

MUHANDISLIK & IQTISODIYOT

*ijtimoiy-iqtisodiy, innovatsion texnik,
fan va ta'limga oid ilmiy-amaliy jurnal*

№12

2025
dekabr

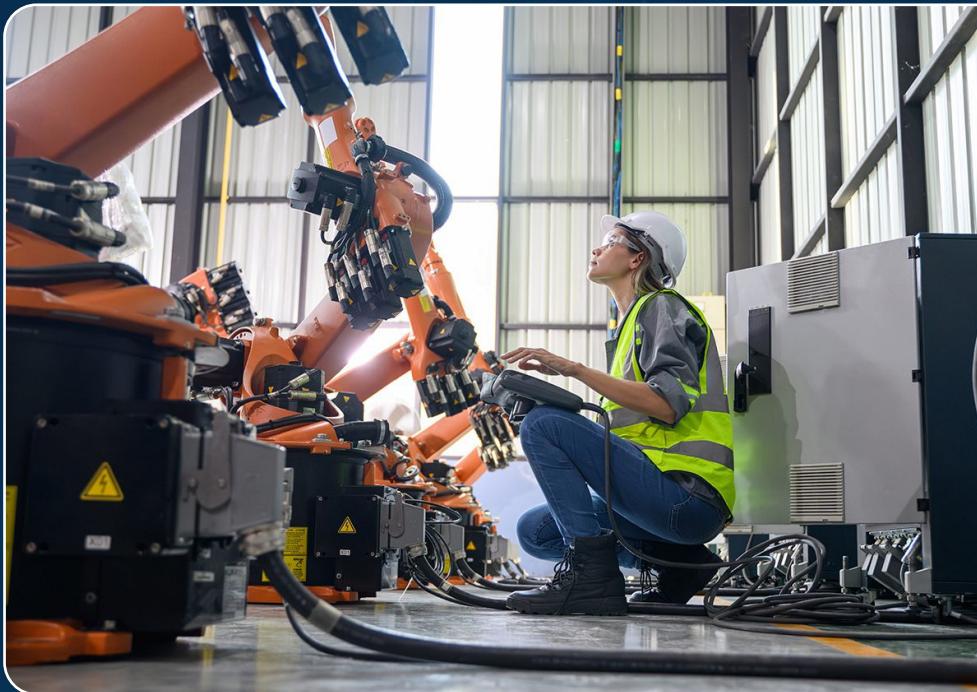


Milliy nashrlar

OAK: <https://oak.uz/pages/4802>

05.00.00 - Texnika fanlari

08.00.00 - Iqtisodiyot fanlari



ISSN: 3060-463X



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*Elektron nashr, 134 sahifa.
2025-yil, dekabr*

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- 05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
- 05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
- 05.01.03 – Informatikaning nazariy asoslari
- 05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
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- 05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
- 05.01.07 – Matematik modellashtirish
- 05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
- 05.02.00 – Mashinasozlik va mashinashunoslik
- 05.02.08 – Yer ustii majmualari va uchish apparatlari
- 05.03.02 – Metrologiya va metrologiya ta'minoti
- 05.04.01 – Telekommunikasiya va kompyuter tizimlari, telekommunikasiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
- 05.05.03 – Yorug'lik texnikasi. Maxsus yoritish texnologiyasi
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- 05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
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- 10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
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- 08.00.05 – Xizmat ko'satish tarmoqlari iqtisodiyoti
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- 08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
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Ma'lumot uchun, OAK

Rayosatining 2024-yil 28-avgustdagagi 360/5-son qarori bilan "Dissertatsiyalar asosiy ilmiy natijalarini chop etishga tavsiya etilgan milliy ilmiy nashrlar ro'yxati"ga texnika va iqtisodiyot fanlari bo'yicha "Muhandislik va iqtisodiyot" jurnali ro'yxatga kiritilgan.

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THE ROLE OF ARTIFICIAL INTELLIGENCE IN OPTIMIZING MARKETING AND EDUCATIONAL PROCESSES IN HIGHER EDUCATION

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Abstract. This article examines the impact of artificial intelligence technologies on higher education, particularly on the modeling and management mechanisms of marketing activities within universities. It provides a scientific analysis of AI's capabilities in personalizing learning, processing and analyzing data, automating assessment, and increasing educational efficiency. The advantages of integrating AI technologies into the training of highly qualified specialists and the effectiveness of digital tools in higher education institutions are discussed. The article also highlights AI-driven marketing management mechanisms and reviews global best practices, particularly those of China and the United States, regarding the application of AI in education.

Keywords: artificial intelligence, higher education, marketing management, modeling, digital technologies, machine learning, personalized learning, innovative ecosystem.

Annotatsiya. Ushbu maqolada sun'iy intellekt texnologiyalarining oliy ta'lim jarayoniga, xususan, marketing faoliyatini modellashtirish va boshqarish mexanizmlariga ta'siri yoritilgan. Sun'iy intellektning o'qitish jarayonini shaxsiylashtirish, ma'lumotlarni qayta ishlash, tahlil qilish, baholash va ta'lim samaradorligini oshirishdagi imkoniyatlari ilmiy tahlil qilingan. Maqolada yuqori malakali kadrlar tayyorlash jarayonida AI texnologiyalarini joriy etishning afzallikkari, oliy ta'lim muassasalari faoliyatida raqamli vositalardan foydalanish samaradorligi hamda dunyo tajribasi asosida marketing boshqaruvida AI algoritmlarining qo'llanish mexanizmlari ko'rsatib o'tilgan. Shuningdek, Xitoy va AQSh kabi ilg'or davlatlar tajribasi misolida ta'lim tizimida sun'iy intellektidan foydalanish istiqbollari yoritilgan.

Kalit so'zlar: sun'iy intellekt, oliy ta'lim, marketing boshqaruvi, modellashtirish, raqamli texnologiyalar, mashinaviy o'qitish, shaxsiylashtirilgan ta'lim, innovatsion ekotizim.

Аннотация. В данной статье рассматривается влияние технологий искусственного интеллекта на систему высшего образования, в частности, на механизмы моделирования и управления маркетинговой деятельностью вузов. Проведен научный анализ возможностей ИИ в персонализации обучения, обработке и анализе данных, автоматизации оценки знаний и повышении эффективности образовательного процесса. Также обсуждаются преимущества внедрения технологий ИИ в подготовку высококвалифицированных кадров и эффективность цифровых инструментов в деятельности высших учебных заведений. На основе мирового опыта, включая Китай и США, раскрываются перспективы применения ИИ в образовательной сфере и маркетинговом управлении.

Ключевые слова: искусственный интеллект, высшее образование, маркетинговое управление, моделирование, цифровые технологии, машинное обучение, персонализированное обучение, инновационная экосистема.

INTRODUCTION

In recent years, extensive reforms have been implemented in all sectors of our country. In particular, recognizing the great importance and potential of artificial intelligence (AI) technologies, special attention is being paid to their development. In this era of rapid technological progress, artificial intelligence is becoming a key factor influencing the advancement of various spheres of life. It must be acknowledged that these technologies have the potential to bring significant benefits — from increasing productivity and efficiency to achieving breakthroughs in science and innovation.

At the same time, in order to introduce artificial intelligence into science, it is necessary to increase the number of qualified specialists. Indeed, highly skilled professionals who are masters of their field will play a decisive role in ensuring the integration of artificial intelligence into all domains.



For this purpose, efforts have been launched to create a favorable and effective ecosystem for the development of innovative business models, products, and service delivery methods based on artificial intelligence technologies, and to ensure their rapid implementation and practical application in designated priority sectors and industries. This is because artificial intelligence technologies are among the fastest-growing and most promising directions within digital technologies. Through the use of AI — a key component of digital technologies — it is possible to achieve efficiency not only in education, but also in all areas of life. The introduction of artificial intelligence provides advantages such as ensuring transparency, preventing fraud, analyzing data, and working with large volumes of information.

In the field of education, in particular, AI technologies enable the creation of virtual learning environments and offer significant conveniences for distance learning.

REVIEW OF LITERATURE ON THE SUBJECT

The integration of artificial intelligence (AI) into higher education has been a focal point of scholarly inquiry over the past decade, with numerous researchers elucidating its transformative potential in both pedagogical and administrative domains. For instance, Luckin et al. (2016)¹ argue that AI technologies, particularly intelligent tutoring systems and adaptive learning platforms, substantially enhance individualized instruction by tailoring content to learners' cognitive profiles, thereby improving engagement and learning outcomes. Their meta-analysis underscores the efficacy of AI-driven personalization in fostering higher-order thinking skills and academic resilience.

In the context of higher education marketing, Baker and Siemens (2014)² emphasize that AI-enabled analytics provide institutions with unprecedented capabilities to monitor student behavior, predict enrollment patterns, and optimize recruitment strategies. They highlight the utility of predictive models and learning analytics as tools for evidence-based decision-making in student acquisition and retention, asserting that such data-driven approaches significantly enhance institutional competitiveness.

Chen et al. (2020)³ examine the application of machine learning algorithms for institutional marketing in Chinese universities, demonstrating that AI facilitates not only automated outreach campaigns but also the segmentation of prospective student populations according to socio-demographic and academic variables. Their study reveals that AI-assisted targeting results in higher conversion rates and improved allocation of marketing resources.

From a pedagogical perspective, Holmes et al. (2019)⁴ explore the broader implications of AI in higher education, arguing that neural networks and natural language processing tools enable real-time feedback and assessment, thus augmenting both teaching efficacy and student autonomy. They further note that AI fosters adaptive instructional design, allowing faculty to dynamically adjust curricular content based on student performance analytics.

Conversely, several scholars have raised critical concerns regarding the ethical and operational challenges associated with AI integration. Floridi et al. (2018)⁵ discuss the risks of algorithmic bias, data privacy violations, and potential depersonalization of the learning process, advocating for robust governance frameworks and ethical oversight mechanisms. Similarly, Selwyn (2019) contends that while AI offers efficiency gains, its adoption must be complemented by pedagogical expertise and human-centered design principles to prevent unintended negative consequences in educational environments.

Finally, comparative analyses of international practices indicate significant variation in AI deployment strategies. Zawacki-Richter et al. (2019)⁶ provide a comprehensive review of AI implementation across North American, European, and Asian higher education systems, noting that policy frameworks, institutional resources, and cultural attitudes shape the scope and effectiveness of AI initiatives. Their findings suggest that successful AI integration is contingent upon strategic alignment with institutional objectives and the broader socio-economic ecosystem.

In summary, the extant literature collectively demonstrates that AI possesses a dual capacity to enhance pedagogical processes and optimize marketing strategies in higher education. However, the efficacy of these

1 Luckin, Rose, and Wayne Holmes. "Intelligence unleashed: An argument for AI in education." (2016).

2 Baker, Ryan, and George Siemens. "Learning analytics and educational data mining." Cambridge handbook of the learning sciences (2014): 253-272.

3 Chen, Wei, et al. "AI assisted PHY in future wireless systems: Recent developments and challenges." China Communications 18.5 (2021): 285-297.

4 Holmes, Wayne, Maya Bialik, and Charles Fadel. Artificial intelligence in education promises and implications for teaching and learning. Center for Curriculum Redesign, 2019.

5 Floridi, Luciano, et al. "AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations." Minds and machines 28.4 (2018): 689-707.

6 Zawacki-Richter, Olaf, et al. "Systematic review of research on artificial intelligence applications in higher education—where are the educators?" International journal of educational technology in higher education 16.1 (2019): 1-27.



interventions is contingent upon careful implementation, ethical considerations, and the ongoing evaluation of both technological performance and educational outcomes. These insights provide a theoretical and empirical foundation for the current study, which aims to model and evaluate AI-enabled marketing management mechanisms in higher education institutions.

RESEARCH METHODOLOGY

The methodological framework of this study is predicated on a multidisciplinary and integrative approach, synthesizing concepts from artificial intelligence (AI), educational technology, and higher education marketing management. The research adopts a mixed-methods paradigm, encompassing both qualitative and quantitative analyses, in order to rigorously interrogate the multifaceted interactions between AI-driven systems and the operational paradigms of higher education institutions. Specifically, this study employs a three-tiered methodological schema comprising: (i) a systematic review of extant scholarly literature; (ii) a comparative cross-sectional analysis of AI implementation strategies within global higher education contexts; and (iii) a conceptual modeling exercise aimed at elucidating optimal mechanisms for AI-enabled marketing management.

The systematic literature review component is grounded in the principles of evidence-based research synthesis. Peer-reviewed articles, monographs, and policy white papers were meticulously collated from leading databases including Scopus, Web of Science, and IEEE Xplore, spanning the period from 2010 to 2025. The review is structured to capture (a) the evolution of AI technologies in educational ecosystems, (b) pedagogical paradigms influenced by AI-enabled personalization, and (c) emergent frameworks for AI-mediated institutional marketing and stakeholder engagement. Through this lens, the study situates contemporary research within a broader epistemological and theoretical context, identifying critical gaps and avenues for future inquiry.

The comparative analysis is informed by a cross-national perspective, juxtaposing the AI integration strategies employed by leading higher education systems in the United States, China, and select European jurisdictions. This component examines the deployment of neural network architectures, machine learning algorithms, natural language processing applications, and cognitive computing systems in both administrative and instructional functions. Key performance indicators, such as operational efficiency, student engagement, curriculum personalization, and marketing reach, are quantitatively evaluated to derive insights into best practices and scalable models for AI assimilation.

Finally, the study engages in a conceptual modeling exercise, employing systems thinking and process optimization frameworks to delineate the mechanisms through which AI can augment marketing management in higher education. This modeling is underpinned by principles of cybernetics, decision theory, and adaptive learning systems, facilitating the design of an AI-mediated ecosystem that integrates data-driven insights, predictive analytics, and strategic stakeholder communication. The resultant framework elucidates pathways for enhancing institutional visibility, optimizing student recruitment processes, and fostering a sustainable competitive advantage through the strategic deployment of AI technologies.

In sum, the methodological approach integrates rigorous empirical analysis with conceptual theorization, providing a robust foundation for understanding the transformative potential of artificial intelligence in higher education marketing and operational management. This integrative paradigm not only advances the scholarly discourse on AI-enabled education systems but also offers actionable insights for policy-makers, academic administrators, and technology strategists seeking to navigate the increasingly complex landscape of digitalized higher education.

ANALYSIS AND RESULTS

Artificial intelligence (AI) is the capability of computer systems to perform creative and intellectual activities that were previously considered unique to humans. AI encompasses complex fields such as neural networks, machine learning, natural language processing, cognitive computing, and computer vision. Today, artificial intelligence and innovative technologies have entered all spheres of society and have fundamentally transformed our way of life. Under the influence of AI, many social processes - including the higher education system - are undergoing significant transformation.

In the educational process, AI plays an important role in learning, analyzing, processing, and interpreting data. AI-based tools assist in recognizing information, conducting targeted searches, analyzing data, and presenting outcomes. Compared to human abilities, artificial intelligence offers several advantages in education, including time-saving, personalization, and enhanced learning efficiency.

Time is advancing rapidly. Twenty years ago, a person carrying a brick-like button phone on the street attracted everyone's attention; today, that device has transformed into a smartphone through which we watch



movies, shop for groceries, monitor our children's school activities, read, communicate, and perform numerous other tasks — all of which have become ordinary aspects of daily life.

To put it simply, artificial intelligence (AI) is the ability of computer systems to perform creative and intellectual activities that were previously considered unique to humans. It combines highly complex fields such as neural networks, machine learning, natural language processing, cognitive computing, and computer vision.

Artificial intelligence and innovative technologies have completely transformed our way of life. AI has entered human life like a storm, influencing every sector of society and bringing about incredible changes.

Today, AI is rapidly gaining its place in the field of education. Artificial intelligence plays a major role in creating information systems that can learn, analyze, transform, and interpret data. These systems help recognize data during the learning process, search for information for specific purposes, analyze data, and present results. Compared to natural human capabilities, artificial intelligence brings several advantages to the education sector.

AI significantly saves learners' time and positively influences their successful academic development. The possibilities of artificial intelligence are extensive: it can answer questions that interest you, draw images based on given commands, create presentations on various topics, and even write different essays and articles.

Its learning algorithms are adapted to the individual characteristics and learning styles of students, which enhances each student's unique educational abilities.

Artificial intelligence not only provides advantages for students but also creates many conveniences for teachers throughout the teaching process. For example, in order to design an intensive curriculum and make lessons more engaging and meaningful, teachers can use AI-based methods to study students' interests, search for information, analyze it, and explain it effectively. With the help of AI, it becomes possible to explore various fields such as genetics, robotics, visual learning, natural language learning, and others.

It should be remembered that the success and constructive use of artificial intelligence depend on careful management and foresight to optimize it and prevent misuse of available tools. Just as science has greatly simplified people's lives, it has also created certain problems. Therefore, approaching this issue from a philosophical perspective allows us to see both the positive and negative aspects of artificial intelligence. Ultimately, the future of humanity will depend on how effectively we can use AI technologies.

Deep learning represents the latest development in machine learning and involves studying large volumes of data through layered neural networks. Here, massive datasets are fed into algorithms to learn or perform complex tasks. Today, AI applications have become increasingly sophisticated—from voice assistants to stock market prediction algorithms, natural language processing tools, and image recognition systems. One of the primary requirements of using AI in modern education is achieving high results in a short time without excessive mental or physical effort.

Artificial intelligence can automate key educational activities such as assessment. Currently, academics can modify multiple-choice or fill-in-the-blank tests, and automated scoring of student writing may soon reach a high level. AI-based programs can provide valuable feedback to both students and teachers. AI not only helps educators create personalized courses based on learners' preferences but can also offer insights into the overall effectiveness of a course. Such AI systems help students receive support and assist professors in identifying areas where teaching can be improved. There will always be a role for teachers in education, but what this role looks like may change as intelligent computational technologies continue to evolve. As mentioned above, AI can take over tasks like grading, help students improve their learning, and even replace real tutoring in some cases.

According to the World Economic Forum, many companies may adopt technologies such as machine learning, prompting governments and educational institutions to rapidly strengthen STEM (science, technology, engineering, and mathematics) education as well as non-cognitive soft skills to meet emerging needs. A recent Microsoft study shows that by 2030, students graduating from college will need to master two major competencies:

- Understanding how to use rapidly evolving technologies like AI for their benefit
- Knowing how to work effectively with others in teams to solve complex problems

Preparing students to work alongside AI begins early. Many young people reach university age without adequate digital literacy, so it is vital to teach them skills that enable development in a digital environment. Integrating AI into education helps build long-term capacity to face the unknown challenges of tomorrow.

China and the United States are global leaders in AI-related scientific research and education. These countries not only host world-renowned universities and research institutions but also fully regulate and support innovation through strong mechanisms and large-scale financial assistance. As a result, China and the U.S. attract highly skilled specialists from around the world. There are many debates among scholars regarding the future of artificial intelligence. Some express concern that certain machines may intrude into people's private lives or even become weaponized, while others hold an optimistic view. They argue that AI-powered



autonomous systems can calculate outcomes that deliver maximum benefit with minimal risk and loss. Our country has taken major steps to promote the development of science, and real-life experience shows that implementing digital technologies across all sectors can significantly advance socio-economic development.

CONCLUSIONS AND SUGGESTIONS

This study underscores the transformative potential of artificial intelligence (AI) in higher education, particularly in the realms of marketing management and pedagogical innovation. The integration of AI technologies—ranging from machine learning algorithms and neural networks to natural language processing and predictive analytics—has demonstrably enhanced operational efficiency, personalized learning, and strategic student engagement. Empirical evidence and international case studies indicate that AI not only streamlines administrative processes and optimizes resource allocation but also provides actionable insights that inform marketing and recruitment strategies.

The findings reveal that AI facilitates adaptive learning environments, real-time feedback, and data-driven decision-making, thereby significantly improving both teaching effectiveness and student outcomes. At the same time, careful attention must be paid to ethical considerations, including data privacy, algorithmic bias, and the potential depersonalization of the educational experience. The success of AI implementation is contingent upon the development of robust governance frameworks, strategic alignment with institutional objectives, and continuous evaluation of both technological and educational performance.

Ultimately, the study highlights that the future of higher education increasingly relies on the strategic deployment of AI to foster innovation, enhance competitiveness, and deliver equitable, high-quality educational experiences. Institutions that effectively harness AI will be better positioned to navigate the evolving landscape of global education, while ensuring that technological integration complements human pedagogical expertise and promotes sustainable development.

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muhandislik & iqtisodiyot

ijtimoiy-iqtisodiy, innovatsion texnik,
fan va ta'limga oid ilmiy-amaliy jurnal

Ingliz tili muharriri: Feruz Hakimov

Musahhih: Zokir Alibekov

Sahifalovchi va dizayner: Iskandar Islomov

2025. № 12

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"Muhandislik va iqtisodiyot" jurnali 26.06.2023-yildan
O'zbekiston Respublikasi Prezidenti Adminstratsiyasi huzuridagi
Axborot va ommaviy kommunikatsiyalar agentligi tomonidan
№S-5669245 reyestr raqami tartibi bo'yicha ro'yxatdan o'tkazilgan.
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