Digital transformation of higher educational system

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Abstract. Digital technologies impact innovation into all areas of society, changing socio-economic relations, put demands on qualification of university graduates. The need to build the competences of educators and students in relation to digital education is acute, the range of strategies proposed to achieve this outcome. A new education system is forming. It is characterized by blending online learning with traditional approaches. Online learning and teaching marketplaces have become the primary source of knowledge all over the world. Vectors of digital transformation, core university processes, and workflows are included in the scope of the study. The article proposes ways to advance business model of university through digitalization and possible sources of funding.

1. Introduction

The existing education system was strongly influenced by social and economic transformations caused by previous industrial revolutions that have affected institutional society. Competition in the global education market poses a formidable challenge to all universities: in addition to transmitting traditional values, new IT-tools and technologies should be implemented.

Digital transformation of higher educational system – transformation of development strategy, while digitalization is a process of implementing of changes: goals, marketed products, approaches that create competitive advantage in the changing global marketplace.

Digital transformation of higher educational system is a unique opportunity for building new business models, discovering new research directions and innovations in educational process, a chance to go beyond the classrooms and learning laboratories, and consequently achieve a high standard of student’s knowledge.

Technological change is not the major factor in the digital transformation of higher educational system, transformation of corporate structure and behavior change of students and professors carry a lot of weight in this process. At this stage, personalized learning is gaining ground: a professor is not a source of knowledge, he or she assumes the role of the mentor and navigator and a student acts as a colleague.

Figure 1 demonstrates unavoidable phases of the digital transformation of higher educational system:

- Innovation of digital training
• Digitalization – digitizing all records, organization of text, audio and video information. The process of conversion of operational and methodological documents that ensure educational process and scientific researches into a machine-readable format. Building digital infrastructure that provides production of digital products.
• Digital streamlining of activities – automation of digital products production and processes of implementing IT technologies and information digitizing for changing institutional business processes (e.g.: organization of admission exams, administration of scientific researches, using of distance learning), culture digitalization and developing of digital competences of employees.
• Digital university or the higher education digital business model – chain of coordinated and significant changes of operating and educational subsystems that will lead to transformation of development trends, resulting in emergence of new competitive value propositions.

![Figure 1. The digital transformation pyramid.](image)

The efficiency of existing business model of organization and the emergency of new models would be increased by the systematic approach to digital transformation.

“New economic models evolve before out eyes” [1].

2. Vectors of digital transformation

*Direction one.* Provision of computer hardware in all components of the educational process and upgrade of pedagogical process based on IT.

Prescriptive and sequential progress from traditional forms of knowledge transferring to large-scale uses of information technology, including the blended stage of intensive use of up-to-date technologies and routine tools. As a result, large scale modernization is necessary at the university: establishing new requirements to the education system, building the technological base, creation of databases, knowledgebases and processing tools (e.g.: educational resources, training managing systems such as learning management system software and electronic libraries).

The introduction and use of LMS is gaining popularity all over the world. According to MarketsandMarkets, the global LMS market size is expected to grow from USD 9.2 billion in 2018 to USD 22.4 billion by 2023 (figure 2) [2].

In the context of article LMS systems classified according to the type of user:

• Academic systems as K-12 (from kindergarten to 12th grade) and Higher Education.
• Corporate systems for employee training and development.
Various business processes occur at Higher educational institution:

- education and onboarding process;
- research management;
- administrative and service management;
- financial management.

Creating and managing digital library collections, creating conditions for active interaction between students and professors, creating debate clubs. These tasks could be done within LMS systems. Figure 3 demonstrates LMS in education process.

Experience of using LMS should be learn from universities across the West or from National Research University - Higher School of Economics, where the above mentioned tool was successfully implemented since 2010.

Direction two. Computerization of organizational authority that can be achieved by automation of business processes. The relevance of the topic resulted from the reduction of financial and time costs needed for universities to function. Different types of software platforms such as LMS are in common use in the global community.
The challenges include the following:

- offering electronic services for students and professors;
- optimizing quality content and processes, simplifying workflows;
- upgrading the infrastructure of data collection, processing and storage;
- provision of electronic records.

**Direction three.** The creation and implementation of anonymous learning feedback forms (e.g.: Google Forms, Qualtrics or personalized templates) and online destinations for professor and university ratings, developing the criteria for assessing the ability to deliver high-quality teaching and learning. There are no statutory regulations imposed on the quality of the professor’s work. The guidelines developed within each institution. For example, Tretjakova N. V. depicts the experience in estimation of the quality of the university professor’s activity, the procedure of this estimation, which makes it possible to make a decision on certification of the professor to correspondence to the taken position [3].

By asking students for feedback and general comments on ways for improvement and development, professors get an opportunity to learn what is working on class, to have an open conversation and improve the quality of education and its service delivery.

Harvard University practice end-of-course evaluation: students are questioned about course structure and organization, learning efficiency, perceiving of readings and assignments, workload and amount of effort required to complete the course successfully.

**Direction four.** Expanding the toolkit for learning process. The teaching methods should be various, teaching staff need to be familiar with recent research in education and know how to exploit the new technologies in order to increase education quality.

Digital technology is the opportunity for the revival of education process. Easy access to news and latest developments, thematic electronic databases, forums via different online education technologies radically change the form of study material presentation. Skype, social networks, various messenger apps, conference call to specialists in certain key disciplines conducive to achieving better understanding among students. Online education is accelerating.

Universities must produce professionals who are successfully integrate into companies. Grads need to have the up-to-date skills for the job: international training and educational and productive practice intend to do so. The education community should be focus on modern technologies such as AR.
(Augmented reality) and VR (Virtual reality) this enables students to access the interactive educational resources and interactive training programs.

Projects such as Dynamic Anatomy (Leiden University) and HoloAnatomy (Case Western Reserve University) allow an immersive 3D exploration of anatomy, giving an unparalleled view of the human body. This initially reduces possible medical error and patient harm during medical practice for medical students.

Figure 5. Immersive 3D exploration of anatomy. HoloAnatomy application.

The scope and impact of modern education technics in higher education institution were examined. The nature of the issues involves building competence in IT of educators. This can provide significant value to improving the quality of the delivery and management of educational services at the higher level.

3. Model of digital transformation of higher education institution

Digital transformation of higher education institutions is critical to their future. Comprehensive and detailed re-engineering is needed.

| Strategic objectives of digital transformation of higher education institutions |
|------------------|-----------------|--------------------|-----------------|-----------------|
| Creating a new business-model | New directions of research studies | Innovations in educational process | High rates of students |

**Vectors of digital transformation**

| Digital technology | Digital control |
|-------------------|-----------------|
| Optimization of the existing production infrastructure | Implementing process of technology in educational process |
| Business process automation | |
| Digital feedback from students | |
| Upgrade of education and pedagogical process | Staff capacity |
| Creation of digital infrastructure | |
| Corporate culture | |

**Investment in digital transformation of higher education institutions**

| Provision of computer hardware in all components of the educational process | Enhancing digital literacy and competency |

Figure 6. Model of digital transformation of higher education institution.
Figure 6 shows objects and vectors of digital transformation and necessary investments in policies, tools and people.

Therefore, digital transformation of a higher education institutions is a new digital management on the basis of digital technologies.

3.1 Digital university

The "Education" national project is being implemented in the Russian Federation. It’s objectives include creation of marketplace of continuing education and service that provide an opportunity of online enrollment (52 schools agreed to participate).

COVID-19 presented a unique opportunity to speed up above services implementation. The vast majority of higher education institutions are ready for the migration to online system.

3.2 Investment

Proposed activity can be financed from the federal budget:

- the «Education» national project for 2019-2024. Under this project, Russian universities are expected to become competitive internationally.
- the State programme «Information Society» for 2011-2020. The programme is aimed at giving individuals and companies opportunities to use the benefits of information and communication technology through providing equal access to information sources, development of digital content, introduction of innovative technology and dramatic improvement of the government regulation of information security [4].
- the National Program «Digital Economy» for 2019-2024. The programme is aimed at creating a safe and powerful infrastructure for high-speed data transfer, processing and storage of information. [4, 5, 6].

External financing for digital transformation of higher educational system projects carries the risk because it leads to the building of isolated projects that cannot be incorporated into the workable university strategy.

4. Conclusion

Online education market raises the question about the university degree status. Building educational information infrastructure requires capital investment in data centers and information transmission channels, enhancing digital literacy and competency, reviewing of training sessions, materials and course content, providing blending online learning with traditional approaches. Establishment of the above steps and requirements will build the foundation for a digital transformation of higher education institutions. This aims to provide students with unique and high-quality educational programs and to maximize the competitive position of a group of leading Russian universities in the global research and education market.

The speed of modern development means that universities have to change and meet the new demands of labour market.

The Fourth Industrial Revolution (4IR) is expected to change everything, it will make certain groups of employees redundant, replacing them with new workers. Universities have to transform in response to 4IR.

Synergy in internal and external business-processes, in other words, the coordination function, becomes the central mission of digital transformation of higher educational system. The envisaged changes would have a big impact on education system generally.

We agree with what was expressed by Grigory L. Tulchinsky: «The main thing in the important case of digitalization: the provision of new schools capable of consolidation and continually improving of necessary competences instead of simplifying education» [7].
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