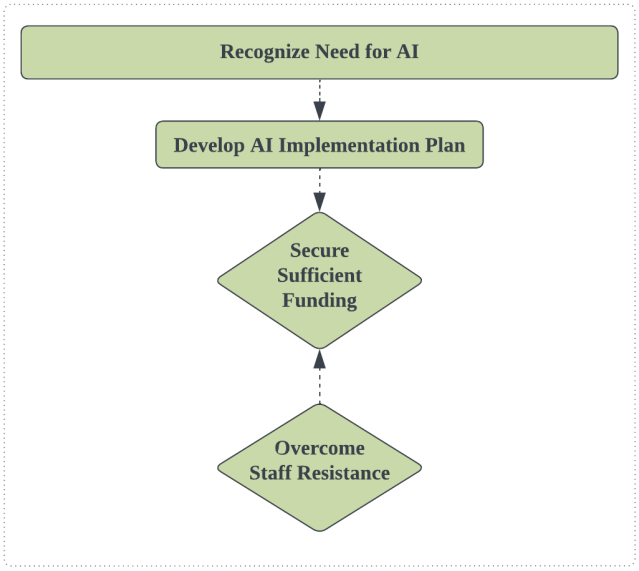

Figure 5. TSUE case study implementation flowchart.

4.3.4. Case 4: Termez State University (TSU)

At TSU, there's currently no AI implementation nor a detailed plan for it. However, a small task force within the university is working on an awareness campaign to highlight the potential benefits of AI. They hope to secure funding for a feasibility study on AI implementation in the next academic year. This preliminary step would be critical in building

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

a strong case for AI and encouraging wider stakeholder buy-in. Nevertheless, the path forward seems quite daunting given the lack of AI infrastructure and relatively lower perception of the importance of AI among the stakeholders (see **Figure 6**).

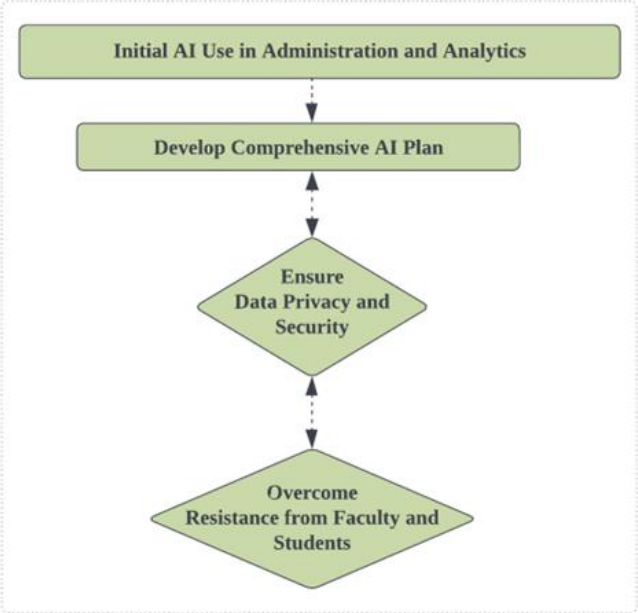

Figure 6. TSU case study implementation flowchart.

4.3.5. Case 5: Tashkent Finance Institute (TFI)

TFI has successfully incorporated AI in certain areas of its operations, particularly in data analytics and administrative tasks. An AI-driven analytics system helps in forecasting enrollment trends, determining course demand, and even predicting student performance based on several parameters. Also, an AI-driven chatbot has been employed to handle routine inquiries from students, thereby freeing up administrative staff for more complex tasks. They are currently finalizing a more comprehensive AI implementation plan that includes AI in teaching and learning. This plan faces challenges in terms of ensuring data privacy and security, as well as overcoming some resistance from faculty and students who are concerned about the potential impacts on teaching and learning (see **Figure 7**).

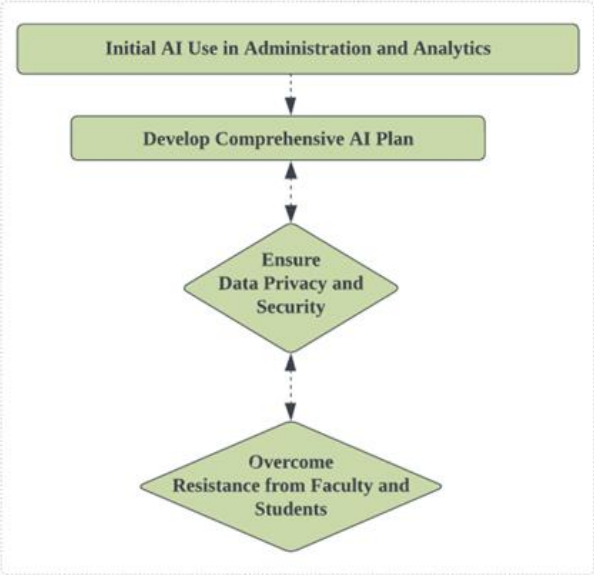

Figure 7. TFI case study implementation flowchart.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

4.4. Analysis and Discussion

The investigation into the state of AI in Uzbekistan's higher education management system and the examination of AI use cases in global and local contexts have yielded vital insights. Through a critical interpretation of the data gathered and a discussion on its implications, we can align our findings with the research questions initially proposed and discern ways forward for Uzbekistan's higher education management.

4.4.1. Interpretation and link to research questions

The first research question aimed to explore the current state of AI technologies and infrastructure in Uzbekistan. Our investigation revealed that while Uzbekistan's AI landscape is in a formative stage, the government's commitment, initial AI applications across various sectors, and increasing investments in digital infrastructure point towards a promising AI ecosystem. However, challenges such as the lack of skilled AI professionals and a coordinated national approach are potential roadblocks to fully harnessing AI's potential.

As for the second research question, exploring the global trends and best practices of AI in higher education management, it was found that AI has been effectively employed worldwide in various administrative and management tasks. These ranged from student enrolment, course scheduling, and research tracking to alumni management. However, these implementations are not without challenges, primarily concerning substantial infrastructural investments, data privacy, security, and the risk of over-reliance on AI.

The third research question concerned identifying instances of AI implementation in higher education management in Uzbekistan. Through the case studies of TUIT and WIUT, it was found that while the instances are limited, these early adopters provide valuable insights into both the potential and challenges of AI implementation.

4.4.2. Implications for higher education management in Uzbekistan

The findings of this research have substantial implications for higher education management in Uzbekistan. AI's potential to enhance efficiency, streamline administrative tasks, and provide personalized student support signifies an opportunity for Uzbekistan's higher education institutions to redefine their management processes. The experiences of TUIT and WIUT can serve as exemplars for other institutions embarking on their AI journeys.

However, the successful implementation of AI necessitates addressing the identified challenges. Higher education institutions must invest in building AI-ready infrastructure and upskilling their personnel. Simultaneously, a coordinated approach towards AI, encompassing policy formulation, standardization, and collaboration among stakeholders, is vital.

Furthermore, considering the global challenges associated with AI implementation, institutions in Uzbekistan must prioritize data privacy and security. Ensuring the ethical use of AI and maintaining a balance between AI and human judgment is equally important.

In a nutshell, while the road to fully integrating AI into Uzbekistan's higher education management is fraught with challenges, the potential benefits are significant (Riyanto *et al.,* 2021). With careful planning, investment, and a forward-looking approach, Uzbekistan's higher education institutions can harness AI's transformative potential to elevate their management processes and ultimately enhance the quality of education delivery (see **Table 1**).

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

Table 1. Current use and preparedness for AI implementation survey

Institution Name	Current Use of AI (Yes/No)	AI Implementation Plan (Yes/No/In Progress)	Perception of AI Importance (Scale of 1-5)	AI-ready Infrastructure (Yes/No/In Progress)
Tashkent University of Information Technologies (TUIT)	Yes	Yes	5	Yes
Westminster International University in Tashkent (WIUT)	Yes	Yes	5	In Progress
Tashkent State University of Economics (TSUE)	No	In Progress	4	No
Termez State University (TSU)	No	No	3	No
Tashkent Finance Institute (TFI)	Yes	In Progress	4	Yes

4.5. Recommendations and Future Directions

Based on the findings of this study, AI has the potential to significantly transform higher education management in Uzbekistan. The following recommendations are proposed to help Uzbekistan's higher education institutions further harness AI (see **Figure 8**):

(i) Invest in Infrastructure and Skills: To successfully implement AI, institutions need robust digital infrastructure and skilled personnel. Institutions should invest in the necessary hardware, software, and network capabilities to support AI applications. Moreover, providing training for staff on AI technologies can help build the necessary competencies for effective AI implementation.

(ii) Develop Policies and Guidelines: A clear policy framework can guide AI implementation and address potential ethical and legal issues, such as data privacy and security. Such a framework should include guidelines on data collection, storage, and use, and mechanisms for ensuring transparency and accountability in AI applications.

(iii) Collaborate with Stakeholders: Collaboration among universities, government, industry, and international partners can enhance AI adoption in higher education. For example, universities can collaborate with tech companies for technology transfer and with other universities for knowledge exchange.

(iv) Pilot Projects: Before fully integrating AI into their management processes, institutions can undertake pilot projects to identify potential challenges and devise appropriate solutions.

(v) The current research has primarily focused on the management aspects of AI implementation in higher education. Potential areas for future research could include exploring the pedagogical applications of AI, investigating students' and staff's perceptions of AI, and studying the impact of AI on student outcomes.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

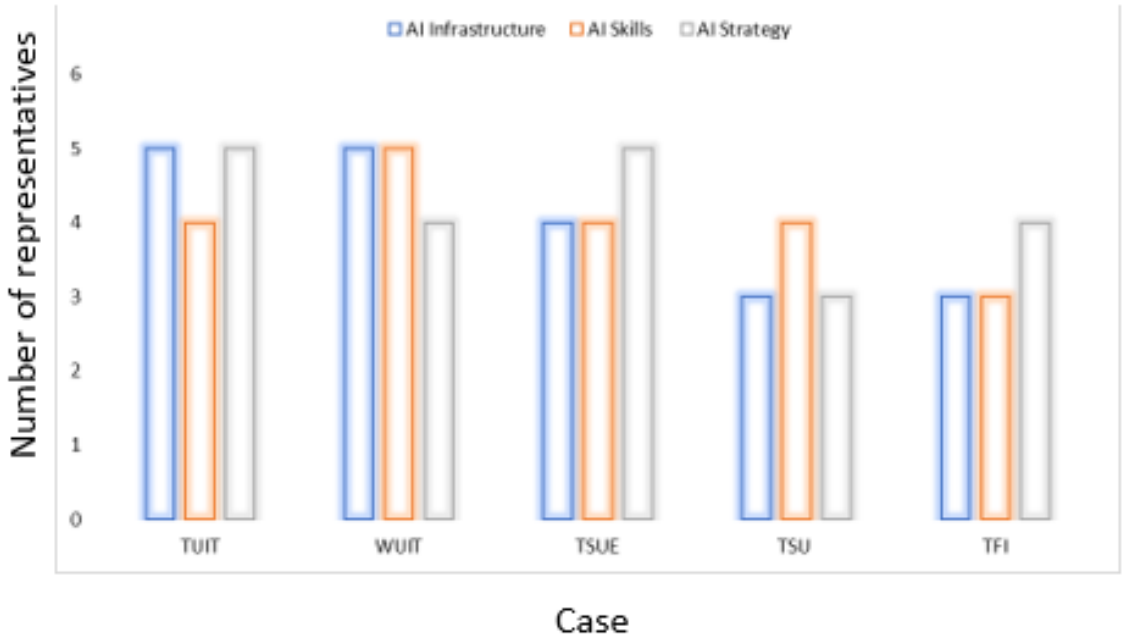

Figure 8. AI implementation survey results. *Note: where 5 represents "Excellent" and 1 is "Very Poor".

5. CONCLUSION

This research set out to explore the current state of AI technologies in Uzbekistan, global trends in AI implementation in higher education management, and specific cases of AI adoption in Uzbekistan's higher education institutions. The findings have highlighted the considerable potential of AI in enhancing the efficiency and effectiveness of higher education management, while also underlining the challenges involved, particularly regarding infrastructure investment, skill development, and data security.

Despite being in its formative stage, Uzbekistan's AI ecosystem shows promise, buoyed by government commitment and initial applications across sectors. Institutions like TUIT and WIUT, which have already begun their AI journeys, provide valuable insights for others looking to embark on similar paths. However, the road to fully integrating AI into higher education management in Uzbekistan requires careful planning, investment, and a forward-looking approach.

The broader significance of this research lies in its contribution to the emerging body of knowledge on AI in higher education management. It highlights the specific context of Uzbekistan, thereby enriching the global discourse on AI in higher education. The study's findings and recommendations can guide policymakers, university administrators, and other stakeholders in shaping Uzbekistan's higher education sector's future in the digital age.

Moreover, the research paves the way for further studies in this field, particularly in exploring other aspects of AI in higher education, such as pedagogical applications and its impact on student outcomes. As the world continues to navigate the digital revolution, such research will be crucial in harnessing technology's transformative potential for education.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

7. REFERENCES

Agustina, S., and Nandiyanto, A. B. D. (2021). The effectiveness of distance learning using learning management system media and whatsapp groups at senior high school. *Indonesian Journal of Multidiciplinary Research, 1*(1), 89-98.

Ajijola, E. M., Ogunlade, O. O., and Aladesusi, G. A. (2021). The attitude of distance learners towards the utilization of learning management system (a case study of national open University of Nigeria). *Indonesian Journal of Teaching in Science, 1*(1), 53-62.

Al Husaeni, D. N., and Hadianto, D. (2022). The influence of spada learning management system (LMS) on algorithm learning and programming of first grade students at Universitas Pendidikan Indonesia. *Indonesian Journal of Multidiciplinary Research, 2*(1), 203-212.

Boakye, K. G., Banini, D. A., and Oduro, G. K. T. (2020). AI in Africa - education and the way forward. *Advances in Intelligent Systems and Computing, 1103*, 188-200.

Eynon, R. (2018). The fight for digital competence: What can we learn from the international computer and information literacy study?. *Learning, Media and Technology, 43*(3), 310-324.

Farxod, T. (2023). ASEAN journal of educational research improving the methodology of preparing the future technology teacher for professional activity in the information education environment. *ASEAN Journal of Educational Research and Technology, 2*(3), 201–210.

Fayzievna, H. M. (2012). Ways Of Professional training of children with the limited opportunities. *Social and Natural Sciences Journal, 4,* 5-6.

Floridi, L., and Taddeo, M. (2016). What is data ethics?. *Philosophical Transactions of the Royal Society A, 374*(2083), 1-5.

Hakimova, M. F. (2018). The importance of modular training in improving economic literacy. *Актуальные проблемы гуманитарных и социально-экономических наук, 12*(9), 32-33.

Hershkovitz, A., and Forkosh-Baruch, A. (2013). Student data mining: Identifying key transitional moments and short-term paths of at-risk students. *Journal of Educational Data Mining, 5*(1), 190-215.

Hodges, J., Ozbek, A., Islamova, Z., and Sultanova, N. (2021). A scoping review of artificial intelligence in healthcare in Central Asia. *International Journal of Medical Informatics, 147,* 104363-1 – 104363-6.

Hook, D., Porter, S.J., and Herzog, C. (2018). Dimensions: Building context for search and evaluation. *Frontiers in Research Metrics and Analytics, 3,* 1-11.

Jakhongir, S., Khayrilla, K., Muhabbat, H., and Salim, K. (2023). analyzing climate policy utilizing financial and energy industry models. *ASEAN Journal of Economic and Economic Education, 2*(2), 125–138.

Kizilcec, R. F., Saltarelli, A. J., Reich, J., and Cohen, G. L. (2020). Closing global achievement gaps in MOOCs. *Science, 355*(6322), 251-252.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427

Kurbanov, R., and Juraev, S. (2021). Transformation of Uzbekistan telecom industry. *Central Asian Journal of Management, Economics, and Social Research, 1*(1), 50-55.

Lee, S. W. Y., Liu, C. L., and Chen, Y. L. (2016). Digital game-based learning to improve students' learning in mathematics: A case study for elementary school. *International Journal of Grid and Distributed Computing, 9*(7), 11-20.

Lovett, J., Bajjaly, S., and Gould, J. (2019). Predictive modeling for annual giving and major gift fundraising: A case study. *Journal of Nonprofit and Public Sector Marketing, 31*(1), 1-15.

Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. *Futures, 90*, 46-60.

Muhabbat, H., Jakhongir, S., Farxod, T., and Khulkar, K. (2023). Modernization of management system of higher education institutions: an empirical perspective from Uzbekistan. *ASEAN Journal of Economic and Economic Education, 3*(2), 297–306.

Oztemel, E., and Gursev, S. (2020). Literature review of Industry 4.0 and related technologies. *Journal of Intelligent Manufacturing, 31*(1), 127-182.

Patton, M. Q. (2002). Two decades of developments in qualitative inquiry: A personal, experiential perspective. *Qualitative Social Work, 1*(3), 261-283.

Prusty, S., Kodali, R., and Bhattacharya, M. (2019). A study on current status, opportunities and challenges of ai in indian higher education. *Advances in Intelligent Systems and Computing, 810*, 299-308.

Riyanto, M., Nandiyanto, A. B. D., Kurniawan, T., and Bilad, M. R. (2022). Management of character education in the scope of elementary school students in the distance learning period. *Indonesian Journal of Multidiciplinary Research, 2*(1), 1-8.

Shaturaev, J. (2023a). Amendment of higher education institution quality assurance. *Indonesian Journal of Multidisciplinary Research, 3*(1), 175–180.

Shaturaev, J. (2023b). Leading-edge strategies for enhancing higher education institutions' management systems. *Indonesian Journal of Teaching in Science, 3*(1), 59-66.

Shaturaev, J., and Khamitovna, K. K. (2023). A computer-based approach to teaching foreign languages. *ASEAN Journal of Educational Research and Technology, 2*(2), 89–98.

Shermatov, K., Yuldashev, F., and Ismailova, R. (2020). The perspectives of using artificial intelligence in education: The case of Uzbekistan. *Innovations in Intelligent Systems and Computing, 1131,* 500-513.

Tulasi, B., and Rambhia, S. (2018). Predictive analysis of course demand for efficient course offering in colleges. *International Journal of Artificial Intelligence and Applications, 9*(1), 1-11.

Ursachi, G., Horodnic, I. and Zait, A. (2015). How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Economics and Finance, 20,* 679-686.

DOI: https://doi.org/10.17509/ijert.v4i1.60367
p- ISSN 2775-8419 e- ISSN 2775-8427