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Article

Ways of Implementing Intelligent Management Mechanisms to Ensure the Sustainability of Higher Education

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Abstract: The aim of the study is to identify practical ways of implementing intelligent, AI-based management mechanisms that strengthen the sustainability of higher education institutions (HEIs) in Uzbekistan. The methodology combines a secondary analysis of the Oxford Insights Government AI Readiness Index 2024, a normative analysis of national legislation, technology-acceptance and change-management theory, and the risk-management frameworks of NIST and ISO/IEC. The results show that Uzbekistan's AI readiness is uneven: it scores 100 in Vision and 84.05 in Data Availability, well above global averages, but only 33.5 in the Technology Sector pillar. On this basis, six intelligent management mechanisms with measurable indicators, a five-phase implementation pathway and a risk register with mitigation measures are proposed. The study concludes that implementation should exploit strong data availability while compensating for weak technical capacity through shared services and staff development.

Keywords: Intelligent management, artificial intelligence, higher education sustainability, AI readiness, implementation pathway, risk management, technology acceptance.

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1. Introduction

The sustainability of higher education institutions increasingly depends on the quality and speed of management decisions. Institutions must balance growing enrolments, constrained public funding, rising quality expectations and competition. Intelligent management mechanisms – management processes in which artificial intelligence supports sensing, forecasting and decision-making – offer a way to respond to these pressures. A systematic review of AI applications in higher education found that research has concentrated on teaching and learning, while institutional and administrative uses remain comparatively under-studied [1]. At the same time, analytics based on institutional data has long been recognised as a means of improving decisions on admissions, retention and resource allocation [2], and big data is regarded as an opportunity for evidence-based management of universities, provided that challenges of data quality, privacy and staff capability are addressed [3]. However, many AI initiatives fail not because of technology but because of weak implementation.

Uzbekistan has created a favourable policy environment. The Strategy for the Development of AI Technologies until 2030 sets national objectives [4], and Law O‘RQ-1115 of 21 January 2026 introduced a legal definition of AI into the Law “On Informatization” and prohibited legally significant decisions affecting human rights from being made solely on the basis of AI [5]. State HEIs with financial autonomy now have the

authority to invest in such mechanisms [6]. International guidance likewise calls on education systems to introduce AI through a human-centred approach that keeps people in control of consequential decisions [7]. What is missing is a practical answer to the question of how to implement such mechanisms.

Research on technology implementation offers several relevant frameworks. E. Rogers explained the diffusion of innovations through relative advantage, compatibility, complexity, trialability and observability [8]. F. Davis proposed the technology acceptance model, according to which perceived usefulness and ease of use determine adoption [9], and V. Venkatesh and co-authors integrated these ideas into the unified theory of acceptance and use of technology (UTAUT), adding social influence and facilitating conditions [10]. J. Kotter showed that organisational change requires a sense of urgency, a guiding coalition and short-term wins [11].

In the AI field, T. Davenport and R. Ronanki found that organisations achieve more with incremental AI projects that augment existing processes than with ambitious "moon shots" [12]. Risk management has become institutionalised: the US National Institute of Standards and Technology published the AI Risk Management Framework with its "govern, map, measure, manage" functions [13], and ISO/IEC 42001 established requirements for an AI management system [14]. At the national level, the Oxford Insights Government AI Readiness Index assesses countries across the Government, Technology Sector, and Data and Infrastructure pillars [15].

Despite this rich literature, studies rarely translate AI readiness diagnostics into concrete implementation pathways for HEIs, especially in emerging higher education systems. The present study addresses this gap.

Research hypothesis: the effective implementation of intelligent management mechanisms in Uzbek HEIs requires a pathway that builds on the country's relative strengths in AI readiness (strategic vision and data availability) and deliberately compensates for its weaknesses (technology sector capacity), while embedding risk management and human oversight from the outset.

2. Research Methodology

The study uses four methods. First, a secondary analysis of the Oxford Insights Government AI Readiness Index 2024 was conducted to identify Uzbekistan's strengths and weaknesses. Second, national legislation – the AI Strategy, Law O'RQ-1115, the resolution on the financial independence of state HEIs and the Law "On Personal Data" [16] – was analysed to derive mandatory requirements for intelligent management mechanisms. Third, the diffusion, technology-acceptance and change-management theories reviewed in the Introduction were used to design the implementation pathway. Fourth, the NIST AI Risk Management Framework and ISO/IEC 42001 were used to construct a risk register. Where national averages were not available, only published values were used.

3. Results And Discussion

The national context determines what HEIs can realistically implement (Figure 1).



Figure 1. Uzbekistan in the Government AI Readiness Index 2024

Source: compiled by the author from the Oxford Insights Government AI Readiness Index 2024.

In 2024 Uzbekistan ranked 70th out of 188 countries, improving by 17 places, and became the leading country in Central Asia. Its profile is markedly uneven. The country scored a perfect 100 in Vision (global average 42.55) and 84.05 in Data Availability (global average 59.81), and slightly exceeded the global average in Governance and Ethics (58.57 versus 57.21). By contrast, the Technology Sector pillar scored only 33.5 – about half the Government (64.71) and Data and Infrastructure (62.14) pillars. For HEIs this means that strategic support and data are relatively available, whereas qualified AI specialists, local AI vendors and technical capacity are scarce. Implementation should therefore rely on shared resources and on mechanisms that use existing data rather than on complex in-house development.

Six mechanisms were identified that directly support HEI sustainability and can be built on data already available in institutional systems (Table 1).

Table 1. Intelligent management mechanisms for HEI sustainability

Mechanism	AI tool	Sustainability target	Key indicator	Human oversight
Early-warning system for financial risks	anomaly detection on payments and expenditure	solvency	share of overdue tuition receivables	finance department review
Enrolment and revenue forecasting	time-series and ensemble models	financial stability	forecast error (MAPE)	rector's office approval
Student retention management	dropout risk prediction	revenue retention, social equity	retention rate; equity gap	adviser contact before any action
Resource and space optimisation	scheduling and optimisation algorithms	cost efficiency, environmental impact	room utilisation; energy per student	timetable office validation
Intelligent document and service processing	natural language processing, chatbots	administrative efficiency	processing time per request	staff handle exceptions
Strategic scenario analysis	simulation of funding and demand scenarios	institutional resilience	reserve months under adverse scenario	supervisory board decision

Source: developed by the author based on Law O'RQ-1115, T. Davenport and R. Ronanki, and the NIST AI RMF.

All six mechanisms are designed as decision-support rather than decision-making tools, consistent with Law O'RQ-1115. Each has a measurable indicator, allowing institutions to evaluate whether the mechanism actually improves sustainability – an essential condition for securing continued investment. Consistent with the findings of T. Davenport and R. Ronanki, the mechanisms augment existing processes rather than replace them.

Based on diffusion and change-management theory, a five-phase pathway is proposed (Figure 2).

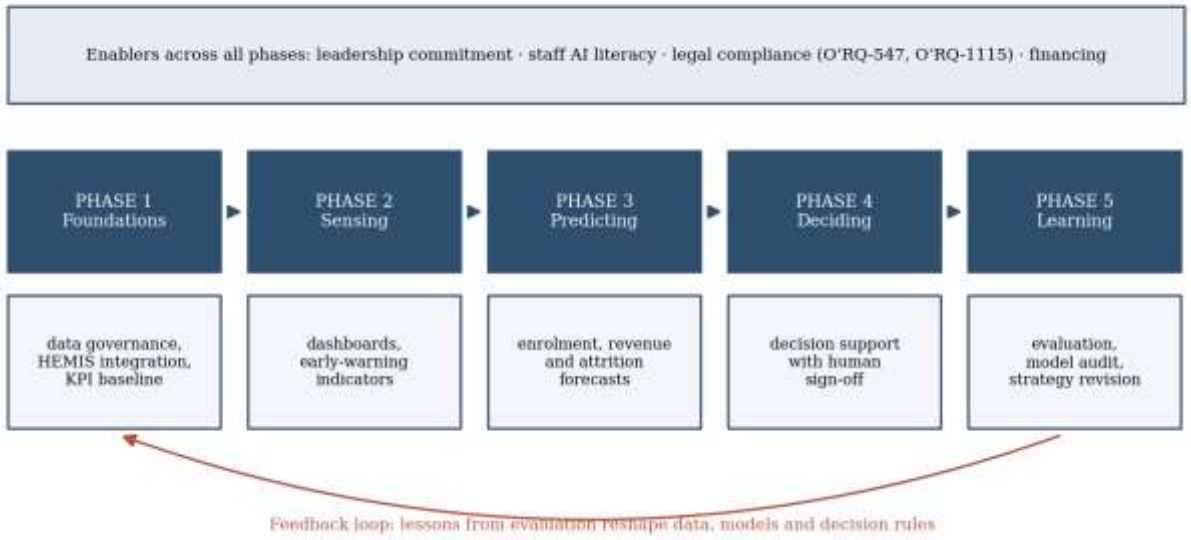


Figure 2. Five-phase pathway for implementing intelligent management mechanisms in HEIs

Source: developed by the author based on E. Rogers, J. Kotter and the NIST AI RMF.

The pathway moves from foundations (data governance, integration with the national HEMIS system and baseline indicators) through sensing (dashboards and early-warning indicators) and predicting (forecasts) to deciding (decision support with human sign-off) and learning (evaluation, model audit and strategy revision). The sequence reflects Rogers' finding that trialability and observability accelerate adoption: early phases produce visible, low-risk results – Kotter's "short-term wins" – that build trust before more consequential decisions are supported. Cross-cutting enablers include leadership commitment, staff AI literacy, legal compliance and financing.

Implementation risks were identified and mapped to mitigation measures using the NIST and ISO/IEC frameworks (Table 2).

Table 2. Risk register for implementing intelligent management mechanisms

Risk	Likelihood	Impact	Mitigation measure
Shortage of AI specialists	high	high	shared regional service centres; partnerships with IT companies; staff training
Poor data quality in institutional systems	medium	high	data quality indicators; data owner for each domain; cleansing before modelling
Breach of personal data legislation	medium	high	anonymisation; data protection officer; compliance review under O'RQ-547
Automated decisions affecting rights	low	high	mandatory human sign-off and decision log under O'RQ-1115
Algorithmic bias against student groups	medium	medium	equity testing of models; monitoring of equity gaps
Staff resistance and low acceptance	high	medium	user involvement in design; demonstration of usefulness; training
Model drift after external shocks	medium	medium	continuous monitoring; scheduled retraining; fallback procedures
Unsustainable costs and vendor lock-in	medium	medium	phased budgeting; open standards; exit clauses in contracts

Source: developed by the author based on Laws O'RQ-1115 and O'RQ-547, the NIST AI RMF and ISO/IEC 42001.

The register shows that the most likely risks are organisational – shortage of specialists and staff resistance – which is consistent with Uzbekistan's low Technology Sector score and with UTAUT's emphasis on facilitating conditions. The highest-impact legal risks are, in principle, controllable through procedures that national legislation already requires. The hypothesis is confirmed.

4. Conclusion and Recommendations

The study shows that Uzbekistan's AI readiness profile combines strong vision and data availability with weak technology sector capacity. Six intelligent management mechanisms with measurable indicators, a five-phase implementation pathway and a risk register were proposed for HEIs.

Recommendations:

1) Begin with mechanisms that use existing HEMIS and financial data – early-warning systems and enrolment and revenue forecasting – before moving to more complex applications.

2) Establish shared regional AI service centres for HEIs to compensate for the shortage of specialists, particularly outside Tashkent.

3) Design every mechanism as decision support with documented human sign-off, in line with Law O'RQ-1115, and maintain decision logs.

4) Adopt an institutional AI management system based on ISO/IEC 42001 and the NIST AI Risk Management Framework, including a risk register updated annually.

5) Link each mechanism to a sustainability indicator and evaluate its effect before scaling it up.

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