Mechanisms of Digital Transformation of Business Processes in Online Education

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Abstract

Digital transformation in online education has progressed far beyond the stage of technical automation. It now reshapes the very principles of business process organization, aligning them with the logic of data-driven decision-making, structural flexibility, and user-centricity. Nevertheless, most current approaches remain limited to fragmented implementation of digital solutions, lacking systemic reconfiguration of operational models. This significantly hampers the achievement of sustainable outcomes. As a result, a contradiction emerges between the proclaimed digital maturity of educational institutions and the actual opacity of their operational structures. The purpose of this article is to identify and conceptualize the key mechanisms of digital transformation in online education as a coherent system rather than a collection of technological innovations. The analysis centers on the integration of end-to-end digital practices that enable the transformation of disjointed tasks and operations into an adaptive architecture of educational value. The author argues that the reconstruction of inter-process connections—through platform-based solutions, continuous digital support, and feedback loops—is what allows organizations to reach new levels of resilience and scalability. The author's contribution lies in a theoretical systematization of these transformation mechanisms, providing a structured lens through which to reinterpret business process management in digital learning environments. This study will be of particular value to EdTech project leaders, digital transformation specialists, platform developers, and scholars examining the evolution of managerial models in education.

Keywords: *Analytics, Automation, Business Processes, Client Journey, Digital Transformation, Flexibility, Online Education, Personalization, Platform.*

INTRODUCTION

The field of online education is undergoing a profound shift driven less by external pressures than by an internal demand for sustainable, technology-enabled models of instructional delivery.

The core issue under examination is the absence of a systematic understanding of how digital transformations affect the structural and functional components of business processes within online learning environments.

Although the literature on digitalization is extensive, transformation mechanisms themselves are often described only superficially: declarations of the need for change prevail, yet concrete analyses of architectural modifications in the operating model are lacking. This gap widens the distance between technological advancement and institutional capacity to manage processes on the basis of digital logic.

Consequently, the conceptualization and structural analysis of digital transformation mechanisms in online-education business processes—emphasizing the systemic interrelationships among technologies, managerial practices, and changes in user experience—appear particularly significant.

MATERIALS AND METHODS

Studies devoted to the digital transformation of business processes in online education span a variety of directions; for the sake of organization, they may be provisionally subdivided into the following thematic blocks:

- application of artificial intelligence;
- digitization of the educational environment and infrastructure;
- management of educational projects and resources;

- economic and organizational aspects of promoting digital products;
- sociocultural and methodological barriers.

For example, A.A. Andreeva and S.V. Kalmykova analyze practical aspects of integrating AI into online courses, concentrating on the personalization of instructional content and the automation of feedback [1]. International scholars are also actively advancing this research vector: P. Jiao et al. propose a model for forecasting students' academic performance using AI, justifying the importance of algorithmic precision and ethical considerations [14], while B. Tonbuloğlu assesses the efficacy of various AI applications, identifying risks related to the loss of pedagogical control and user distrust [15].

N.A. Dorokhova highlights theoretical and practical discrepancies in the implementation of online learning, noting both institutional and technological gaps [4]. E.G. Kiseleva characterizes online education as a "driver" of broader societal digital transformation, underscoring its role in shaping new employment models and competencies [5]. L.S. Onokoi draws attention to the potential of digital technologies in adaptive learning contexts and blended formats [9].

Meanwhile, S.V. Petrova and A.O. Balabanova examine educational services as learning-management systems, describing their significance in constructing individualized learning trajectories [10]. O.S. Kharina and E.Yu. Kozlov present a management model for online educational projects that encompasses the stages of design, piloting, and scaling [13]. A similar orientation appears in studies focused on resource provisioning: O.S. Kiselevsky and E.V. Kosyakova regard resource management as the "foundation" for the sustainability of digital initiatives in education [6].

A separate body of research addresses logistics and innovative management. S.V. Danilov advances a logistical paradigm for pedagogical innovations as an instrument for introducing novel practices into educational settings [3], and A.R. Sadykova with A.S. Krikunov investigate the evolution of MOOC platforms and learning-management systems through the lens of adapting global best practices [11].

In his article, M.D. Grinev portrays an online educational product as a B2C communication tool within traditional business, emphasizing the importance of positioning and visual components [2]. O.S. Krainova and colleagues model the business process of product promotion in this domain, drawing on instances of collaboration between universities and industry partners [7].

Special attention is also given to quality assessment. N.A. Filipenko stresses criteria for the effectiveness of online education, accounting for both subjective user satisfaction and objective learning outcomes [12].

The review further includes integrative studies offering macro-analytical frameworks. A.Sh. Monoliguna systematizes key digitalization trends in the context of online education, identifying regulatory and infrastructural barriers [8].

Analysis of these sources reveals several gaps. On one hand, there is a strong drive toward technologizing the educational process and actively implementing AI, yet many authors note an underestimation of pedagogical elements and substantial difficulties in the institutional integration of digital solutions. On the other hand, despite the scholarly community's close focus on management and resource bases, questions concerning the transformation of organizational culture and the resilience of new business models in conditions of digital turbulence remain insufficiently explored.

To date, the least studied aspects include the interaction of digital platforms with the regulatory and legal environment, as well as the long-term consequences of digitalization for faculty employment and the redistribution of functions between humans and algorithms.

The methods employed in this article comprise comparison, case studies (notably the Real English project), expert evaluations, content analysis of scholarly publications, and systematization.

RESULTS AND DISCUSSION

Digital transformation represents not a collection of technical initiatives but a comprehensive reconfiguration of organizational mechanisms, with mandatory consideration of the logic of:

- platform economy;
- automation;
- scalability;
- personalization [2, 4].

In the context of online education, this encompasses both the deployment of new digital tools and the redefinition of the very nature of processes—from the design of learning pathways to the metrics used to assess outcomes.

Thus, digitalization in the examined domain is by no means confined to digital platforms as infrastructure; it impacts the core of interactions among stakeholders in the educational process, including:

- pricing;
- marketing;
- content logistics;
- user analytics.

When analyzing transformational mechanisms, a clear delineation of the business processes influenced by digitalization is essential. Table 1 provides the corresponding systematization.

Table 1. Typology of business processes in online education subject to digital transformation (composed by the author based on [5, 13])

Type	Description
Content creation processes	Development and structuring of course curricula, facilitation of expert involvement, quality assurance.
User engagement and retention	Marketing campaigns, automation of sales funnels, gamification of the user experience.
Knowledge delivery	Learning management systems, interactive environments, mobile applications.
Feedback and analytics	Tracking systems, processing of user data, progress and engagement metrics.
Support processes	Human resources management, financial administration, legal support.

Each category listed in the table demonstrates a distinct degree of susceptibility to digital change and therefore demands a differentiated approach to the evaluation and implementation of innovations.

Consider the most significant mechanisms that drive the transformation of business processes in the field under study (Fig. 1).
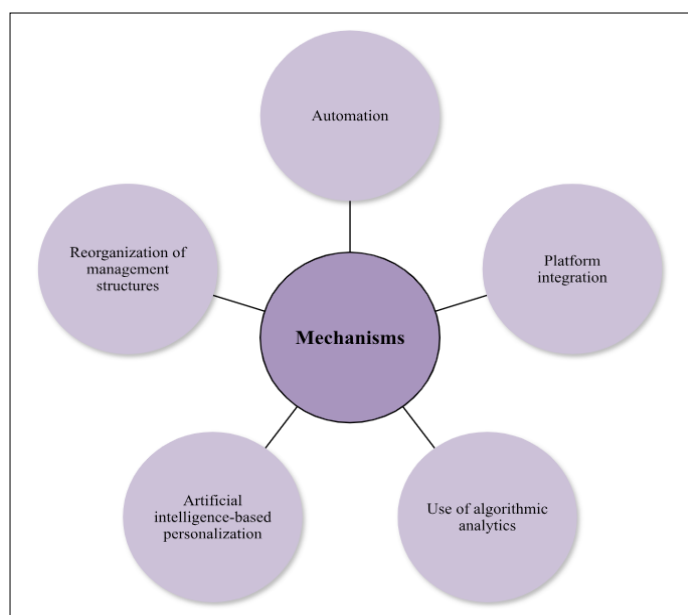

Fig. 1. Systematization of mechanisms for the digital transformation of business processes in online education (composed by the author based on [7, 8, 15])

Thus, automation addresses routine and scalable operations—from student enrollment through to the generation of personalized learning pathways. The deployment of RPA (Robotic Process Automation) minimizes human involvement in operational tasks, reducing costs and enhancing the reproducibility of quality.

The creation of end-to-end digital ecosystems ensures seamless connectivity among disparate modules of the educational platform. The adoption of API interfaces, modular architectures, and cloud storage fosters scalable flexibility and removes barriers to integrating new services.

Analysis of large volumes of user data via machine learning enables timely detection of behavioral patterns and prediction of learner attrition. Content can be dynamically tailored to individual needs, and algorithmic decision making provides the basis for micro-management of the educational process.

AI-driven mechanisms adapt materials and assignments to each learner's style, thereby boosting engagement and alleviating cognitive overload. The key effect is a shift from a mass-education model toward hyper-personalized learning trajectories [1, 14].

Digital transformation also demands a reconfiguration of organizational design. Traditional hierarchies give way to agile models characterized by short feedback cycles and decentralized decision making.

The transition to digital business models in education exerts a systemic impact on three key levels:

- Operational, by accelerating processes and reducing transaction costs while increasing manageability;

- Strategic, by enabling rapid testing of new formats and diversifying revenue streams;

- User, by enhancing convenience, inclusivity, personalization, and access to relevant content [9–11].

It is important to emphasize that the transformation touches not only the technological dimension but also the value proposition of the educational service—creating demand for meaningful learner support rather than mere knowledge transmission.

On the basis of this analysis, Table 2 summarizes the author's recommendations.

Table 2. Recommendations for optimizing mechanisms of digital transformation in online-education business processes (composed by the author)

Instrument / Approach	Justification of Novelty and Significance
Integration of LLMs into educational scenarios	Provides flexibility in content generation and adaptation to learners' cognitive styles
Feedback models based on behavioral analytics	Establish informal engagement metrics previously unavailable in traditional systems
Dynamic pricing systems	Account for shifts in demand and user behavior in real time
NFT certificates and blockchain validation	Reinforce trust in credentials and enable cross-border verification
Autonomous digital assistants	Reduce faculty workload and increase availability of student support

In the context of the present discussion, one of the key aspects is the evaluation of an automated engagement funnel's effectiveness. Let us assume that the initial lead flow, N0, sequentially passes through k stages (email open, click-through, consultation signup, purchase), each characterized by a conversion rate $r_i \in [0,1]$. The total number of users remaining after stage k is determined by the following formula:

$$N_k = N_0 \prod_{i=1}^{k} r_i.$$ (1)

Consider a hypothetical example of calculating conversion at each step of the digital customer journey when implementing a lead-nurturing system (an automated funnel with personalized content).

Scenario: An online school launches a 7-day email funnel following a client's registration for a free intensive. Over the course of one month, 10,000 users enter this funnel. The parameters for each stage are:

- Open rate for the first email: 60%;

- Click-through rate: 45% of those who opened;

- Consultation signup: 30% of those who clicked;

- Paid-course purchase: 50% of those who attended a consultation.

According to formula (1), the successive results are:

$$N_{\text{open}} = N_0\, r_1 = 10\,000 \times 0{,}60 = 6\,000,$$

$$N_{\text{click}} = N_{\text{open}}\, r_2 = 6\,000 \times 0{,}45 = 2\,700,$$

$$N_{\text{consult}} = N_{\text{click}}\, r_3 = 2\,700 \times 0{,}30 = 810,$$ (2-5)

$$N_{\text{purchase}} = N_{\text{consult}}\, r_4 = 810 \times 0{,}50 = 405.$$

Thus, by digitalizing the funnel and applying a personalized interaction logic, the school gained 405 new clients in a single month. If the average revenue per purchase equals ARPU and the campaign's cost is Ccampaign, then profitability is defined as:

$$ROI = \frac{ARPU \cdot N_{\text{purchase}} - C_{\text{campaign}}}{C_{\text{campaign}}}.$$ (6)

By substituting actual values, the company can instantly assess the economic impact, while automation serves to reduce operating expenses and ensure scalability. This illustrative example demonstrates how digital tools enable online-education business processes to be not only transformed but also rigorously quantified in terms of profitability and effectiveness.

The Real English case study vividly exemplifies the mechanisms of a digital overhaul through the prioritization of user data and adaptive product management. At its core lies a detailed behavioral analysis: 82% of clients are professionally active women seeking English-language proficiency for career advancement. By examining 'pain points'—previous unsuccessful learning experiences, language barriers, comprehension difficulties, and so forth—the organization devises educational solutions inherently grounded in real-world usage scenarios. Pre-sales and focus groups function as risk-mitigation instruments, ensuring that products are developed in response to validated demand, which in turn yields high conversion rates and minimizes ineffective launches.

Digital transformation also reveals itself within the support structure: over 90% of clients complete their training, and more than 80% make repeat purchases, thanks to a comprehensive support ecosystem (ranging from a personal curator to daily feedback). Moreover, offering free intensives allows the demonstration of tangible results prior to payment, thereby lowering entry barriers and reinforcing trust. Collectively, these elements form an ecosystemic approach in which marketing, sales, and instructional processes are unified within a single digital architecture oriented toward individual user trajectories. Real conversion metrics are calculated in accordance with formulas (1) and (2–5), ensuring that the case aligns with the theoretical template and that ROI can be transparently evaluated via formula (6).

CONCLUSIONS

Digital transformation of business processes in online education represents not a mere upgrade of the technological infrastructure but a fundamental shift in management logic, interaction structures, and patterns of educational-content consumption.

Effective change in this field demands the construction of end-to-end mechanisms—ranging from organizational design to granular analytics of user behavior. It is precisely a systemic approach that makes it possible to achieve lasting outcomes rather than isolated, incremental improvements.

The scientific contribution of the present analysis lies in uncovering the interconnected mechanisms at work, while its practical relevance emerges from the proposed tools capable of significantly boosting the adaptability of educational platforms in the face of ongoing digitalization.

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