Barriers to digital transformation in higher education institutions

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International Hellenic University
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International Hellenic University
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Barriers to digital transformation in higher education institutions

Thomais Gkrimpizi
PhD Candidate, School of Science and Technology,
International Hellenic University, Thessaloniki, Greece
t.gkrimpizi@ihu.edu.gr

Vassilios Peristeras
Associate Professor, School of Science and Technology,
International Hellenic University, Thessaloniki, Greece
Council of the European Union, Brussels, Belgium
v.peristeras@ihu.edu.gr

ABSTRACT

Digital transformation is ubiquitous, affecting all aspects of human life and benefiting the performance of organisations. Existing literature has shown that implementing digital transformation in higher education institutions remains a challenge. HEIs are unaccustomed to the radical shifts of this transformation and the course of digital transformation in higher education faces several barriers. These barriers impede organisations from realising the potential benefits of

in universities. Consequently, the barriers were categorised into contextual, social, technical, and cultural.

The aim of this study is to identify and categorise the barriers to digital transformation in HEIs digital transformation. For HEIs fostering digital transformation, understanding the barriers is crucial to accomplishing it.

This study has examined existing barriers that higher education institutions need to consider in their digital transformation journey. To that end, a systematic literature review was conducted on the barriers of digital transformation. We contribute in providing a basic understanding of possible barriers in order to overcome them and improve the likelihood of success.

CCS CONCEPTS

• **B7;**; • **Applied computing** → Computers in other domains; Computing in government; E-government;

KEYWORDS

Digital transformation, universities, higher education, tertiary education, barrier, challenge, obstacle

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1 INTRODUCTION

Digital Transformation (DT) of modern organisations, both private and public, has emerged in recent years as a phenomenon that cannot be ignored. We live in a transitional era from the industrial to the digital. The internet, social media and mobiles have changed the way we communicate with each other [35]. The impact of digital technologies is profound, far-reaching and many believe unprecedented by any other technological-based transformation that has occurred in history. According to [29] the notion of digital transformation has especially gained momentum in the last decade. It is seen as an evolutionary process through which IT becomes a fundamental element of our daily life, affecting people and organisations.

1.1 Scope – Problem Statement

It is not uncommon to find the terms digitisation, digitalisation, and digital transformation used interchangeably without a clear distinction. We try to provide some clarity for these terms. **Digitisation** is described as a technical process in [31]. The authors in [22] states that digitisation is the conversion of analogue data and processes into a machine-readable format. Digitisation is the conversion from analogue to digital formats, for example paper forms to webforms. [11]. **Digitalisation** is defined as a sociotechnical process in [31]. The authors in [22] states that digitalisation is the use of digital technologies and data as well as inter-connections that result in new activities or changes to existing activities. Digitalisation is referred to as a development of technology to achieve transactional operational efficiencies, or local advantages [11]. **Digital transformation** is described as a sociocultural process in [31]. According to [11], digital transformation is the cultural, organisational and operational change of an organisation, industry or ecosystem through a smart integration of digital technologies, processes and competencies across all levels and functions in a staged way. It is not primarily about technology adoption. It is first and foremost about transforming the mindset and culture of an organisation to ensure that technology can be deployed as a multiplier of impact. The concept of digital transformation goes beyond digitalisation, and must also be understood as a profound and radical process of change that directs businesses and organisations in new directions and brings them to a completely different level of effectiveness [44]. The process of digital transformation must be seen as a long-term and iterative process. This paper focuses on the area of higher education institutions (HEIs), which, like all other areas, face challenges in the implementation of digital transformation.

Digital transformation has the potential to radically affect universities. The success of digital transformation is dependent on the extent to which policy makers develop strategies to deal with the anticipated barriers which prevent organisations from reaching potential benefits of digital transformation [19]. If organisations identify barriers early, they can take appropriate and coordinated countermeasures. Lack of preparation for overcoming barriers is

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one of the main reasons for failure to initiate digital transformation in modern organisations, including universities. Lack of understanding of the barriers would certainly make it difficult for policy makers to formulate the right transformation strategies. Ignoring the barriers can certainly delay or even create failure in designing and implementing digital transformation. This study aims to identify and categorise the barriers of digital transformation in public universities.

2 METHODOLOGY

This paper first identifies in the relevant literature the barriers that impede digital transformation in higher education institutions; these barriers are further categorised into contextual, social, technical, and cultural. The method applied in this research is systematic literature review. We used the protocols described in [43] [14] to examine the literature published up until January 2022. We designed our research in five phases: 1) Formulating the research questions, 2) search process, 3) definition of inclusion and exclusion criteria, 4) synthesis, and 5) evaluation. Initially, the following research questions were established:

RQ1: What are considered to be the barriers of digital transformation in HEIs?

RQ2: How could barriers to digital transformation in HEIs be structured in broader categories?

Once the research questions were set, we conducted a systematic literature review to identify which barriers were related to digital transformation in higher education.

We conducted searches in the Scopus and Web of Science (WoS) databases. We chose these databases since they cover many disciplines and publications over the years. For the search we used strings' construction, the Boolean operators, as well as AND and OR to integrate the selected variables [14]. We used the following queries: a) in Scopus: ((“digital transformation”) AND (“university” OR “higher education” OR “tertiary education)) and b) in WoS: ((“digital transformation”) AND (“universit*” OR “higher education” OR “tertiary education”)) . We then selected the available literature based on title, abstract, and keywords.

In the next step we defined inclusion and exclusion criteria. Inclusion criteria in the WoS database were refined as follows: Document Types: Articles or Early Access or Review Articles or Editorial Materials; Languages: English; Research Areas: Business Economics or Engineering or Computer Science or Science Technology Other Topics or Education Educational Research or Public Administration or Social Sciences Other Topics. Inclusion criteria in the Scopus database were limited to the English language. Publications that did not meet the inclusion criteria were excluded.

The initial research yielded 1372 articles. 155 articles were removed as they were duplicates using an MS Excel and the Mendeley software. We manually filtered the remaining 1217 articles and used the ones that focused on barriers, challenges and obstacles to digital transformation in HEIs. Based on that, after removing 1188 articles, we ended up with 21 articles that addressed the barriers, challenges and obstacles for digital transformation in HEIs. By using the references lists in these publications, we identified and included another 8 articles applying Forward and Backward Citation Search. Finally, we proceeded to analyse these papers to identify barriers using an adaptation of existing models to organise the discussion about digital transformation.

3 FINDINGS

Even though digital transformation in HEIs is a relatively new field, we found a considerable number of barriers in the literature.

3.1 What are the barriers of digital transformation in HEIs?

The authors in [1] [2] [3] [27] identified twenty-two barriers to the implementation of digital transformation in HEIs in Indonesia, which they subsequently classified into nine groups (vision, strategy and policy, resources, leadership, digital skills and knowledge, technology, adaptability, resistance to change, and government and economic). In addition, they grouped the above barriers into four categories: Contextual, Social, Technical and Cultural barriers.

The authors in [4] found that the focus on the short-term outcome and insufficient prioritisation of investments, decentralised decision making, internal resistance, digital literacy of academic staff that is fed by the generation gap of digitally native students are some of the most significant barriers in digital transformation in HEIs.

The authors in [5] examined the non-technical challenges to implementing digital transformation in Saudi Arabia universities from the perspective of both academic professors and students. They analysed and categorised the challenges into a three-dimension attitude model (cognitive, behavioural and affective).

The authors in [6] examined the readiness of HEIs for Quality 4.0 transformation according to LNS Research Framework. They found a number of challenges related to the adoption of data-driven tools and techniques.

The authors in [7] carried out research in HEIs globally in regards to barriers to innovation and sustainability in universities. They identified twenty common barriers in HEIs across the world that were associated with management and technology.

The authors in [10] examined the changes occurring in the management system and infrastructure of universities taking into account the main groups of key stakeholders.

The authors in [12] documented the role of digital transformation of higher education in Ukraine in the era of the 4th industrial revolution. They supported that the implementation of the digital transformation of HEIs requires the existence of a strategy and the development of appropriate information and communication competencies. The authors investigated the possible directions of the transformation of educational services systems as well as the associated processes.

The authors in [13] proposed for the implementation of digital transformation an agile model for the Hassan II University of Casablanca 4.0. This model brings together a set of administrative and educational processes that facilitate the transition to an agile university. The key drivers for digital transformation are the development of the telecommunications sector and network infrastructure and the technological contributions of the digital age.

The authors in [15] found thirty barriers of the innovation process in higher education across ten European Universities. In addition, they categorised them into three major clusters: a)

external-related barriers of innovation (Disparities between needs of higher education institution and regulatory framework, Tensions in academia business–cooperation, Inconsistent technological developments), b) internal-related barriers acting within the participants' organisational environment (Blocked management and Rigid human resource management operations), and c) people-related barriers, mainly related to teachers and students (Unprepared academic staff and distracted students).

The author in [16] addressed the challenges of digital transformation facing universities from an organisational, technical, legal and security, and user-related perspectives in order to ensure consistency of information across digital services. The main difficulty that digital transformation had was the fragmentation and diversity of data.

The authors in [17] addressed the degree of maturity of digital transformation in HEIs in the United Arab Emirates. This study investigated the role of digital transformation in a developing country in today's knowledge economy. The findings also revealed the lack of holistic vision, digital transformation capability, data structure and processing as the top challenges of digital transformation.

The authors in [20] aimed to analyse current trends in digital transformation from the perspective of university administrators, academic staff and students in three HEIs in the Russian Federation. The contribution of this research was to outline the key principles: readiness, convenience, transparency and trust for effective digital transformation of HEIs.

The author in [23] examined the present situation of higher education in a disruptive world. Four building blocks are required, i.e. strategy, capabilities, operating model and technology, for universities to continue providing benefits to the community.

The author in [26] identified five categories of barriers for the adoption of institutional technologies in higher education: technology (Access, Reliability and Complexity), process (Project management, Support for faculty, staff and student, Faculty professional development to acquire effectiveness, focuses on technology use, Pedagogy and technology and type and format), administration (Control, Institutional support, Misunderstanding of required effort, Rewards and recognition and time requirements), environment (Organisational change, Tensions between administration and academia, Legal issues and Technology effectiveness), and faculty (effective use of instructional technologies, Resistance to change, Self-efficacy in technical competencies, institutional experience and technology background, Perception of quality and effectiveness and Participation in professional development).

The author in [28] in a brief discussion reported the challenges that need to be taken into account when defining digital policies and strategies in order to implement the digital transformation of HEIs. The proposed way to improve performance and adapt to an increasingly technology-driven society is to use emerging technologies.

The authors in [29] assessed the level of maturity of HEIs in their digital transformation processes. They created a comprehensive digital transformation model to assess the maturity level of HEIs in its digital transformation processes and to compare them with other sectors. The results of the research show that universities lag behind other sectors, probably due to lack of effective leadership and cultural changes as well as an inadequate degree of innovation and financial support.

The authors in [30] explored, by analysing the case of a conventional university, the impact of digital transformation on their business model. They then proceeded to understand the main challenges in the implementation process of digital transformation in each of the business model dimensions and the potential solutions to resolve these obstacles. Finally, the results reveal the existence of an emerging visionary business model, which is an illustration of how the current business model is expected to innovate due to the impact of digital transformation.

The authors in [32] [33] outlined the main threats and opportunities in universities' use of digital technology. A balanced system of indicators was formulated to measure the effectiveness of a university's tactical and strategic management.

The author in [34] aimed, through a case study at the Universidad Nacional del Sur to identify the organisational elements required for public universities to respond to the new environment of digital transformation. The results indicated that organisational processes, talent management and educational service delivery models have not been modified in consequence of new technologies.

The authors in [37] identified the pros and cons of digital transformation of the Metropolitan Area of Porto in Portugal. They then focused on better understanding the impact of digital transformation and Industry 4.0 on local society, as well as identifying the contributions of HEIs to the economic and social development of both the region and the country.

The authors in [38] tried to solve the issues of building digital universities. Furthermore, it proposed to create a system engineering concept of digitisation of HEIs, which would incorporate systemic, process-based and project-based approaches in order to solve the problems of digitisation of universities.

The authors in [39] aimed, through a case study analysis in Chilean HEIs, to evaluate the involvement of the institutional ecosystem in the digital transformation of universities. They then analysed the findings to understand digitalisation through the adoption of technologies by universities. The research concluded that the impact of technological change on higher education institutions, particularly in the categories of values and functions, affects HEIs in all aspects.

The authors in [41] tried to identify the constraints of digital innovation in the light of the quality of the existing digital infrastructure, as well as both hardware and software resources available in higher education in Portugal. A comparison analysis is conducted between Portuguese HEIs and Polytechnics, the two components of the national higher education system, in order to 1) characterise the quality of the available digital infrastructure and resources (hardware and software), and 2) identify the main constraints to digital innovation. The Table 1 presents the list of all the barriers found in the literature and their categorisation.

3.2 How could barriers to digital transformation in HEIs be structured in broader categories?

Different articles have identified barriers based on different perspectives (i.e. innovation, technology, strategy). Different perspectives lead to different categorisation of barriers. Whilst going through the

Table 1: Lists and Categories of Barriers

Category	Barrier	References
Contextual	Lack of Strategy	[27] [3] [2] [1] [23] [26] [13] [29] [17] [34]
	Lack of Vision	[27] [3] [2] [1] [26] [7] [13] [39] [17]
	Lack of Policy and Action Plan	[27] [3] [2] [1] [26] [7] [34]
	Lack of prioritisation plan	[4]
	Lack/Insufficient funds	[27] [3] [2] [1] [41] [18] [15] [28][20] [38] [6]
	Legislation and guidelines	[7]
	Organisational complexity	[16] [38] [12] [6]
	Lack of organisational agility	[34]
	Silos	[18] [28] [16] [29] [38] [6]
	Lack of Management support	[7] [5] [17]
	Legal issues/ownership/copyright laws	[26] [17]
Social	Lack of expertise in digital transformation /Lack of digital skills, competencies literacy	[27] [3] [2] [1] [23] [28] [5] [17] [34] [6] [26] [18] [15]
	Lack of digital literacy of academic staff	[4]
	Lack of leadership for changes	[27] [3] [2] [1] [5]
	Digital generation gap between academic staff and students	[5]
	Lack of time to incorporate digital technology	[27] [3] [2] [1] [26]
	Lack of interest in technology	[27] [3] [2] [1]
	Difficulties in keeping up with technological changes	[27] [3] [2] [1] [10]
	Lack of organisational leadership skills	[27] [3] [2] [1] [4] [37]
Technical	Quality of data	[6]
	Lack of IT infrastructure	[27] [3] [2] [1] [26] [41] [7] [10] [20] [17] [6]
	Legacy systems	[4]
	Data fragmentation and diversity	[16] [38] [33] [32] [6]
	IT security risk and standards	[27] [3] [2] [1] [12] [4][5]
	Full exploration of digital technologies in educational systems	[27] [3] [2] [1][4]
	Not adequate IT support	[27] [3] [2] [1] [26] [41] [15]
Cultural	Organisational resistance to chance	[28] [29] [5] [37]
	Academic staff resistance to change	[4]
	Lack of collaboration / communication	[26] [41] [15] [7] [33] [37]
	Lack of coordination between department	[4]
	Conservative/Bureaucratic culture	[41] [15] [7] [28] [5] [20]
	Reluctant to leave comfort zone/Inertia	[27] [3] [2] [1] [26] [15] [7] [36] [30] [29] [20] [38] [17] [4]
	Mindsets and behaviours/dominant logic	[26] [30] [37] [1][2] [3] [27]
	Lack of commitment	[27] [3] [2] [1] [7] [6]

literature on digital transformation, we found interesting models which we have used to produce our proposed categorisation of the barriers in the HEIs.

The authors in [24] proposed a framework of barriers for Global Social Knowledge Management (GSKM) considering the categorisation and classifications proposed by Pallot, Martínez-Carreras, et al. (2010), Sclater et al. (2001) , Agerfalk et al. (2005) and Riege (2005). The barriers are organised into four broad categories. These categories are: a) contextual, b) social, c) technical and d) cultural. According to the authors, the first category includes barriers related to a specific context, organisation or task. The second category consists of barriers associated with individual and group behaviour. The third category comprises of barriers that are linked to technologies and their qualities. The fourth category includes barriers related to the cultural distance of the workforce. The authors in [2] [3] [27] adopted the same framework in their analysis of barriers to digital transformation in universities.

According to [42] digital transformation is fundamentally about changes and it involves people, processes, strategies, structures, and competitive dynamics. People, processes and technology (PPT) have been broadly acknowledged to be the three components that are crucial to the transformation of organisations. This three-dimension model was first introduced in [9]. As stand-alone elements, people, processes and technology are essential for the implementation of transformation in organisations. Since then, many attempts have been made to improve this model. The initial model was expanded to include the organisational culture [40]. The authors in [21] mention that Leavitt's model was modified in the light of technological

determinism. In the modified model, the key factors are five: technology, processes, structure, people and culture. Under this view, technology is seen as an independent variable, whereas processes, structures, people and culture are dependent variables. Ten years later, following Leavitt's model and based on socio-technical theory, two inter-related systems, the social and the technical are deemed to be important for the organisations. The social system includes structure and people and the technical system includes the processes and tasks [8]. In the same vein, the authors in [25] introduced the six dimensional improvement model and added another three areas: customer focus, innovation and management functions.

Considering that the digital transformation is deemed a socio-cultural phenomenon, the dimensions of technology, processes, structure, people and culture remain the same but their importance changes. Technology is seen as a facilitator. Digital transformation depends on the culture and people of an organisation to further guarantee that technology can be used as a multiplier of impact.

HEIs should be treated as more than just the sum of their parts. To fully understand their parts and to implement digital transformation at different levels, universities are required to focus on specific areas. For digital transformation to be effective, balance and interdependence between them is required.

Taking all of the above into account, we have decided to adopt the classification system developed in paper [24] that categorises barriers as organisational and contextual, social, technical and cultural. This categorisation although provided in a different barrier context allows us to observe how the different fields of research are complementary and share common types of barriers, while each has its particular focus. In addition, considering that people, processes, technology, culture and structure are equally important dimensions for the implementation of digital transformation in HEIs, we have placed each of these dimensions in the above categories as follows: In the organisational and contextual category we have included the structure and processes dimensions, in the social category we have included people and their competencies, in the technical we have included technology and, lastly, in the cultural category we have included all matters related to the culture either in the individual or organisational level.

4 DISCUSSION

Our proposed categorisation of barriers provides universities with a starting point for adopting digital transformation, mitigating and minimising as many barriers as possible, thus giving digital transformation a greater likelihood of success.

4.1 Contextual Barriers

The barriers in this category, as presented in Table1, play a vital role in how universities operate and perform. The external environment of the Universities is regulated by the government. Public universities are subject to the constraints of legislation and government guidelines. Furthermore, lack of sufficient funding to universities for their operation and development is another important barrier that needs to be taken into account in the design and implementation of digital transformation.

This category also includes issues related to the internal policies of universities and their governing bodies. University administration tends to prioritise immediate issues and problems and postpone critical decisions on strategic issues that are time-consuming. The findings reveal that the lack of vision, plan and policy are the most significant barriers from this viewpoint. Most of the time, there is no clear action plan for the implementation of digital transformation in HEIs, and no hierarchy of implementation stages. In addition, and to the extent of an existing plan, sufficient internal funds are not available to implement digital transformation. High levels of bureaucracy, organisational complexity, and silos in the HEIs are barriers to moving resources quickly and efficiently. Finally, it is important to stress that the lack of management support is a critical factor in the implementation of digital transformation. Agility is required to enable universities to reap the benefits of digital technologies.

4.2 Social barriers

This category of barriers is related to the digital competencies, skills and digital literacy about digital technology. Many of these stem from the attitudes and beliefs about digital technology.

As the phenomenon of digital transformation and the widespread use of new technologies is relatively recent, there is a lack of experts in new technologies. In Universities there is a difficulty from all key stakeholders (administration, academic and administrative staff) in coping with the technological changes. It is also important to note that there is no comprehensive strategy on the part of the HEIs administrations for the training and cultivation of new skills in order to develop specialists who can meet the new requirements.

One issue that has to be taken into account is the digital generation gap that exists between students and academic staff in HEIs. On the one hand, students are considered native in the use of new technologies, and on the other hand the digital literacy of academic staff remains low. The academic staff of HEIs has to adapt and acquire skills in the use of new technologies. They also need to use digital skills for teaching and learning. This will require the acquisition and development of professional and pedagogical competencies.

4.3 Technical barriers

These address the tools and techniques used to communicate and to make work efficient. Technology is one of the pathways of value delivery in a modern organisation; all services are now, to some degree, enabled by technology.

An important barrier to the implementation of digital transformation is the legacy systems that universities have in place. A large number of outdated IT infrastructure continue to be used beyond their expiration date. This results in a lack of IT standards and security in their use. In addition, HEIs also need to improve their digital infrastructure and provide students, academic and administrative staff with the support they need.

Another significant barrier in this category is data fragmentation and diversity. In most cases the data is stored in separate HEI systems which are not interlinked to each other. Often this data may contain duplicate records or numerous versions. The multiple different systems for different uses and storage in multiple locations

that are not connected to each other significantly affects the quality of the HEIs' data.

4.4 Cultural barriers

This set of barrier refers to the environment in which all other components (organisational, social and technical) interrelate. The cultural barriers dealt with the issue of resistance to change either as an individual phenomenon, i.e. the resistance of individuals to change, or as a systemic phenomenon in light of the gradual and disruptive change caused by digital transformation. From a systemic perspective, systems seek stability and internal equilibrium, which by definition makes them resistant to change. Since the world is constantly evolving, systems need to keep up with the changes.

The most important asset an organisation has is its human resources. The success or failure of digital transformation depends on people, not technology. The inherent reluctance to leave one's comfort zone and try to find new ways of doing business is a major barrier to the success of digital transformation since it is by nature a disruptive process. Resistance to chance at the individual level is observed both among universities professors and administrative staff. Inertia is another important barrier to seizing opportunities in implementing digital transformation.

The transition of universities from traditional to digital is hindered by the "dominant logic". Dominant logic can be seen as a twofold resistance to change. At the individual level, the prevailing conservative, bureaucratic and risk-averse culture impedes the implementation of digital transformation. At the organisational level, the cultural barriers correlate to the changes in organisational values. HEIs are also affected by the resistance to change in mindsets and behaviours, not only from the perspective of people as individuals but also as an entity. The organisation's culture must find ways to embrace the new relationship, whilst maintaining the effectiveness of the current system until the new one is ready to fully take over. Finally, it is vital for the success of digital transformation to ensure collaboration and communication between university's community members in order to facilitate coordination between its departments.

5 CONCLUSIONS

This paper set out to identify and categorise the barriers to digital transformation in higher education institutions in order to aid universities in creating an appropriate strategy to overcome them and increase their likelihood of succeeding.

This study identified thirty-four distinct barriers that were found to impede digital transformation in HEIs. They were grouped into four distinct categories: a) contextual, b) social, c) technical and d) cultural. In order to overcome the barriers, each category requires different actions from the administrations of the universities, due to the fact that it affects different parts of the organisation.

As shown in Table 1, not all barriers have equal weight and significance. From a contextual perspective, lack of strategy, vision and action plan to support digital transformation was identified as a barrier for the university management. Also, the lack of organisational agility and the creation of silos within university departments (administrative and academic). In this category, the issue of insufficient funding to support digital transformation was highlighted by the majority of researchers.

The issue of sufficient funding is relevant and linked to many aspects of digital transformation. From a technical point of view, it is linked to the lack of adequate infrastructure, the existence of legacy and obsolete systems and the lack of support for security issues and standards.

In the category of social barriers, the barriers related to lagging behind and difficulties in finding experts in the implementation of new technologies are very important. The lack of digital skills and competencies appears at all levels of both the administration hierarchy and staff (administrative and academic). Also important is the reported lack of offering appropriate curricula to cover digital literacy.

Last, but by no means least significant, are the barriers identified in the cultural category. From the broad majority of researchers the issue of cultural change is stressed. The existence of a significant reaction to change, the safety zone and change of mindset emerge as important issues from the literature. It is interesting that this involves not only individuals but also the organization as a whole "dominant logic".

We acknowledge that to delve deeper and gain a more comprehensive insight into the barriers, it is crucial to examine in depth the barriers that are faced when implementing digital transformation in both private and public organisations. Moreover, barriers in the public sector need to be examined, as universities are subject to many legislative restrictions and regulations imposed by governments. In this sense, it is significant to examine the experience of implementing digital transformation in other public entities as well as in the governments themselves.

Furthermore, it would be interesting to investigate barriers when implementing digital transformation in enterprises which operate in a different legislative environment and are exposed to intense competition . We could then identify common barriers but also the differences compared to HEIs.

Last, we need to mention that the barriers only emerged from the literature review and further research should be conducted e.g. by inquiring important stakeholders to examine the importance of each barrier according to the above categorisations.

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REFERENCES

[1] B.R. Aditya, R. Ferdiana, and S.S. Kusumawardani. 2021. Categories for barriers to digital transformation in higher education: An analysis based on literature. *Int. J. Inf. Educ. Technol.* 11, 12 (2021), 658–664. DOI:https://doi.org/10.18178/IJIET.2021.11.12.1578

[2] B.R. Aditya, R. Ferdiana, and S.S. Kusumawardani. 2021. Identifying and prioritizing barriers to digital transformation in higher education: a case study in Indonesia. *Int. J. Innov. Sci.* (2021). DOI:https://doi.org/10.1108/IJIS-11-2020-0262

[3] B.R. Aditya, R. Ferdiana, and S.S. Kusumawardani. 2021. A barrier diagnostic framework in process of digital transformation in higher education institutions. *J. Appl. Res. High. Educ.* (2021). DOI:https://doi.org/10.1108/JARHE-12-2020-0454

[4] M Alenezi. 2021. Deep Dive into Digital Transformation in Higher Education. *Educ. Sci.* 11, 12 (2021), 13.

[5] A. Alhubaishy, A., & Aljuhani. 2021. The challenges of instructors' and students' attitudes in digital transformation: A case study of Saudi Universities. *Educ. Inf. Technol.* 26, 4 (2021), 4647–4662. DOI:https://doi.org/10.1007/s10639-021-10491-6

[6] Bandar Alzahrani, Haitham Bahaitham, Murad Andejany, and Ahmad Elshennawy. 2021. How Ready Is Higher Education for Quality 4.0 Transformation According To the Lns Research Framework? *Sustain.* 13, 9 (2021), 1–29. DOI:https://doi.org/10.3390/su13095169

[7] Lucas Veiga Ávila, Walter Leal Filho, Luciana Brandli, Colin J. Macgregor, Petra Molthan-Hill, Pinar Gökçin Özuyar, and Rodrigo Martins Moreira. 2017. Barriers to innovation and sustainability at universities around the world. *J. Clean. Prod.* 164, (2017), 1268–1278. DOI:https://doi.org/10.1016/j.jclepro.2017.07.025

[8] J. S. Bostrom, R. P., & Heinen. 1977. MIS problems and failures: A socio-technical perspective. *MIS Q.* 1, 3 (1977), 17–32.

[9] M. W. (Eds.) Cooper, W. W., Leavitt, H. J., & Shelly. 1964. *New perspectives in organization research*. Wiley.

[10] Ilshat Rafkatovich Gafurov, Marat Rashitovich Safiullin, Elvir Munirovich Akhmetshin, Almaz Rafisovich Gapsalamov, and Vladimir Lvovich Vasilev. 2020. Change of the higher education paradigm in the context of digital transformation: From resource management to access control. *International Journal of Higher Education 9*, 71–85. DOI:https://doi.org/10.5430/ijhe.v9n3p71

[11] Alexander Iosad. 2020. Digital at the core: A 2030 strategy framework for university leaders. *Jisc* (2020).

[12] S. O. Kaminskyi, O. Y., Yereshko, Y. O., & Kyrychenko. 2018. Digital transformation of University Education in Ukraine: Trajectories of Development in the conditions of new technological and economic order. *Інформаційнітехнологіїізасобинавчання* 64, 2 (2018), 128–137. Retrieved from https://journal.iitta.gov.ua/index.php/itlt/article/view/2083

[13] Kamal Kerroum, Azeddine Khiat, Ayoub Bahnasse, Es Saadia Aoula, and Yousaf Khiat. 2020. The proposal of an agile model for the digital transformation of the University Hassan II of Casablanca 4.0. *Procedia Comput. Sci.* 175, (2020), 403–410. DOI:https://doi.org/10.1016/j.procs.2020.07.057

[14] Barbara Kitchenham. 2007. Guidelines for performing Systematic Literature Reviews in Software Engineering. *EBSE Tech. Rep. EBSE-2007-01* (2007), 65. DOI:https://doi.org/10.1541/ieejias.126.589

[15] Anna Lašáková, Ľubica Bajzíková, and Indra Dedze. 2017. Barriers and drivers of innovation in higher education: Case study-based evidence across ten European universities. *Int. J. Educ. Dev.* 55, May (2017), 69–79. DOI:https://doi.org/10.1016/j.ijedudev.2017.06.002

[16] Vincenzo Maltese. 2018. Digital transformation challenges for universities: Ensuring information consistency across digital services. *Cat. Classif. Q.* 56, 7 (2018), 592–606. DOI:https://doi.org/10.1080/01639374.2018.1504847

[17] A. Marks, M. AL-Ali, R. Atassi, A.Z. Abualkishik, and Y. Rezgui. 2020. Digital transformation in higher education: a framework for maturity assessment. *Int. J. Adv. Comput. Sci. Appl.* 11, 12 (2020), 504–513. DOI:https://doi.org/10.14569/IJACSA.2020.0111261

[18] Stephen James Marshall. 2018. *Shaping the University of the Future: using Tehcnology to Catalyse Change*. Retrieved from http://link.springer.com/10.1007/978-981-10-7620-6_20

[19] Christian Matt, Thomas Hess, and Alexander Benlian. 2015. Digital Transformation Strategies. *Business and Information Systems Engineering 57*, 339–343. DOI:https://doi.org/10.1007/s12599-015-0401-5

[20] Alexey Mikheev, Yana Serkina, and Alexander Vasyaev. 2021. Current trends in the digital transformation of higher education institutions in Russia. *Educ. Inf. Technol.* 26, 4 (2021), 4537–4551. DOI:https://doi.org/10.1007/s10639-021-10467-6

[21] Janja Nograšek and Mirko Vintar. 2014. E-government and organisational transformation of government: Black box revisited? *Gov. Inf. Q.* 31, 1 (2014), 108–118. DOI:https://doi.org/10.1016/j.giq.2013.07.006

[22] OEDC. 2020. Digital Transformation and the Futures of Civic Space To 2030. *OECD Dev. Policy Pap. 29* (2020). DOI:https://doi.org/10.36548/jismac.2020.2

[23] S. Parker. 2020. The future of higher education in a disruptive world. *KPMG* (2020), 30.

[24] Henri Pirkkalainen and Jan M. Pawlowski. 2014. Global social knowledge management - Understanding barriers for global workers utilizing social software. *Comput. Human Behav.* 30, (2014), 637–647. DOI:https://doi.org/10.1016/j.chb.2013.07.041

[25] A. A. Prodan, M., Prodan, A., & Purcarea. 2015. Three new dimensions to people, process, technology improvement model. *New Contrib. Inf. Syst. Technol. (pp. 481-490). Springer, Cham.* (2015), 481–490. DOI:https://doi.org/10.1007/978-3-319-16486-1

[26] Pat Reid. 2014. Categories for barriers to adoption of instructional technologies. *Educ. Inf. Technol.* 19, 2 (2014), 383–407. DOI:https://doi.org/10.1007/s10639-012-9222-z

[27] B. Rima Aditya, R. Ferdiana, and S. Suning Kusumawardani. 2021. Digital Transformation in Higher Education: A Barrier Framework. In *ACM International Conference Proceeding Series*, 100–106. DOI:https://doi.org/10.1145/3468978.3468995

[28] Luis Silva Rodrigues. 2017. Challenges of digital transformation in higher education institutions: A brief discussion. *Proc. 30th Int. Bus. Inf. Manag. Assoc. Conf. IBIMA 2017 - Vis. 2020 Sustain. Econ. Dev. Innov. Manag. Glob. Growth* 2017-Janua, (2017), 4490–4493.

[29] G. Rodríguez-Abitia, G., & Bribiesca-Correa. 2021. Assessing digital transformation in universities. *Futur. Internet* 13, 2 (2021), 1–17. DOI:https://doi.org/10.3390/fi13020052

[30] P. Rof, A., Bikfalvi, A., & Marquès. 2020. Digital transformation for business model innovation in higher education: Overcoming the tensions. *Sustain.* 12, 12 (2020), 4980. DOI:https://doi.org/10.3390/su12124980

[31] Ted Saarikko, Ulrika H. Westergren, and Tomas Blomquist. 2020. Digital transformation: Five recommendations for the digitally conscious firm. *Bus. Horiz.* 63, 6 (2020), 825–839. DOI:https://doi.org/10.1016/j.bushor.2020.07.005

[32] E. M. Safiullin, M. R., & Akhmetshin. 2019. Digital transformation of a university as a factor of ensuring its competitiveness. *Int. J. Eng. Adv. Technol.* 9, 1 (2019), 7387–7390. DOI:https://doi.org/10.35940/ijeat.A3097.109119

[33] Marat R. Safiullin, Elvir M. Akhmetshin, and Vladimir L. Vasilev. 2019. Production of indicators for evaluation of digital transformation of modern university. *Int. J. Eng. Adv. Technol.* 9, 1 (2019), 7399–7402. DOI:https://doi.org/10.35940/ijeat.A3100.109119

[34] Sanchez A Marisa. 2020. University e-readiness for the digital transformation: the case of Universidad Nacional del Sur. *Rev. Gestão Tecnol.* 20, 2 (2020), 75–97.

[35] D. Schallmo, C.A. Williams, and L. Boardman. 2017. Digital transformation of business models-best practice, enablers, and roadmap. *Int. J. Innov. Manag.* 21, 8 (2017). DOI:https://doi.org/10.1142/S136391961740014X

[36] A. B. Scholkmann. 2021. *Resistance to (digital) change: Individual, systemic and learning-related perspectives*. DOI:https://doi.org/10.1007/978-3-030-55878-9_1

[37] Andreia Filipa Teixeira, Maria José Angélico Gonçalves, and Maria de Lourdes Machado Taylor. 2021. How higher education institutions are driving to digital transformation: A case study. *Educ. Sci.* 11, 10 (2021). DOI:https://doi.org/10.3390/educsci11100636

[38] Iurii Teslia, Nataliia Yehorchenkova, Iulia Khlevna, Yevheniia Kataieva, Tatiana Latysheva, Oleksii Yehorchenkov, Andrii Khlevnyi, and Vitaliy Veretelnyk. 2020. Developing a systems engineering concept for digitalizing higher education institutions. *Eastern-European J. Enterp. Technol.* 6, 2–108 (2020), 6–20. DOI:https://doi.org/10.15587/1729-4061.2020.219260

[39] Karen Núñez Valdés, Susana Quirós Y. Alpera, and Luis Manuel Cerdá Suárez. 2021. An institutional perspective for evaluating digital transformation in higher education: Insights from the chilean case. *Sustain.* 13, 17 (2021). DOI:https://doi.org/10.3390/su13179850

[40] F. Valdez, B., Svolou, A., & Valdez. 2008. A Holistic Approach to Process Improvement Using the People CMM and the CMMI-DEV: Technology, Process, People and Culture, The Holistic Quardripartite. *Softw. Eng. Inf. Repos. SEI C.* (2008). Retrieved from https://resources.sei.cmu.edu/asset_files/Presentation/2008_017_001_24459.pdf

[41] Paulo Nuno Vicente, Margarida Lucas, Vânia Carlos, and Pedro Bem-Haja. 2020. Higher education in a material world: Constraints to digital innovation in Portuguese universities and polytechnic institutes. *Educ. Inf. Technol.* 25, 6 (2020), 5815–5833. DOI:https://doi.org/10.1007/s10639-020-10258-5

[42] M. Wade. 2015. A Conceptual Framework For Digital Business Transformation. *Glob. Cent. Digit. Bus. Transform.* June (2015), 173–195. DOI:https://doi.org/10.4018/978-1-7998-5015-1.ch009

[43] R. T. Webster, J., & Watson. 2002. Analyzing the past to prepare for the future: Writing a literature review. *MIS Q.* 26, 2 (2002), xiii–xxiiii. DOI:https://doi.org/10.1016/j.freeradbiomed.2005.02.032

[44] Konstantin L. Wilms, Stefan Stieglitz, Lena Fröhlich, Sarah Schaulies, Christian Meske, Hannah Decker, Nadine Jendrosch, Raimund Vogl, and Dominik Rudolph. 2017. Digital transformation in higher education – new cohorts, new requirements? *AMCIS 2017 - Am. Conf. Inf. Syst. A Tradit. Innov.* 2017-Augus, 2004 (2017), 1–10.