Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 13 | Issue: 1 | January 2026 -Peer-Reviewed Journal

ASSESSING THE EFFECTIVENESS OF DIGITAL TRANSFORMATION IN HIGHER EDUCATION INSTITUTIONS BASED ON ARTIFICIAL INTELLIGENCE AND DATA ANALYTICS

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ABSTRACT
In the article is devoted to assessing the effectiveness of digital transformation in higher education based on artificial intelligence and data analysis. The model demonstrates the potential to personalize the learning process, select adaptive strategies, and ensure academic integrity through automated assessment and proctoring systems. Using data analysis and real-time monitoring, student performance is evaluated, and the effectiveness of digital transformation is determined based on learning quality, management efficiency, and student satisfaction. Artificial intelligence is not a competitor to teaching staff in higher education but serves as an additional tool to optimize the learning process and enhance effective management.

KEY WORDS: *Artificial Intelligence, Data Analysis, Digital Transformation, Higher Education, Learning Effectiveness, Management Efficiency*

1. INTRODUCTION

In the context of the digital economy, higher education institutions are undergoing a profound transformation. The digitization of educational processes, management systems, and institutional mechanisms is becoming a key factor in enhancing the quality of education, improving administrative efficiency and developing human capital.

However, the mere implementation of digital technologies is not sufficient; assessing their actual outcomes and effectiveness has emerged as a significant scientific challenge.

In recent years, the rapid development of artificial intelligence and data analytics technologies has brought digital transformation in higher education institutions to a qualitatively new level. AI-based systems enable the personalization of the learning process, forecasting of students' academic performance early identification of risks in the educational process, and optimization of management decisions.

At the same time, the analysis of large volumes of data provides the opportunity to comprehensively assess the digital activities of higher education institutions and identify strategic directions for development.

Nevertheless, the analysis of existing scientific research shows that the assessment of digital transformation effectiveness in higher education institutions often relies on individual indicators or subjective evaluations. The use of artificial intelligence and data analytics as a unified, integrated evaluation mechanism has not been sufficiently explored. As a result, the actual impact of the digital transformation process, as well as its economic and institutional effectiveness, remains incompletely revealed.

This situation necessitates the development of a scientifically grounded approach for assessing the effectiveness of digital transformation in higher education institutions based on artificial intelligence and data analytics. The aim of this article is to identify the possibilities of using AI and data analytics in evaluating digital transformation effectiveness in higher education and to substantiate their practical application directions.

2. LITERATURE REVIEW

Modern education is becoming mobile and open. The integration of information and communication technologies (ICT) and e-learning resources into the educational process contributes to the formation of a new paradigm of learning.

The essence of digital transformation in education lies in ensuring that each learner achieves the required educational outcomes through the personalization of the learning process. This process involves leveraging the expanding capabilities of digital technologies, including artificial intelligence methods and virtual reality tools;

developing a digital learning environment within educational institutions; providing the general public with high-speed internet access; and working effectively with big data.

The term "Artificial Intelligence" (AI) was introduced in 1956 by the American computer scientist John McCarthy. AI is generally understood as the ability of intelligent systems and algorithms to perform creative functions typically carried out by humans. The primary task of artificial intelligence is to intellectually model achievable cognitive processes.

Thus, Oganesyan T.K. and Styrin E.M. (2017) note that humanity is currently on the threshold of the Fourth Industrial Revolution, and it is practically impossible to stop the development of artificial intelligence. According to them, neural networks are capable of performing a range of tasks much more efficiently and accurately than humans. This may lead to the full automation of many jobs in the near future, resulting in an increased risk of unemployment. At the same time, the authors emphasize that, historically, various technologies have displaced humans in the labor market, yet humanity has always managed to adapt to ongoing changes.

The digitalization of the economic system has also had a significant impact on higher education. Today, numerous studies are dedicated to examining the interrelationship between education and economic development. In particular, the works of Buryashov B.A. (2017) and other international scholars conceptually highlight the role of education in economic growth.

Their research outlines key directions for improving the efficiency of the education system, contributing to economic development, and modernizing the learning process through the use of innovative technologies. Furthermore, these studies emphasize that the digitalization of the education system and processes of digital transformation serve as important tools for ensuring economic stability and competitiveness. This underscores the importance of implementing innovative approaches in higher education and evaluating their practical outcomes.

Furthermore, Learning House (2018) emphasizes that artificial intelligence systems are effectively used in higher education for student admissions, accelerating learning, completing complex tasks, and optimizing and personalizing curricula. According to their study, AI-based chatbots (e.g., Admit Hub) are highly efficient in consulting students and explaining admission requirements.

Therefore, Research on the Shadow Health and M-Write platforms (Open Education, 2021) shows that AI systems are effectively applied in medical and academic writing training and assessment processes. At the same time, AI cannot fully replace human qualities such as intuition, creative thinking, and empathy.

3. RESEARCH METHODOLOGY

The methodology of this study was aimed at assessing the effectiveness of digital transformation in higher education institutions. It involved analyzing learning processes based on artificial intelligence and data analytics, ensuring efficient use of resources, improving learning outcomes, and guaranteeing strategic development. The study employed methods of analysis, synthesis, critical thinking, and generalization.

4. ANALYSIS AND RESULT

The implementation of artificial intelligence and data analytics in higher education institutions has significantly enhanced the effectiveness of digital transformation. Personalized learning paths, automated assessment, and real-time monitoring have improved student engagement and academic outcomes.

In addition, efficient resource utilization and data-driven decision-making have strengthened strategic development and ensured the institution's operational stability. These findings clearly demonstrate the positive impact of AI-driven digital transformation on the quality of education and institutional performance.

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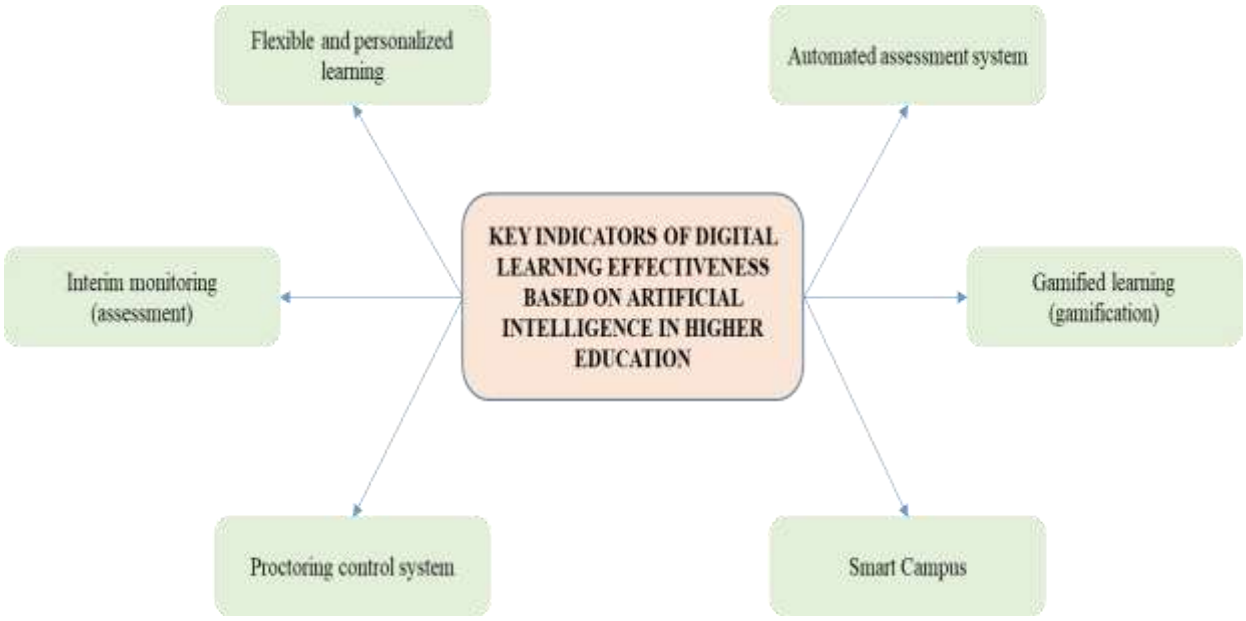


Figure1. Evaluation of digital learning effectiveness in higher education based on artificial intelligence[1]

Thus, the figure illustrates a conceptual model for assessing the effectiveness of AI-based digital learning in higher education institutions. At the center of the model are the key indicators determining digital learning effectiveness, which focus on organizing the learning process in a flexible and personalized manner, implementing automated assessment mechanisms, and enhancing student engagement and motivation through gamification.

In addition, proctoring systems and interim monitoring tools not only ensure academic integrity but also enable the real-time analysis of learning outcomes. The "Smart Campus" component enhances the efficiency of managing the educational process through digital infrastructure and data integration. Overall, this model serves to ensure quality, transparency, and sustainable development in higher education by leveraging the comprehensive use of artificial intelligence technologies.

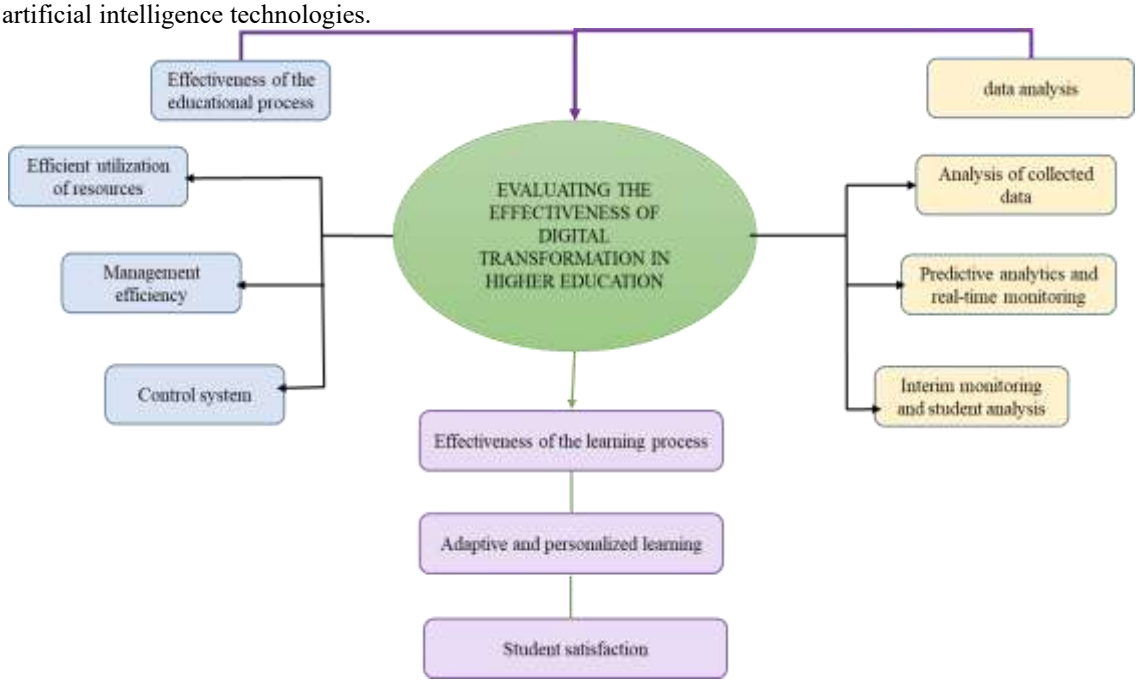


Figure 1. Classification of higher education effectiveness assessment under conditions of digital transformation[2]

[1] *Developed by the author on the basis of theoretical insights*
[2] *By Made Athour*

The presented figure illustrates a conceptual-analytical model for assessing the effectiveness of digital transformation in higher education institutions, developed based on the principle of data-driven management. The model places data analysis, predictive analytics, and real-time monitoring mechanisms at its core. This approach enables the identification of strengths and weaknesses in the educational process through interim monitoring and the analysis of student engagement.

At the same time, efficient use of resources, enhanced management effectiveness, and the implementation of digital control systems contribute to the optimization of the educational process.

According to the model's results, the overall efficiency of learning increases, a flexible and personalized learning environment is established, and student satisfaction steadily improves. This serves as a methodological foundation for the comprehensive assessment of the impact of digital transformation on the quality of higher education.

5. CONCLUSION

Based on the above analysis, we summarize the conclusions and the achieved results:
The implementation of artificial intelligence and data analytics in higher education institutions significantly enhances the effectiveness of digital transformation. AI systems enable the personalization of learning, forecasting of students' academic performance, and optimization of management decisions.

The proposed conceptual-analytical model supports data-driven management a flexible and personalized learning environment, automated assessment mechanisms, and gamification, all of which contribute to increased student engagement and satisfaction. At the same time, efficient resource utilization and digital control systems help optimize the educational process and ensure institutional stability.

Overall, AI and data analytics do not replace teaching staff but serve as a strong methodological foundation for improving educational quality, enhancing transparency, and ensuring sustainable development in higher education. These findings provide a basis for further scientific research and practical applications in evaluating the impact of digital transformation on learning and management effectiveness.

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