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TEXNOLOGIK VA INDUSTRIAL SANOATNI RIVOJLANTIRISH
ORQALI MIKRO VA MAKROIQTISODIY BARQAROR
O'SISHNI TA'MINLASH DOLZARBLIGI”**

**“GLOBAL DIGITAL INTEGRATION: THE RELEVANCE OF
ENSURING MICRO AND MACROECONOMIC SUSTAINABLE
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DEVELOPMENT IN THE TRANSITION TO A GREEN
ECONOMY BY 2030”**

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АКТУАЛЬНОСТЬ ОБЕСПЕЧЕНИЯ УСТОЙЧИВОГО
МИКРО- И МАКРОЭКОНОМИЧЕСКОГО РОСТА ЧЕРЕЗ
РАЗВИТИЕ ТЕХНОЛОГИЧЕСКОЙ И ИНДУСТРИАЛЬНОЙ
ПРОМЫШЛЕННОСТИ В ПЕРЕХОДЕ К ЗЕЛЁНОЙ
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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
- 05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
- 05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
- 05.01.07 – Matematik modellash
- 05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
- 05.02.00 – Mashinasozlik va mashinashunoslik
- 05.02.08 – Yer usti majmualari va uchish apparatlari
- 05.03.02 – Metrologiya va metrologiya ta'minoti
- 05.04.01 – Telekommunikatsiya va kompyuter tizimlari, telekommunikatsiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
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- 05.05.05 – Issiqlik texnikasining nazariy asoslari
- 05.05.06 – Qayta tiklanadigan energiya turlari asosidagi energiya qurilmalari
- 05.06.01 – To'qimachilik va yengil sanoat ishlab chiqarishlari materialshunosligi
- 05.08.03 – Temir yo'l transportini ishlatish
- 05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
- 05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
- 10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
- 10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
- 08.00.01 – Iqtisodiyot nazariyasi
- 08.00.02 – Makroiqtisodiyot
- 08.00.03 – Sanoat iqtisodiyoti
- 08.00.04 – Qishloq xo'jaligi iqtisodiyoti
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- 08.00.06 – Ekonometrika va statistika
- 08.00.07 – Moliya, pul muomalasi va kredit
- 08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
- 08.00.09 – Jahon iqtisodiyoti
- 08.00.10 – Demografiya. Mehnat iqtisodiyoti
- 08.00.11 – Marketing
- 08.00.12 – Mintaqaviy iqtisodiyot
- 08.00.13 – Menejment
- 08.00.14 – Iqtisodiyotda axborot tizimlari va texnologiyalari
- 08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
- 08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
- 08.00.17 – Turizm va mehmonxona faoliyati

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MUNDARIJA

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ARTIFICIAL INTELLIGENCE AND BIG DATA APPLICATIONS IN UNIVERSITY MANAGEMENT: EVIDENCE FROM UZBEKISTAN

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Abstract. The findings indicate that universities with higher levels of artificial intelligence and Big Data integration demonstrate stronger management performance, faster decision-making processes, improved resource utilization, and greater institutional adaptability. The study also highlights challenges related to digital infrastructure, staff competencies, data quality, and cybersecurity. Based on the findings, practical recommendations are proposed to support the wider implementation of AI-driven governance mechanisms in higher education institutions across Uzbekistan.

Keywords: artificial intelligence, Big Data, university management, digital governance, higher education, HEMIS.

Annotatsiya. Tadqiqot natijalari sun'iy intellekt va Big Data texnologiyalarini yuqori darajada integratsiya qilgan universitetlar boshqaruv samaradorligi, qaror qabul qilish tezligi, resurslardan foydalanish darajasi hamda institutsional moslashuvchanlik bo'yicha yuqori natijalarga erishayotganligini ko'rsatdi. Shuningdek, tadqiqot davomida raqamli infratuzilma, xodimlarning raqamli kompetensiyalari, ma'lumotlar sifati va kiberxavfsizlik bilan bog'liq muammolar aniqlandi. Olingan natijalar asosida O'zbekiston oliy ta'lim muassasalarida sun'iy intellektga asoslangan boshqaruv mexanizmlarini keng joriy etish bo'yicha amaliy tavsiyalar ishlab chiqildi.

Kalit so'zlar: sun'iy intellekt, Big Data, universitet boshqaruvi, raqamli boshqaruv, oliy ta'lim, HEMIS.

Аннотация. Результаты исследования показывают, что университеты с высоким уровнем интеграции технологий искусственного интеллекта и Big Data демонстрируют более высокую эффективность управления, более быстрые процессы принятия решений, более рациональное использование ресурсов и большую институциональную адаптивность. В ходе исследования также были выявлены проблемы, связанные с цифровой инфраструктурой, компетенциями персонала, качеством данных и кибербезопасностью. На основе полученных результатов разработаны практические рекомендации по расширению внедрения механизмов управления на основе искусственного интеллекта в высших учебных заведениях Узбекистана.

Ключевые слова: искусственный интеллект, Big Data, управление университетом, цифровое управление, высшее образование, HEMIS.

INTRODUCTION

The digital transformation of higher education has become a strategic priority for universities worldwide. Technological innovations such as artificial intelligence (AI), Big Data analytics, machine learning, and cloud computing have significantly changed the way universities manage resources, deliver educational services, and make strategic decisions.

In Uzbekistan, the modernization of higher education management has gained momentum through national digitalization initiatives and the introduction of integrated information systems. Universities increasingly use digital platforms to manage student information, academic records, financial resources, and administrative processes. Nevertheless, the use of AI and Big Data remains at an early stage compared with international best practices.

The growing volume of institutional data generated through HEMIS, learning management systems (LMS), electronic document circulation systems, and online educational platforms creates new opportunities for data-driven governance. Proper use of these data resources can improve planning, forecasting, risk management,



and institutional performance. Therefore, assessing the potential of AI and Big Data applications in university management has become an important research objective.

Artificial intelligence and Big Data have emerged as fundamental technologies driving the digital transformation of higher education institutions worldwide. The increasing complexity of university management, together with the rapid growth of institutional data, requires the adoption of advanced analytical and intelligent systems capable of supporting strategic and operational decision-making. Traditional management approaches often rely on fragmented information sources and manual processing procedures, which limit responsiveness and reduce administrative efficiency. In contrast, AI and Big Data technologies provide universities with opportunities to transform large volumes of data into actionable knowledge and evidence-based management practices.

Within higher education institutions, artificial intelligence can be defined as a set of computational technologies capable of simulating human cognitive functions, including learning, reasoning, prediction, and decision support. Big Data refers to large volumes of structured and unstructured information generated through academic, administrative, financial, and operational activities. Together, these technologies create an integrated digital ecosystem that enables universities to optimize resource utilization, improve governance processes, and enhance institutional performance.

The importance of AI and Big Data has significantly increased in the context of digital governance. Universities generate large amounts of data through student information systems, learning management platforms, electronic document circulation systems, financial management software, human resource databases, and online educational platforms. Effective analysis of these datasets enables university administrators to identify performance trends, forecast future developments, and develop strategic interventions aimed at improving educational quality and organizational effectiveness.

In Uzbekistan, the implementation of the Higher Education Management Information System (HEMIS) represents one of the most significant steps toward the digitalization of university management. HEMIS facilitates centralized data collection, storage, and processing across higher education institutions, providing administrators with access to real-time information on students, academic programs, faculty performance, and institutional activities. The integration of AI tools with HEMIS has the potential to significantly enhance analytical capabilities by enabling predictive modeling, automated reporting, and intelligent decision-support mechanisms.

One of the most promising applications of artificial intelligence in university management is predictive analytics. By using machine learning algorithms, universities can identify students who are at risk of academic underperformance, predict enrollment trends, forecast budget requirements, and evaluate the effectiveness of institutional policies. Predictive analytics supports proactive management by allowing administrators to implement preventive measures before issues become critical.

Similarly, Big Data technologies contribute to improving institutional efficiency through the comprehensive analysis of academic and administrative processes. Data generated through digital platforms can be used to evaluate faculty performance, optimize classroom utilization, monitor resource consumption, and identify inefficiencies within organizational workflows. Such analyses support evidence-based governance and improve institutional accountability.

Furthermore, artificial intelligence contributes significantly to administrative automation. Intelligent document management systems, automated scheduling tools, virtual assistants, and chatbot technologies reduce administrative workloads and improve service delivery. The implementation of AI-powered automation enables universities to accelerate document processing, minimize human errors, and improve communication among stakeholders.

Resource management represents another critical area where AI and Big Data generate substantial benefits. Through advanced analytical models, universities can forecast financial requirements, optimize infrastructure investments, and allocate resources more effectively. Data-driven budgeting mechanisms improve financial sustainability and enhance the transparency of resource distribution processes.

The application of AI and Big Data also strengthens quality assurance mechanisms within higher education institutions. Learning analytics systems enable continuous monitoring of student engagement, academic performance, and learning outcomes. University administrators can use these insights to improve curricula, enhance teaching methodologies, and support student success initiatives.

Consequently, artificial intelligence and Big Data should not be viewed merely as technological innovations, but rather as strategic instruments for institutional transformation. Their successful implementation contributes to the establishment of intelligent governance systems capable of improving efficiency, transparency, accountability, and long-term competitiveness in higher education institutions.

The application of AI and Big Data technologies can be observed in several key areas of university management, as presented in Table 1.

Table 1
Major Applications of AI and Big Data in Higher Education Management¹

Application Area	AI and Big Data Function	Expected Benefits
Student Management	Academic performance prediction	Improved retention rates
Administrative Processes	Workflow automation	Reduced bureaucracy
Resource Management	Budget forecasting and optimization	Efficient resource allocation
Human Resource Management	Staff performance analytics	Better workforce planning
Decision-Making	Predictive analytics and dashboards	Evidence-based governance
Quality Assurance	Learning analytics	Improved educational outcomes
Strategic Planning	Trend forecasting	Long-term sustainability

The results suggest that AI technologies enable universities to automate repetitive tasks, identify emerging challenges, and improve institutional responsiveness.

The empirical analysis indicates significant differences in the adoption of AI and Big Data among universities in Uzbekistan. International and private universities demonstrate higher levels of technological integration compared with most regional public universities.

The assessment revealed that institutions actively using integrated information systems achieve higher administrative efficiency and greater effectiveness in decision-making. Data analytics tools support university leaders in identifying performance trends, optimizing budgets, and monitoring academic quality, as illustrated in Figure 1.

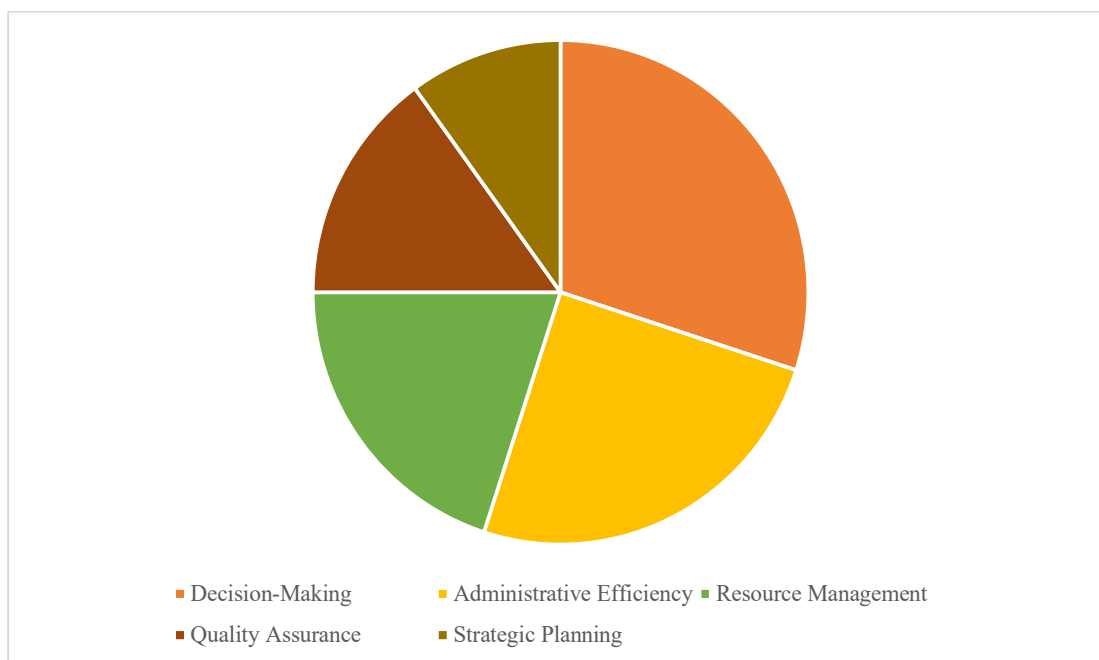


Figure 1. Distribution of AI and Big Data Impact on University Management²

The figure demonstrates that decision-making and administrative efficiency account for the largest share of the benefits generated by AI and Big Data technologies. These findings highlight the growing importance of intelligent information systems in supporting university governance.

¹ author's work

² author's work



Despite significant progress, several barriers continue to limit the effective implementation of AI and Big Data technologies in higher education institutions. These include:

- insufficient digital infrastructure in regional universities;
- limited availability of qualified data analysts and AI specialists;
- fragmentation of data across multiple information systems;
- cybersecurity and data privacy concerns;
- financial constraints affecting technological investments.

Addressing these challenges requires coordinated efforts from policymakers, university administrators, and technology providers.

CONCLUSION AND RECOMMENDATIONS

Artificial intelligence and Big Data are becoming critical drivers of modern university management. The findings of this study demonstrate that the effective integration of these technologies contributes significantly to administrative efficiency, resource optimization, strategic decision-making, and institutional competitiveness. Universities with advanced digital capabilities demonstrate stronger governance performance and greater adaptability to changing educational environments.

For Uzbekistan, the successful implementation of AI and Big Data technologies requires further investment in digital infrastructure, the enhancement of staff competencies, the integration of institutional information systems, and the development of comprehensive digital governance strategies. The adoption of these measures will support the long-term modernization of higher education management and contribute to achieving the objectives of the “Digital Uzbekistan – 2030” strategy.

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