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Article

Trends in the Transformation of Higher Education Services in the Digital Economy

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Abstract: *The establishment of the digital economy places entirely new quality requirements on the system of organizing, delivering, and managing educational services. In particular, digital transformation in higher education is not limited to introducing information and communication technologies or moving the learning process only partially into electronic form. Its true economic and managerial essence lies in integrating all stages, from the creation and consumption of educational services to academic performance, financial relations, statistical reporting, and managerial decision-making, into a single data-driven digital ecosystem. This article analyzes the digital transformation processes that took place in the higher education system of the Republic of Uzbekistan between 2010 and 2025, together with their stages and economic and managerial mechanisms. The analysis substantiates that the sharp increase in the student body and the expansion in the scale of educational services have been the main driving factor behind the need for digitalization and platformization.*

Keywords: *Higher education, digital transformation, platformization, ecosystem, digital maturity, Hemis, EduBilling.*

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1. Introduction

In recent years, the dynamics of the student body in Uzbekistan's higher education system have changed fundamentally, both in quality and in quantity. This process is mainly associated with reforms such as raising the higher education enrollment rate, allowing private and foreign higher education institutions (HEIs) to operate, and introducing distance and evening forms of study [1]. These reforms have been implemented in parallel with the national digitalization agenda defined by the "Digital Uzbekistan-2030" Strategy [2].

The aim of the study is to analyze trends in digital transformation in Uzbekistan's higher education services market in 2010–2025, to periodize the stages of its development, and to substantiate an integrated, data-driven management model.

The theoretical and scientific-methodological foundations for improving the efficiency of higher education services in the context of digital transformation have long been studied by foreign economists [3]. In particular, the Technology Acceptance Model (TAM) developed by F.D. Davis scientifically substantiates the important role of the user's subjective assessment in the use of digital technologies [4]. Its application in higher education is considered to have made it possible "to identify the gap between the technical capabilities of digital platforms and the actual results of their use" [5]. It should be noted here that even though a modern "LMS" platform may offer highly advanced functionality, its effectiveness may be rated low if faculty members find it complicated or if students need additional time to use it. Likewise, the Unified Theory of Acceptance and Use of

Technology (UTAUT) enriches this theoretical approach with institutional and social factors [6]. It makes it possible to substantiate that a user's acceptance of technology is linked not only to personal motives but also to attitudes formed within the collective, management support, technical infrastructure, and organizational incentive mechanisms [7]. Uzbek scholars, including L.Sh. Ubaydullayeva, D.A. Shadibekova, U.I. Djumaniyazov, S.G. Alimova, and S.A. Berdiyev, have studied the state of use of digital technologies in the country's higher education services market and its national specifics. In particular, L.Sh. Ubaydullayeva studied the digital transformation of Uzbekistan's education system and the transition to online teaching during the pandemic. The author interprets digitalization not merely as a technological change but as a factor in reorganizing the higher education management model [8]. It is also substantiated that the effectiveness of digital transformation depends, alongside ICT infrastructure, on long-term institutional policy and on the renewal of educational technologies. D.A. Shadibekova examined the digital transformation of higher education in the context of the Fourth Industrial Revolution and the transition of universities to a new digital management model, and substantiated the need to develop a separate digital transformation strategy for HEIs and to build new information and communication competencies among faculty members and students [9].

2. Materials And Methods

This article draws on studies by economist researchers on the topic. Systematic analysis and comparative methods were used on the basis of reflecting on the views of experts in the field. A systematic and staged approach was applied to analyze the processes that took place in Uzbekistan's higher education in 2010–2025. These processes were examined through the stages of informatization, digitalization, platformization, and the formation of an integrated digital ecosystem. The methodological basis of the study consisted of dynamic and statistical analysis, evolutionary and staged modeling, and comparative-institutional analysis.

3. Results and Discussion

According to the analyses conducted, the need for digital transformation of higher education services today is linked, first and foremost, to the expansion in the scale of the educational services market.

Statistical observations show that the formation of digital transformation in Uzbekistan's higher education system has been directly linked to the dynamics of the student body. According to the analyses, the number of students changed from 274.5 thousand to 268.3 thousand in 2010–2016 (see Figure 1) and remained at a relatively stable level [10]. This period is characterized by the fact that the main function of information technologies was to provide technical support for existing educational and administrative processes. Therefore, the demand for digitalization was largely limited to local information databases, electronic resources, and computerization (see Table 1).

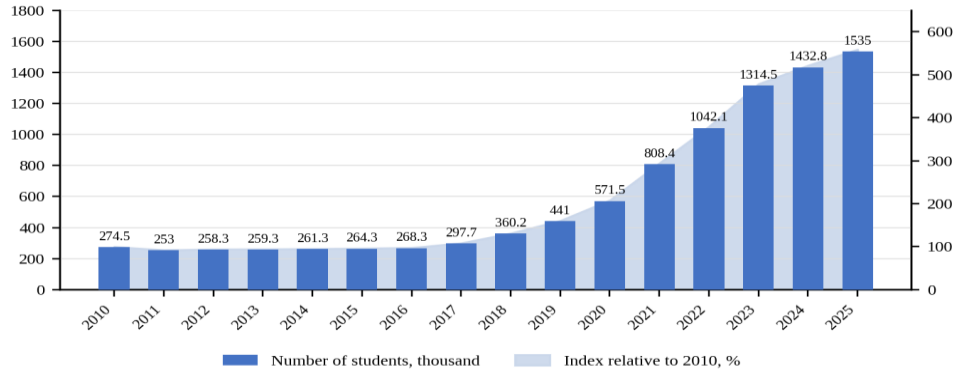


Figure 1. Dynamics of the development of the student body in Uzbekistan's higher education system [12]

Beginning in 2017, the higher education services market entered a qualitatively new growth phase. The increase in the number of students from 297.7 thousand to 571.5 thousand between 2017 and 2020 shows that the student body nearly doubled in a short time (see Figure 1) [11]. This process proportionally increased the volume of data processing, the number of academic operations, and the requirements for financial calculations and administrative control. In particular, the 41.5 percent growth in the number of students in 2021 (see Table 1) began to seriously limit the possibility of using traditional methods in managing the system.

Table 1

Features of digital transformation under the development of the student body in Uzbekistan's higher education system (calculated by the author on the basis of the data in Figure 1)

Years	Growth relative to the previous year, %	Stage of digital transformation
2010	–	
2011	-7.8	
2012	+2.1	
2013	+0.4	Basic informatization
2014	+0.8	
2015	+1.1	
2016	+1.5	
2017	+11.0	Transition to digitalization
2018	+21.0	
2019	+22.4	Emergence of platform needs
2020	+29.6	Rapid digitalization
2021	+41.5	Platform transformation
2022	+28.9	
2023	+26.1	Digital ecosystem
2024	+9.0	Integration stage
2025	+7.1	Integrated digital management

It should be noted here that, in order to fully understand the effectiveness of the digital transformation of the higher education system, it is important to assess the dynamics of graduates alongside the number of students. While the student body represents the flow of resources entering the system, the number of graduates is one of the final outcome parameters of educational services [12]. The data in Table 2 make the institutional demand for digital transformation even clearer. In particular, between 2010 and 2025 the number of students grew by 459.2 percent and the number of graduates by 195.8 percent. This gap shows that the inflow of students into the system expanded faster than the outflow of graduates [13].

Table 2

Main statistical parameters of changes in the scale of higher education services [13]

No.	Indicator	2010	2015	2020	2025	Change, 2010–2025
1	Students, thousand	274.5	264.3	571.5	1,535.0	+459.2%
2	Graduates, thousand	76.4	66.3	83.9	225.9	+195.8%
3	Student body index	1.00	0.96	2.08	5.59	5.59-fold
4	Graduates index	1.00	0.87	1.10	2.96	2.96-fold
5	Data flows to be managed	Relatively limited	Stable	Rapidly expanded	Very high	Sharply increased
6	Need for digital management	Low to medium	Medium	High	Very high	Has become systemic

Interpreting the situation described above, which emerged from the dynamic development trends achieved during the analyzed period, as a decline in educational efficiency would be methodologically incorrect. The reason is that the largest increase in student numbers occurred after 2020, and a certain portion of these students had not yet completed their programs by 2025. Rather, this disproportion means that the number of graduates and the volume of academic operations in the higher education system will increase even further in the coming years.

Statistical observations showed that in 2010–2025 digital transformation in the country's higher education services market did not proceed at the same pace or with the same content. According to the analyses, the functional importance of technologies in educational services became more complex over time, and technologies gradually evolved from a simple information tool into a systemic management mechanism. On the basis of the analyses, five main evolutionary stages of digital transformation were identified (see Table 3):

Table 3

Stages of development of the digital transformation model of higher education services in Uzbekistan (compiled by the author)

No.	Period (years)	Characteristics of the stage	Role of digital technology	System outcome
1	2010–2016	Stage I: Informatization	Auxiliary technological tool	Local digital environment
2	2017–2019	Stage II: Digitalization	Automation of individual processes	Expansion of electronic services
3	2020–2022	Stage III: Platformization	Running educational and management processes in a single system	HEMIS-based management
4	2023–2025	Stage IV: Ecosystemization	Integration of academic, financial, and administrative processes	Unified digital service environment
5	Next stage (from 2026)	Stage V: Intellectualization	Big Data, AI, and predictive analytics	Data-driven management

It should be noted here that the analyses showed that the third stage, in 2020–2022, differs fundamentally in quality from the preceding stages [14]. In this period, digital

technologies penetrated the internal architecture of educational and management processes, and technology, rather than being limited to supporting an existing process, changed the way in which it is carried out. The introduction of information systems such as HEMIS made it possible to collect, process, and monitor academic data in a centralized manner.

In 2023–2025, digital transformation moved up yet another level and took on an ecosystem character. At this stage of development, the main change lies not in an increase in the number of separate systems but in the strengthening of data exchange and functional interdependence among them. Because the mutual integration of academic, administrative, and financial data has broadened the possibility of making managerial decisions on the basis of data close to the primary information, it is logical to define the next stage as the stage of intellectualization [15].

The economic effect of digitalization manifests itself, first of all, in how management processes have changed. Whereas in the traditional model many operations depended on paper documents and human labor, in the digital model they are carried out through databases and automated algorithms. Taking this into account, the analyses made it possible to establish that, as a result of digital transformation in the country's higher education services market, management functions have changed in the manner shown in Table 4.

Table 4

Changes in management functions due to digital transformation in Uzbekistan's higher education services market (compiled by the author)

No.	Process	Traditional model	Digital model	Expected effect
1	Student records	Paper / local database	HEMIS	Single database
2	Attendance	Paper register	Electronic monitoring	Prompt control
3	Academic performance	Record sheet	Electronic results	Transparency
4	Class timetable	Local compilation	Digital planning	Timeliness of information
5	Exam results	Paper record sheets	Electronic database	Control capability
6	Academic transcript	Manual preparation	Electronic generation	Time savings
7	Diploma data	Fragmentary database	Centralized electronic data	Verification
8	Contract	Paper contract	EduBilling	Automated accounting
9	Payment monitoring	Separate accounting	Billing.edu.uz	Financial control
10	Credit-module accounting	Manual / local accounting	HEMIS + Billing	Integration
11	Student dormitory payments	Local accounting	Billing	Centralized accounting
12	State financial system	Separate process	Uzasbo DM integration	Data consistency
13	Management decisions	Delayed reporting	Near-real-time data	Prompt decision-making

Taking the above into account, we established that another important result of digital transformation in the country's higher education services market is the standardization effect. Carrying out identical processes across different higher education institutions through a single information system helps to unify data formats, accounting principles, and control mechanisms. This, in turn, broadens the information base for conducting comparative analysis and rankings at the national level [16].

At the same time, another important direction of the digital transformation of higher education services is associated with the diversification of the composition of learners. Analysis of official statistical data shows that the composition of consumers of higher education services has expanded significantly. In particular, the increase in the number of students aged 40 and older from 616 to 53,483 (see Table 5) indicates that education is diversifying in terms of age composition.

Table 5

Selected indicators reflecting the diversification of higher education coverage (compiled by the author on the basis of official statistical data)

No.	Indicator	2010	2020	2025	Change
1	Total students	274,520	571,512	1,535,006	5.59-fold
2	Students aged 19 and under	33,417	59,704	220,598	6.60-fold
3	Students aged 21 and under	49,059	68,251	179,230	3.65-fold
4	25-year-old students	13,063	33,782	49,377	3.78-fold
5	Students aged 40 and older	616	10,110	53,483	86.82-fold

Although a firm conclusion that this development is directly causally related to digital transformation would require additional econometric analysis, the institutional role of digital infrastructure in meeting such demand cannot be denied. Because older students typically have work obligations, family responsibilities, and other time constraints, personal accounts, electronic timetables, online certificates, digital payments, and the ability to obtain information remotely increase the real convenience of educational services for them. In this sense, digital transformation emerges not merely as a mechanism that makes educational services cheaper but also as one that broadens the possibility of consuming them. This, in turn, shows that in assessing the efficiency of higher education services in the digital economy, criteria such as “digital convenience” and “user orientation” must also be taken into account.

By 2025, the main substance of digital transformation had shifted from introducing individual information systems to ensuring their mutual integration. Linking academic and financial processes with each other makes it possible to shape a higher education institution into a single data-driven management system [17]. The digital management mechanism can conventionally be expressed as the chained sequence “student → digital identification → HEMIS → academic data → EduBilling/Billing → financial data → integration with state information systems → monitoring → management decision,” in which each element is not an independent information module but a constituent part of a single system of data circulation. Therefore, the effectiveness of digital transformation is determined not by the number of platforms but by the degree of integration among them and the possibility of reusing data.

In order to formulate generalized scientific conclusions on the results of the study of trends in the digital transformation of higher education services, the digital transformation processes identified through statistical observations were assessed in general terms, and the results obtained are presented in Table 6.

Table 6

Generalized assessment of the results of the digital transformation process in Uzbekistan's higher education services market in 2010–2025 (compiled by the author)

No.	Criterion	Years			
		2010–2016	2017–2019	2020–2022	2023–2025

1	Student body	Stable	Rapidly growing	Very rapidly growing	Over one million
2	Purpose of digitalization	Informatization	Automation	Platformization	Integration
3	Data architecture	Fragmented	Local electronic	Centralized	Mutually integrated
4	Main management model	Traditional	Mixed	HEMIS-based	HEMIS + Billing + external systems
5	Electronic services	Limited	Expanding	Mass-scale	Comprehensive
6	Use of data	Record-keeping	Monitoring	Management	Transition to analytical management
7	Impact on transaction costs	Low	Medium	High	Very high
8	Digital maturity	Initial	Medium	High	Integrated
9	Next strategic task	–	–	–	Intellectualization based on AI and Big Data

Generalizing the features identified through the analyses shows that the main qualitative change in the digital transformation process lies in the growing role of technologies in the management system. In particular, whereas in 2010–2016 technologies mainly served as a tool supporting existing processes, by 2023–2025 they had become the core infrastructural platform for organizing and managing educational services. This situation can also be explained through the category of "digital maturity". At the initial stage of digital maturity, an organization uses technology to perform separate tasks; at a higher stage, data becomes the main resource for managerial decisions. In Uzbekistan's higher education system, too, this evolution is manifested in the transition from fragmented information systems to centralized and integrated platforms. At the same time, the next strategic task may be the integration of artificial intelligence and big data analytics into this infrastructure [18]. Under such conditions, digital systems make it possible not merely to register and monitor students but also to identify academic risks early, forecast students' learning trajectories, assess the efficiency of the use of financial resources, and optimize managerial decisions [19].

The economic substance of digital transformation is determined, first of all, by reducing transaction costs, increasing the speed of information processing, reducing the time lag in decision-making, and improving data accuracy [20]. These processes enhance the efficiency of higher education services not only in terms of costs but also in terms of service quality and user orientation.

4. Conclusion

Taking the above into account, the years 2010–2016 can be assessed as a period of digital infrastructure preparation, 2017–2019 as a period of process digitalization, 2020–2022 as a period of platform transformation, and 2023–2025 as the period in which an integrated digital ecosystem took shape. This kind of periodization makes it possible to interpret digital transformation not as a simple evolution of technologies but as a gradual change in the institutional model of producing and managing higher education services. As a result of the study, the following conclusions and proposals were formulated:

Because the sharp growth in the student body, the increase in the number of higher education institutions, the diversification of educational processes, and the growth in the volume of academic and financial operations have clearly exposed the efficiency limits of traditional management mechanisms, digital transformation should be assessed not merely as technological modernization but as an institutional and managerial response that adapts to the expansion in the scale of higher education services. Each additional unit of growth in the number of students increases not only educational services but also course enrollments, academic credits, attendance records, grades, payments, certificates, and many other transactions. It can therefore be concluded that the introduction of digital platforms has become an economically necessary mechanism for reducing the administrative burden arising from the growth in student numbers. The 5.59-fold increase in the student body in 2010–2025 further strengthens the strategic importance of digital transformation. Had an education system of this scale been managed only through paper document circulation and local programs, the costs of information processing, the likelihood of errors, and delays in managerial decisions would have been significantly higher. It is therefore appropriate to assess digital transformation as an institutional innovation that raises labor productivity and reduces transaction costs. The 5.59-fold growth in the student body and the 2.96-fold growth in the number of graduates indicate that the functional load on digital management systems will remain high in the future as well. Digital platforms here appear not only as a means of storing information but also as a mechanism for standardizing, automating, and controlling the growing flow of operations. According to the characteristics of the identified trends, technology mainly played an auxiliary role at the first stage, while the second stage saw a transition to automating individual processes. Although the share of electronic information databases, online services, and digital resources grew during this period, they were still not fully integrated into a single platform environment. On the basis of the analyses, the results show that the most important economic outcome of digital transformation is the shortening of the information-handling chain. Whereas in the traditional model data could be re-entered, approved, and transferred between various departments several times, in a centralized digital environment these processes are carried out on the principle of entering data once and using it many times. This makes it possible to reduce information asymmetry, limit the influence of the human factor, and increase the speed of decision-making. In particular, linking academic and financial data creates new analytical opportunities for assessing the quality and the economic results of educational services at the same time. The analyses show that the digital transformation of Uzbekistan's higher education services in 2010–2025 took shape through the interaction of extensive and intensive factors. The extensive factor is expressed in the growth in the number of students and in the scale of the educational services market, while the intensive factor manifests itself in changes in the technology of organizing services, the digitization of information flows, and the automation of management processes.

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