IRSTI 06.54.31

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DIGITAL TRANSFORMATION OF HIGH EDUCATION INSTITUTIONS (HEIs)

Abstract. Digital transformation (DT) has become one of the main trends for higher education institutions (HEIs) in the second decade of the 21st century. It is a necessary process for universities that want to achieve higher organizational performance and make a comparative advantage in their area. According to the state program "Digital Kazakhstan" improvements in the quality of education achieved by implementation and development of digital technologies in key sectors of the county's economy. However, the program does not specify an exact framework and roadmap for DT of universities. Management research on application of Lean and digitalization in education is still in its beginning stage, as it remains unclear what organization models and principles provide the best implication of the new digital technologies. The article focuses on defining the relationship of Lean and digital transformation of universities. New practical tools and techniques for digitalization will be developed on the basis of Lean.

Keywods: digital transformation, higher education, organization models and principles.

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Аннотация. Цифровая трансформация стала одной из основных тенденций для высших учебных заведений (ВУЗов) во втором десятилетии 21 века. Это необходимый процесс для университетов, которые хотят добиться более высоких организационных показателей и получить сравнительные преимущества в своей области. Согласно государственной программе «Цифровой Казахстан» повышение качества образования достигается за счет внедрения и развития цифровых технологий в ключевых отраслях экономики страны. Однако в программе не указаны точные рамки и дорожная карта для цифровой трансформации университетов. Управленческие исследования по применению Бережливых технологии и цифровизации в образовании все еще находятся на начальной стадии, поскольку остается неясным, какие организационные модели и принципы обеспечивают наилучшее применение новых цифровых технологий. Статья посвящена определению взаимосвязи бережливых технологии и цифровой трансформации в университетах. На основе бережливых технологии

будут разработаны новые практические инструменты и методы цифровой трансформации.

Ключевые слова: цифровая трансформация, высшее образование, организационные модели и принципы.

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Аңдатпа. Цифрлық трансформация 21 ғасырдың екінші онжылдығында жоғары оқу орындары (ЖОО) үшін негізгі трендтердің біріне айналды. Бұл жоғары ұйымдастырушылық көрсеткіштерге қол жеткізгісі келетін және өз саласында салыстырмалы артықшылықтарға ие болғысы келетін университеттер үшін қажетті процесс. "Цифрлық Қазақстан" мемлекеттік бағдарламасына сәйкес білім беру сапасын арттыруға ел экономикасының негізгі салаларында цифрлық технологияларды енгізу және дамыту есебінен қол жеткізіледі. Алайда, бағдарламада университеттер үшін нақты шеңбер мен жол картасы жоқ. Білім беруде үнемді өндіріс пен цифрландыруды қолдану бойынша басқарушылық зерттеулер әлі де бастапқы сатыда, өйткені жаңа цифрлық технологияларды ең жақсы қолдануды қандай модельдер мен қағидалар қамтамасыз ететіні белгісіз. Мақала үнемді өндіріс пен университеттердің цифрлық трансформациясы арасындағы байланысты анықтауға арналған. Үнемді өндіріс негізінде цифрландырудың жаңа практикалық құралдары мен әдістері әзірленетін болады.

Түйін сөздер: цифрлық трансформация, жоғары білім, ұйымдастыру модельдері мен принциптері.

Digital technologies forced a number of initiatives in organizations of almost all industries. In each industry, the impact varies, which makes it essential to have a good understanding of what to face and how digitization will affect an organization (Bawany, 2018). It generally involves changes in business processes and products as well as organizational structure and management changes. There are many scientific definitions of Digital Transformation (DT), in simpler terms can be described as “the use of new digital technologies to enable major business improvements” (Fitzgerald et al., 2014, Liere-Netheler et al., 2018). (More definitions are given in table 1).

Similar to other industries, higher education institutions (HEIs) must integrate digital technologies into their business. It is a necessary process for organizations that want to be highly competitive and adaptive in the digital era (Castro Benavides et al., 2020). Moreover, COVID-19 pushed universities to make quick and noticeable digital changes (online learning environment, virtual assessment etc.) to sustain operations. McCusker and Babington (2015) claim that current institutions are not ready to succeed in DT, because of the following main factors: inflexibility of internal processes, development specific digital, not business strategies and lack of embedding digital all across

university departments. Common understanding of DT of HEIs in Ukraine is limited to creation of digital education content, preparation of virtual learning environment, automation of academic processes and development of centralized IT infrastructure (Kaminskyi et al., 2018). In Russia the largest amount(about 35%) of the "Digital economy" program's budget was devoted to purchasing computer equipment and software for universities, however staff training budget about usage of digital technologies does not exceed 0,5% in 2017 (Plotnikova, 2019). Situation in Post-Soviet universities are characteristics of digitization, where the "paperless office" concept and huge investments in IT infrastructure take place. However, it's not a DT. Therefore, distinction between digitization, digitalization, and DT has to be explicitly understood as a starting point (Detailed definitions provided in table 1), because as Rogers D. (2016) describes "DT is fundamentally not about technology, but about strategy and new ways of thinking". Main barriers of DT in Russian universities are scarce financial resources for implementing comprehensive strategy, a long adaptation period for organizational culture change and resistance or unwillingness to change among staff (Mikheev et al., 2021).

Most of the papers' focused on DT in HEIs are written in a specific way (digitalization of teaching and learning, information technology, online education etc). However, none articles developed in a holistic dimension, covering business model, operational process and structures, taking into account organizational capabilities and user experience (Castro Benavides et al., 2020). That is why research methodologies to adopt DT in HEIs should be deepened.

Furthermore, the level of digital maturity of university should be clarified from the beginning. There is no scientific one definition of the digital maturity term, and some are given in table 1. Aslanova I.V & Kulichkina A.I. (2020) say that digital maturity is the basement of DT and classification of organization based on digital maturity levels helps to determine the next ongoing plan for DT (Maturity levels are described in table 1). More digitally mature companies (ex. Differentiators) is more ready for DT (Fitzgerald et al., 2014) .

Lean in the context of higher education is a new concept. Lean higher education (LHE) refers to the adaptation of Lean thinking to higher education and was introduced by Bill Balzer in 2010. Continuous process improvement and respect for people are main characteristics of Lean (Balzer B., 2010). Some characteristics describe Lean as a tool to cut cost and work efficiently, but this proposal takes differently by considering Lean as an invisible tool to engage all stakeholders by establishing a culture of continuous improvements. It is essential to meet administrative and academic staff, as well as top, middle, and low level management to sit together and clarify their daily needs and develop

standardized processes and structures to foster new ways of working (Kamp P., 2017). Five key principles of Lean thinking introduced by Womack and Jones (1996) are used to address the various demands within and between business units and management processes (Explanation to Lean principles and waste are given in table 1). According to a survey conducted with 4,800 business executives, 44% of respondents said that the most insufficient organizational capability in their company is "knowing the business and being able to conceptualize how new digital technologies can impact current business processes/models". (Kane G. et al., 2015). It supports the statement that preparing organizational culture, developing communications structures before making digital are important as changes (Klein S., 1996).

Management research on application of Lean thinking in the digital era is still in its beginning stage (Cattaneo et al., 2017; Sanders et al., 2016). It remains unclear what organization models and principles provide the best implication of the new digital technologies (Bodrožić & Adler, 2018). Manufacturing industry has almost completed the lean transformation and is now ready for "Industry 4.0 Challenge", however, the service industry is still unprepared. As long as processes control transformation of inputs into output, the transactional Lean will have its place. (Rüttimann, 2019).

Thus, it is plausible to hypothesize that an organization's digital maturity level and established culture are important explanatory variables of DT. During my PhD, I would like to address several questions:

RQ1: What are preconditions for successful (or failed) DT in the high education sector?

RQ2: What specific dimensions can be developed to measure DT of HEI?

RQ3: How to apply Lean to adopt for DT in HEI?

The proposed research will particularly focus on the HEIs in Post-Soviet states. The work will conduct action research with several universities to converge towards a better understanding of what happens and steps to improve particular situations. Qualitative research design is used to determine the universities' preconditions, maturity level and dimensions for DT. Also Lean principles and tools will be adopted and examined as a prerequisite before DT. Research results will be used to develop practical roadmaps to redesign capabilities, structures and processes to drive DT for many universities.

Table 1. THE THEORETICAL DEFINITIONS (ADDITIONAL)

Concepts	Definition
Digitization	"Technical process of converting analogue signals to digital signals" (Tilson et al., 2010). It is a straightforward process like scanning or

	uploading documents, replacing hand-filled forms to online versions that go directly to the database, etc. "Paperless office" concept based on digitization by converting to digital format "paper based" processes.
Digitalization	"Sociotechnical process of leveraging digitized products or systems to develop new organizational procedures, business models, or commercial offerings" (Brynjolfsson & McAfee, 2014). Digitization is an operational necessity while digitalization requires a visionary digital value that offers the opportunity to redefine business or industry (Ross et al., 2017).
Digital transformation	Deep transformation of business activities and processes, as well as organization processes and models to fully exploit the variances and benefits of digital technologies and their impact on society in a strategic and priority manner with respect to present and future time (Perkin N.& Abraham P. 2017). Use of digital technologies to radically improve the company's performance (Bekkhus, 2016).
Digital maturity	- Gradual process of integration and implementation of organization processes, human, and other resources into digital processes (Rossman A., 2018). - Integration of organizational operations and human capital into digital processes and vice versa-digital processes into organizational operations and human capital (Westerman et al., 2014).
Digital maturity levels	There are 4 levels of digital maturity (Gill & VanBoskirk, 2016, Fitzgerald et al., 2014) Beginners - companies who have just started a digital journey, no digital strategy at all. It's difficult for them to make changes in business

	processes, staff may not have the necessary skills to work with modern technologies, the technical equipment of the organization may also not allow digitalization of the business. Adopters - companies who are going to develop a digital strategy. Management are aware and ready for changes and investing in skills and infrastructure. Collaborators - companies who have a digitalization strategy, but have difficulty implementing it. Management tries to break down traditional silos in order to coordinate well across departments. Differentiators - companies who already have a digitalization strategy and implement it. Management invests in and manages digital technologies quickly and effectively, thus gaining the most value from DT.
Lean	"Series of tools and techniques for managing an organization's processes. Specifically, it focuses on eliminating all non-value added activities and waste from processes. Although Lean tools differ from application to application, the goal is always the same, continuous and constant improvement" (Koskela, 2004). In 1996 Womack and Jones defined five Lean principles as follows: specify customer value, identify the value stream, make value flow, implement pull-based production and strive for perfection continuously (Womack & Jones, 1996).
Lean wastes	The concept of the seven major wastes typically found in mass production was developed by Taichii Ohno of Toyota Motor Company. Below eight wastes examples are listed (Myerson, 2012, Sohel Ahmed & Chowdhury, 2018).: 1. Transportation. Unnecessary movement of people, papers or information. 2. Inventory. Excess stock, unnecessary files and copies in printed and scan versions are common cases.

	3. Movements. Unnecessary walking and searching for information or even people. 4. Waiting. Idle time to postpone workflow waiting for signatures, approvals or slow loading system. 5. Overprocessing. Doing things that do not add value to clients such as asking the same information several times from different departments, excessive checking or duplicating. 6. Overproduction. Producing too much paper or information which is not required. 7. Defects. Work that needs to be redone due to human or technical errors. 8. Non-Utilized Talent. Unused employee skill or creativity by assigning him the wrong tasks, lack of team training or policies.

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