

INNOVATION SCIENCE AND TECHNOLOGY

ISSUE 9, PART 2 / SEPTEMBER 2026

 Acceptance of papers



**Acceptance of
papers**

Published monthly



Topics

economics,
technology, social
sciences



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JOURNAL **"INNOVATION SCIENCE AND
TECHNOLOGY"** HAS BEEN REGISTERED
UNDER THE NUMBER **C-5669633** BY THE
AGENCY FOR INFORMATION AND MASS
COMMUNICATIONS (AOKA) OF THE
REPUBLIC OF UZBEKISTAN, EFFECTIVE
FROM OCTOBER 9, 2024.

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CONTENTS

DETERMINING WAYS TO IMPROVE THE DESIGN OF THE NEEDLE THREAD TENSION REGULATOR IN A SEWING MACHINE	8
Zarina Mukhitdinovna Nurlibaeva, Anvar Zhuraevich Djuraev	
STRATEGY FOR DEVELOPING THE TOURISM POTENTIAL OF THE SURKHANDARYA REGION THROUGH 2030.....	13
Muminova Mavjuda Sharifovna	
MATHEMATICAL MODEL, ALGORITHM, AND SOFTWARE SUITE FOR ACOUSTIC LOCALIZATION OF UNDERWATER OBJECTS	20
Islomov Diyorbek Zafar o'g'li	
WAYS TO IMPROVE THE METHODOLOGY OF EXPORT FINANCING IN UZBEKISTAN	25
Qarshiyev Daniyar Eshpulatovich	
EVALUATION OF ADAPTIVE MODELS OF ENSURING THE STABILITY OF THE TRANSPORT AND LOGISTICS SERVICES MARKET IN THE FERGANA REGION	31
Khakimov Dilshodjon Rakhmonalievich, Ruziboyeva Zahro Anvar kizi	
EVENT-DRIVEN VAR ANALYTICS FOR OPEN FOREIGN EXCHANGE POSITION MANAGEMENT: EMPIRICAL EVIDENCE AND A DIGITAL PLATFORM DESIGN FOR UZBEKISTAN'S BANKS.....	35
Doniyor Abdurashidovich Djalilov	
VALUING INDUSTRIAL REAL ESTATE IN UZBEKISTAN: A COMPARATIVE ASSESSMENT OF ECONOMETRIC AND MACHINE LEARNING MODELS.....	44
Mansurova Sayyora Bakhtiyorovna	
INNOVATION-BASED TOURISM DEVELOPMENT IN UZBEKISTAN: AN INTEGRATED FRAMEWORK FOR DIGITAL, INSTITUTIONAL AND SUSTAINABLE TRANSFORMATION	52
Umirova Dilnoza Safarovna	
INNOVATION-BASED TOURISM DEVELOPMENT IN UZBEKISTAN: AN INTEGRATED FRAMEWORK FOR DIGITAL, INSTITUTIONAL AND SUSTAINABLE TRANSFORMATION.....	52
Umirova Dilnoza Safarovna	
INTEGRATION OF ATTENTION-BASED DEEP LEARNING INTO MODELS OF DRYLAND EXPANSION AND ECOLOGICAL RESILIENCE	58
Muksimova Shahnoza, Umirzakova Sabina, Mardiyeva Sevara	
DIGITAL PLATFORMS AND THE RETENTION OF TOURISM REVENUE IN LOCAL ECONOMIES ACROSS THE REGIONS OF UZBEKISTAN.....	70
Quralova Feruza	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF ADAPTIVE MODELS IN THE ECONOMIC MANAGEMENT OF HIGHER EDUCATION INSTITUTIONS.....	79
O'lmasxo'jayev Zoirxo'ja Abbos o'g'li	

THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF ADAPTIVE MODELS IN THE ECONOMIC MANAGEMENT OF HIGHER EDUCATION INSTITUTIONS

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Abstract. The purpose of this article is to systematize the theoretical and methodological foundations of adaptive models of economic management in higher education institutions and to substantiate a conceptual model applicable to the conditions of Uzbekistan. The methodology includes a comparative theoretical analysis of the theories of cybernetics, complex adaptive systems, organizational learning, and dynamic capabilities, along with historical-logical and systems approaches. As a result, the evolution of paradigms of university economic management was classified into four stages; traditional and adaptive management were compared across eleven parameters; and a five-stage adaptive cycle and a three-level structural model were proposed. The conclusion identifies the methodological conditions required for implementing the adaptive model.

Keywords: adaptive model, higher education institution, economic management, financial autonomy, feedback, organizational learning, dynamic capabilities.

Annotatsiya. Maqolaning maqsadi oliy ta'lim muassasalarini iqtisodiy boshqarishda adaptiv modellarning nazariy-uslubiy asoslarini tizimlashtirish va O'zbekiston sharoitiga mos konseptual modelni asoslashdan iborat. Metodologiya sifatida kibernetika, murakkab adaptiv tizimlar, tashkiliy o'rganish va dinamik qobiliyatlar nazariyalarini qiyosiy-nazariy tahlil qilish, tarixiy-mantiqiy va tizimli yondashuvlar qo'llanildi. Natijada universitet iqtisodiy boshqaruvi paradigmalarining evolyutsiyasi to'rt bosqichda tasniflandi, an'anaviy va adaptiv boshqaruv o'n bir parametr bo'yicha qiyoslandi hamda besh bosqichli adaptiv sikl va uch darajali tuzilmaviy model taklif etildi. Xulosada adaptiv modelni joriy etishning uslubiy shartlari belgilandi.

Kalit so'zlar: adaptiv model, oliy ta'lim muassasasi, iqtisodiy boshqaruv, moliyaviy mustaqillik, qayta aloqa, tashkiliy o'rganish, dinamik qobiliyatlar.

Аннотация. Целью статьи является систематизация теоретико-методологических основ адаптивных моделей экономического управления высшими образовательными учреждениями и обоснование концептуальной модели, соответствующей условиям Узбекистана. В качестве методологии использованы сравнительно-теоретический анализ теорий кибернетики, сложных адаптивных систем, организационного обучения и динамических способностей, а также историко-логический и системный подходы. В результате эволюция парадигм экономического управления университетом классифицирована по четырём этапам, проведено сравнение традиционного и адаптивного управления по одиннадцати параметрам, а также предложены пятиэтапный адаптивный цикл и трёхуровневая структурная модель. В заключении определены методологические условия внедрения адаптивной модели.

Ключевые слова: адаптивная модель, высшее образовательное учреждение, экономическое управление, финансовая автономия, обратная связь, организационное обучение, динамические способности.

INTRODUCTION

The economic and institutional environment in which higher education institutions (HEIs) operate has changed significantly in recent years, with increasing demand for educational services, competition, and financial pressure. According to the National Statistics Committee of Uzbekistan, the number of students increased from 808.4 thousand in the 2021/2022 academic year to 1,535.0 thousand in the 2025/2026 academic year, nearly doubling. During the same period, the structure of the HEI network also changed: at the beginning of the 2025/2026 academic year, 215 HEIs, including branches, were operating, while the number of non-state HEIs reached 97.

The institutional conditions of HEI activities are also being renewed. In particular, from January 1, 2022, 35 leading state HEIs were granted financial autonomy [1], providing them with additional authority to determine tuition fees, use extra-budgetary funds, and make management decisions more independently [2]. Improvements in financing mechanisms [3], as well as the objectives set out in the "Concept for the Development of the Higher Education System until 2030" [4] and the "Uzbekistan - 2030" Strategy [5], are increasing the requirements placed on HEIs not only in terms of education quality, but also financial sustainability, efficient use of resources, and the ability to adapt to changing conditions.

Managing HEIs solely through a model based on estimates and predetermined standards may not be sufficiently effective in a changing external environment. Changes in student flows, funding sources, expenditure structure, competition, and demand for educational services require HEIs to make prompt economic decisions and reallocate resources. However, in the economic management of HEIs, the concept of "adaptability" is often used as a general description, while its theoretical foundations, structural elements, and methodological mechanisms for its assessment have not been sufficiently systematized. Determining the content of adaptive management in ensuring the economic sustainability of HEIs, systematizing its main structural components, and developing a methodology for assessing the degree of adaptation to a changing environment constitute a relevant scientific and practical issue.

Research hypothesis: When the adaptive model of HEI economic management is constructed as a synthesis of cybernetic feedback, organizational learning, and dynamic capabilities theories, it can serve as a methodological basis for increasing the speed of HEIs' response to external changes and improving resource-use efficiency under conditions of financial autonomy.

LITERATURE REVIEW

The earliest theoretical foundations of adaptive management were formed within cybernetics. W. Ashby proposed the "law of requisite variety," arguing that a control system can operate stably only when it possesses a level of variety equal to or greater than that of the environment being controlled [6]. For HEIs, this law implies that financing based on a single normative formula may not always be sufficient to respond adequately to the complexity of the educational services market.

In the theory of complex adaptive systems, J. Holland demonstrated that system elements modify their rules based on experience [7]. C. Argyris and D. Schön distinguished organizational learning into single-loop learning (correcting errors within existing rules) and double-loop learning (reconsidering rules and objectives) [8], while P. Senge developed the concept of the "learning organization" [9]. D. Teece, G. Pisano, and A. Shuen defined dynamic capabilities as an organization's ability to reconfigure its internal and external competencies in response to a rapidly changing environment [10].

Among approaches specific to the economics of higher education, H. Bowen proposed the principle that "revenues determine costs": because universities tend to spend all available funds, expenditure is determined not by efficiency but by revenue opportunities [11]. W. Baumol demonstrated the relative increase in costs in labor-intensive services due to slow productivity growth, known as the "cost disease" [12]. B. Clark identified five elements of the entrepreneurial university, including a strengthened steering core and a diversified funding base [13]. The European University Association's autonomy scorecard measures financial autonomy together with organizational, staffing, and academic autonomy [14].

At the same time, R. Heifetz and co-authors distinguished technical problems from adaptive challenges, emphasizing that the latter require changes in values and behavior [15]. The analysis of the reviewed sources shows that these theories have largely been developed separately, while an integrated methodological model for their application to the economic management of HEIs has been addressed to a relatively limited extent in local literature.

RESEARCH METHODOLOGY

The study employed a set of theoretical and methodological approaches. First, the historical-logical method was used to periodize the evolution of university economic management paradigms. Second, comparative-theoretical analysis was applied to identify principles of cybernetics, complex adaptive systems, organizational learning, and dynamic capabilities theories that can be applied to HEI economics. Third, based on a systems approach and modeling, an adaptive management cycle and a structural model were developed.

As the regulatory framework, documents concerning HEI autonomy and financing from the national Lex.uz database were used [1; 2; 3; 4], while data from the National Statistics Committee served as the statistical basis. The proposed models are conceptual in nature, and their empirical testing was defined as a task for further research.

ANALYSIS AND RESULTS

Based on the literature analysis, four paradigms were identified (Table 1).

Table 1. Evolution of HEI Economic Management Paradigms¹

Paradigm	Financing Logic	Management Instrument	Main Limitation
Bureaucratic-budgetary	State allocations based on expenditure estimates and regulatory norms	Budget estimates, staffing schedule	Slow response to external changes; lack of incentives for efficiency
New Public Management	Based on performance indicators and contracts	Performance indicators, rankings, audit	Risk of “gaming” indicators; short-term focus
Entrepreneurial university	Diversified revenue base	Strengthened steering core, project management	Tension between the academic mission and commercial activities
Adaptive	Dynamic reallocation of resources based on signals	Feedback, forecasting, threshold values, organizational learning	High requirements for data quality and analytical capacity

As can be seen from the table, the adaptive paradigm does not reject the preceding paradigms; rather, it integrates their instruments, such as performance indicators and revenue diversification, with a continuous feedback mechanism. Its main distinguishing feature is that the management rules themselves may also change, meaning that double-loop learning is incorporated into the system.

Based on the theoretical principles, the two models were compared across eleven parameters (Table 2).

Table 2. Comparative Characteristics of Traditional and Adaptive Economic Management Models²

Parameter	Traditional Model	Adaptive Model
Planning horizon	One-year budget estimate	Rolling 3–5-year forecast and annual budget
Information flow	Periodic reports (quarterly, annually)	Continuous monitoring, leading indicators
Basis for decision-making	Regulatory norms and previous-year levels	Deviation signals and scenario analysis
Resource allocation	By fixed expenditure items	Dynamic reallocation based on results and demand
Pricing policy	Administratively determined tuition fee	Differentiated based on demand, costs, and competition
Revenue structure	Mainly a single source	Diversified portfolio
Risk management	After the risk event has occurred	Proactive management through threshold values (triggers)
Type of feedback	None or single-loop	Single-loop and double-loop
Organizational structure	Hierarchical, centralized	Network-based, with authority delegated to lower levels
Efficiency criterion	Budget execution	Financial sustainability and educational outcomes
Human factor	Executor	Learning-oriented and proactive

The comparison shows that adaptability is not a single instrument, but rather a systemic characteristic encompassing the planning horizon, information flows, pricing policy, and organizational structure. Importantly, many elements of the adaptive model can be implemented within the legal powers granted to financially autonomous HEIs in Uzbekistan, including the authority to determine tuition fees, manage extra-budgetary funds, and make decisions through governing boards [1; 2].

Based on the synthesis of cybernetic feedback and organizational learning theories, a five-stage cycle was proposed (Figure 1).

¹ Source: compiled by the author based on [10; 11; 13; 14].

² Source: the author's development based on [6; 7; 8; 15].

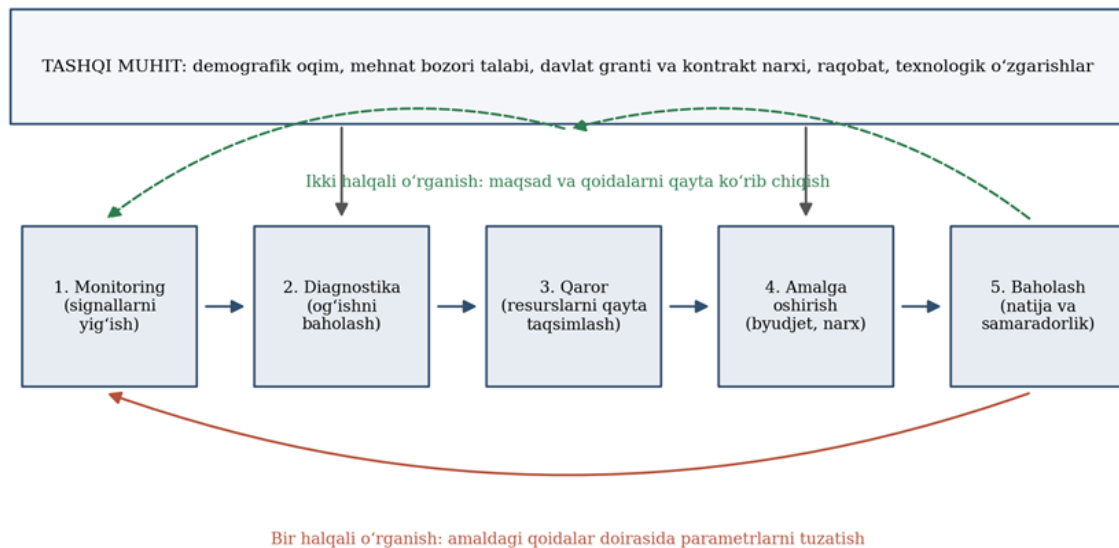


Figure 1. Adaptive Economic Management Cycle of a Higher Education Institution³

At the first stage of the cycle, signals from the external environment-such as the flow of applicants, labor market demand, and grant and tuition fee levels-are monitored. At the second stage, deviations from the plan are assessed. At the third stage, a decision is made regarding the reallocation of resources. At the fourth stage, the decision is implemented through budgetary and pricing policies. At the fifth stage, the results are evaluated.

Single-loop feedback adjusts the parameters, whereas double-loop feedback leads to a reconsideration of strategic goals and rules. For example, under conditions of rapid growth in the number of students, a single-loop response may involve reallocating classroom workloads, while a double-loop response may involve reviewing the portfolio of study formats and academic programs.

To implement the cycle, a three-level structure was proposed (Figure 2).

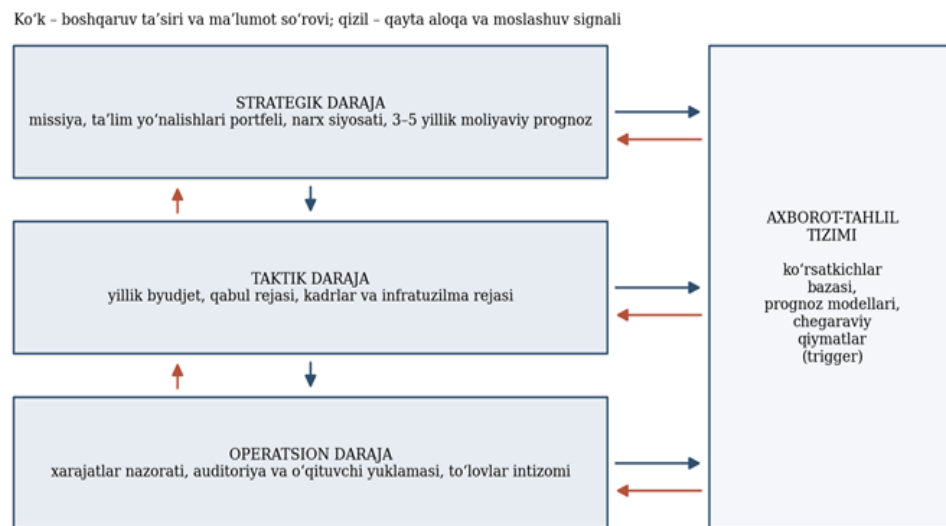


Figure 2. Three-Level Structure of the Adaptive Economic Model of a Higher Education Institution⁴

In the model, each management level is connected bidirectionally to a unified information and analytical system. The strategic level covers the portfolio of academic programs and pricing policy, the tactical level covers the annual budget and admission plan, while the operational level covers expenditure and workload

³ Source: the author's development based on [6; 8].

⁴ Source: the author's development.

control. When threshold values are exceeded—for example, with regard to tuition payment discipline or the allowable deviation in expenditure per student—the signal is automatically transmitted to a higher management level. In accordance with W. Ashby's law, this increases the variety of the management system and ensures faster decision-making. The results theoretically support the proposed hypothesis.

CONCLUSION AND RECOMMENDATIONS

The study led to the following conclusions. First, the adaptive model of HEI economic management was substantiated as a synthesis of the theories of cybernetics, complex adaptive systems, organizational learning, and dynamic capabilities. Second, the adaptive paradigm was classified as an advanced stage in the development of the bureaucratic, New Public Management, and entrepreneurial paradigms. Third, a five-stage adaptive cycle and a three-level structural model were proposed.

Based on these findings, the following recommendations are proposed:

Introduce budgeting based on a rolling three-year financial forecast instead of an annual cost estimate in HEIs that have been granted financial autonomy.

Develop, in each HEI, a system of leading indicators—such as applicant numbers, tuition payment discipline, and expenditure per student—and establish threshold values for these indicators.

Include within the authority of supervisory boards the requirement to review strategic objectives and financing rules at least once a year.

When assessing HEI autonomy, apply indicators that measure adaptive management capacity alongside financial autonomy.

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Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

2026. № 9

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