Classification of Barriers to Digital Transformation in Higher Education Institutions: Systematic Literature Review

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Abstract: Digital transformation of higher education institutions (HEIs) is of paramount importance in today's technology-driven world. However, there are numerous barriers that hinder the successful implementation of digital transformation initiatives in HEIs. In this article, we identify and classify these barriers based on a systematic literature review. The findings reveal twenty distinct barriers that inhibit digital transformation in higher education. These were then organised into six broad categories, namely environmental, strategic, organisational, technological, people-related and cultural. The study provides a comprehensive understanding of the barriers faced, facilitating the development of effective strategies and interventions. Our analysis provides valuable information for higher education institutions, policy makers and stakeholders involved in digital transformation initiatives.

Keywords: digital transformation; university; higher education; barrier; challenge; obstacle; systematic literature review

1. Introduction

In recent years, digital transformation has become an essential aspect of modern society, deeply affecting organisations in various sectors. The significance of this issue stems from the remarkable rate at which digital technologies have penetrated all aspects of our lives. A survey conducted by the World Economic Forum [1] highlighted that 87% of companies believe that digital transformation will disrupt their industry, but only half say they are prepared. In a different study conducted by the World Economic Forum [2] in 2019, it predicted that by 2022, 60% of global GDP would be digitised.

The need for digital transformation in higher education is underlined by rapid developments in technology and their profound impact on society. In 2019, the global e-learning market was valued at nearly USD 200 billion. In the same year, the Learning Management System (LMS) market generated nearly USD 18 billion [3]. Moreover, the COVID-19 pandemic has accelerated the shift towards digital education, with many educational institutions being forced to switch to remote and hybrid teaching models. According to recent figures [4], the global e-learning market is expected to reach USD 848.12 billion by 2030, suggesting a growing adoption of online educational platforms and digital learning resources.

Digital transformation is not a completely new phenomenon, as relevant concepts have been around in different forms for at least 50 years. The first wave of transformation, usually called digitisation, took place in the 1960s–1970s and resulted in the automation of small parts of processes with marginal changes to the organisation [5]. Information flows inside the organisation remained vertical following the Weberian paradigm. In the 1980s–1990s, the second wave of transformation occurred, usually called digitalisation, which was driven by the business process reengineering rhetoric [6]. Organisations produced the same goods and services as before, but in a completely innovative way that affected internal

functions, information flows and structures [5]. They were challenging and dramatically changing their business processes, which is the "how" part of their operations [7]. This enabled integration and coordination across a variety of individual activities in businesses. The third wave that is happening now is linked to a total reinvention of the organisation. Their core business is affected together with their business models. The central axis of change is not just about *how* to produce, but about *what* and *why* to produce [8]. This phase is what is nowadays usually called digital transformation. These terms are better defined later in the next section.

Today, advances in digital technologies have allowed broad, we could say, grassroot implementation and transformation to all types and size of organisations [9,10]. The Internet of Things (IoT), cloud computing, artificial intelligence (AI), advanced robotics and blockchain technologies are examples of modern technologies that drive this revolution. Their influence on society and organisations, public and private, is increasingly accelerating due to the growing affordability and computing power of devices [11]. The social, political, economic and technological changes taking place are affecting the way people live, work and educate themselves. It seems that all nations, regardless of their current level of development, will undergo digital transformation as the rate of adoption of technology is unprecedented [12]. In the developed world, during the last two decades, the need for digital transformation has settled, and governments have developed sophisticated methods for applying digital technology to add value to and create new products and services. During the same period, developing countries have been trying to move from desire and ambition to planning, delivering and reaping the benefits of digital transformation [13]. Digital transformation becomes a priority and an urgent issue for organisations in their efforts to survive and maintain key functions [14]. The issue now is no longer if but how an organisation will embrace and cope with the needed digital transformation.

Whole eras of technical progress and economic growth appear to be driven by a few key technologies, which we call general purpose technologies (GPTs) [15]. A GPT has the potential to affect the entire economic system and can lead to far-reaching social changes. Examples of GPTs are the steam engine, electricity and the computer [16]. Disruptive technologies such as artificial intelligence, blockchain and the Internet of Things (IoT) have the potential to be GPTs in the modern era. Each of these technologies has had a significant impact on the economy and society, leading to innovation, increased productivity and substantial changes in various aspects of life. These technologies are transformative, impacting many sectors, and have the potential to reshape industries, economies and even social structures in far-reaching ways. In the context of universities, it refers to the transformative impact of digital technologies on traditional educational models, changing the way universities operate, deliver education and engage with students and can be seen as a catalyst for digital transformation, pushing universities to evolve and adapt to the changing digital landscape. Digital transformation goes beyond simply adopting new technologies; it involves deep organisational change to adopt digital practices and capabilities. So, while digital disruption focuses on the specific impact of digital technologies on universities and education, digital transformation refers to the broader organisational changes required to harness the power of digital technologies and create a digitally oriented institution.

In this environment, the education sector is not an exception. Demand for digital reform, especially in higher education institutions (HEIs), has been a necessity since the early 1960s and has stemmed from a variety of external and internal sources. Furthermore, radical changes occurring in the education sector push for change. The massification of education, as educational services are massively delivered; the democratisation of knowledge, as huge quantities of learning content is accessible online; the post-truth era, as experts tend to have less influence in shaping public opinion; career changes, as there are many changes in professions; and increased global competition [17] should not be ignored in any case. Globalisation and the competitive environment put pressure and make it difficult for HEIs to keep up with the speed of change [18], and push them to redesign strategies to remain relevant and competitive [19]. Reacting to these pressures, several

universities are shifting to a more business-oriented model [20] to fulfil the demands of students to gain skills that meet the needs of society [21].

HEIs have a unique nature and purpose [22]. As "one size does not fit all" for digital transformation [22], we need to delve deeper into the changes it brings to higher education. Digital transformation improves the operations of institutions and can simulate competitive advantage. These marks drastically affect universities and lead to a new era for higher education institutions. Digital transformation in HEIs creates new educational services [23,24], enhances the effectiveness of learning processes [24–26], contributes to greater satisfaction of students' needs [24,27], improves the quality of academic administration [24,27], and optimises administrative processes [26]. Moreover, emerging technological solutions remain fascinating and aspirational, as they still come with unexploited opportunities in teaching, learning and research [12,22]. Transformation is not just about curriculum, learning delivery, student support and research. It is also about the back office, the operating model and, fundamentally, the set of key organisational capabilities: to be flexible, agile, purposeful and evidence-led [28].

Since the 1970s–80s, Larry Cuban, in [29], criticising the widespread belief that simply introducing technology into teaching classrooms would automatically lead to improved educational outcomes, stressed the importance of considering the complex interplay between technology, pedagogy and the wider social and cultural context in which education operates. He argued that technology alone does not guarantee better learning outcomes and that effective integration of technology requires careful consideration of many factors, including teaching practices, teacher training, curriculum design and the overall educational environment. In essence, Cuban's critique of technocentrism urged educators and policymakers to adopt a more balanced and holistic approach to educational technology, one that recognizes the importance of pedagogy, human factors, and social context alongside technological tools.

As a new phenomenon, the success of digital transformation is dependent on the extent to which policy makers identify, understand barriers and develop adequate strategies to deal with them [30]. According to [20], without a detailed understanding of the barriers, HEIs will face difficulties in selecting the appropriate goal and strategy to accomplish digital transformation. Research from [30] revealed that lack of barriers awareness is one of the main causes of digital transformation failure. Research from [30] revealed that a lack of barriers awareness is one of the main causes of digital transformation failure.

1.1. Structure of the Paper

In this section, the notions of digitisation, digitalisation and digital transformation are introduced. We also discuss what digital transformation means for HEIs, present the research gap, and set our research questions and the scope of our contribution. In Section 2, the research methodology is described. Subsequently, in Section 3, we present our results and try to address our research questions. Discussion on the results appears in Section 4. Finally, we conclude and present limitations and future work.

1.1.1. Background

In order to better understand digital transformation and what it entails, it is important to define the terms surrounding it. The terms digitisation, digitalisation, and digital transformation, although used interchangeably, have distinct meanings.

Digitisation is described as a technical process in [31] and refers to the modification of analogue tools into digital representations [13,32], the conversion of analogue data and processes into a machine-readable format [33] or the conversion from analogue to digital formats, for example, paper forms to webforms [34].

Digitalisation is defined as a sociotechnical process in [31] and is the use of digital technologies and data as well as inter-connections that result in new activities or changes to existing activities [33], the way in which many aspects of social life are being reshaped by digital communication and media infrastructures [35,36], the deployment of technology to

achieve transactional operational efficiencies, or local advantages [34] or the improvements that results through the integration of digital data [32]. The term conveys social, operational and economic dimensions [8]. Hence, "digitalisation" may be defined as "the way in which many domains of social life are restructured around digital communication and media infrastructures".

Digital transformation is described as a sociocultural process in [31]. According to [34], digital transformation is the cultural, organisational and operational change of an organisation, industry or ecosystem through smart integration of digital technologies, processes and competencies across all levels and functions in a staged way. It affects people, processes, strategies, structures and competitive dynamics [37,38], involves revolutionary and holistic shifts in the organisation by integrating digital technologies and goes beyond the adoption of advanced digital technologies alone [32]. It is the deep transformation of business and organisational operations, processes, capabilities and models to fully exploit the changes and opportunities of a combination of digital technologies and their impact on society as a whole in a strategic and prioritised manner, driven by present and future changes [38–40].

Digitalisation differs significantly from digital transformation. Through digitalisation, the organisation achieves process automatisation [13,34] and streamline processes [34], while through digital transformation, horizontal organisational changes can be achieved [41]. Furthermore, through digitalisation, organisations can create new opportunities by improving their organisational value chain [21]. Digital transformation is not achieved as individual processes and projects [41] but must be understood as a profound and radical process of change that drives businesses and organisations in new directions and brings them to a completely different level of effectiveness [27]. The European Commission stresses that digital transformation refers to the profound changes taking place in the economy and society as a result of the adoption and integration of digital technologies in every aspect of human life [42].

Thus, we can say that we are digitising information, digitalising the processes and roles that comprise the functions of an organisation and digitally transforming the organisation and its strategy [41]. Each of these is required but is not enough for the next, while digitisation and digitalisation are fundamentally about technology, and digital transformation goes beyond technology. It is about changes in value, culture, and organisational structure [8] and must be seen as a long-term and iterative process [41].

HEIs are by nature complex organisations, with many specific features that differentiate them from other organisations such as teaching, pedagogy, curriculum, research [32,43]. Also, society expects the university to fulfil multiple social and political missions. HEIs, like other organisations, operate today in an environment subject to unpredictable changes that they need to cope with. To date, in higher education, technology has been mainly seen as a medium for gradual change in order to improve current learning approaches and has been largely ignored as a means for disruptive and evolutionary changes [32,44].

Educause, a global non-profit organisation whose membership includes U.S. and international higher education institutions, defines digital transformation as "*a series of profound and coordinated changes in culture, workforce and technology that enable new educational and operational models, transforming the business model, strategic directions and value proposition of HEIs*" [45]. Digital transformation for HEIs is also defined as the phenomenon in which old management patterns are broken and reinvented through a creative disruption, supported by the use of digital technology, in order to achieve more effective management and build new relationships [38]. As a result of digital transformation and the use of new technologies, both academics and their institutions are changing the way they operate at a faster pace than expected [46]. Digital technologies allow significant improvements in processes, business models and interactions between them [18,20,47].

1.1.2. Research Gaps

As digital transformation in higher education is an emerging research area, barriers have not been fully and systematically identified and studied. Since the beginning of the 21st century, many disruptive changes have been taken. Emerging technologies, on the one hand, bring new opportunities, while, on the other hand, there are many challenges and barriers. Education generally retains traditional ways and patterns [46] and is slow in initiating and adopting changes [27]. True digital transformation often remains elusive, even in pioneering countries like the USA [45,48]. One of the reasons that the failure rate of digital transformation is high is a lack of understanding and managing barriers. Internal and external barriers to technology integration in education [49] were systematically studied at least two decades ago. Thus, first- and second-order barriers were identified in [50]. First-order barriers refer to external barriers that directly impede the implementation of technology, such as a lack of infrastructure, limited access to devices and the internet, and inadequate technical support. Second-order barriers, on the other hand, are internal or behavioural barriers, such as resistance to change, a lack of educators' confidence and expertise, and limited understanding of the potential benefits of technology in education.

1.1.3. Our Contribution

We try to fill this gap by identifying the barriers faced by HEIs in the design and implementation of digital transformation initiatives and organising them into broader categories. Based on these categories of barriers, strategies to address them could be developed in a systematic way. Furthermore, educational policies could embed and further amplify digital transformation in the HEIs. Finally, HEI professionals such as academics, administrators and researchers can benefit from this work to gain a better understanding of challenges related to digital transformation and readjust their practices and skills to the changing landscape of higher education.

2. Materials and Methods

The method applied in this research is a systematic literature review [51–53]. The systematic literature review (SLR) is a research approach for finding, evaluating, explaining, and synthesising the extant literature created by scholars, researchers, and practitioners [54]. An SLR is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically evaluate relevant research, and to collect and analyse data from the studies that are included in the review [55]. We use the protocols described in [52,53], consisting of five phases: (1) formulating the research questions, (2) research process, (3) synthesis, (4) analysis, and (5) evaluation.

2.1. Research Questions

We identify the barriers that hinder the implementation of digital transformation in HEIs, and we organise them into broader categories. For this purpose, we formulate two research questions:

RQ1: *What are the barriers of digital transformation in HEIs?*

RQ2: *How can barriers be organised into broader categories?*

2.2. Research Process

We start by applying the PRISMA flow diagram for the study selection phase. In Figure 1, we also present the number of studies identified per phase.

Identification: The relevant studies were retrieved from the scientific databases Web of Science and Scopus [51]. We chose these databases as they cover a wide range of academic disciplines, publications from many countries and languages, and provide a comprehensive and reliable source of literature for research purposes. They further use strict selection criteria to ensure that the publications they include are of high quality and have undergone a rigorous peer review process. Furthermore, both databases allow tracking of articles or

author citations, which helps us to identify other relevant research. Finally, they are widely used by researchers, academics and students around the world and are usually available through university libraries or research institutions.
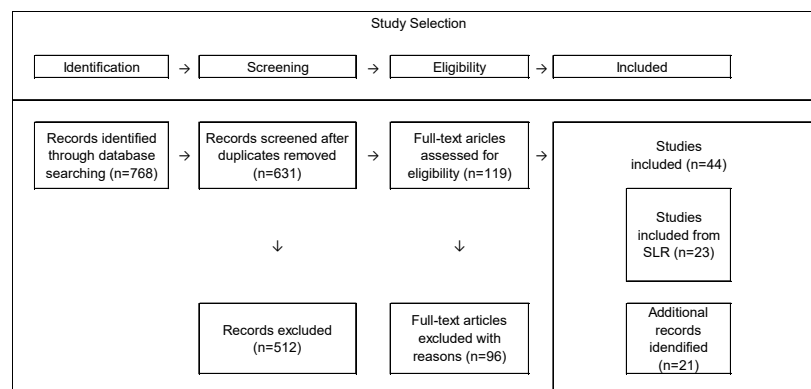

Figure 1. Process applied for study selection adapted by [55].

For the search, we used string construction, the Boolean operators, as well as AND and OR to integrate the selected variables [52,53]. In both databases, the query followed was: ((digital transformation) AND (universit* OR higher education) AND (barrier OR challenge OR obstacle)).

The search was conducted in English sources without time limitations. In both databases, we searched in the title, abstract, and keywords fields. Searches were performed in November 2022, maintaining the above-mentioned structure. The search yielded 768 studies, 305 articles in the Scopus database and 463 in the Web of Science database. We included articles, review articles, and conference proceedings [51,52] as digital transformation is a relatively new field with few publications in scholarly journals. Also, in this scientific area, there are many conferences of international reputation with high-quality articles in conference proceedings.

Screening. We then proceeded to check the studies retrieved from the previous step after we removed 137 duplicates, using MS Excel and the Mendeley software. For this purpose, all titles, abstracts and keywords were read. We removed studies that were not fully available and excluded short papers. From this phase, 119 studies remained.

Eligibility. During this phase, more concretely, we filtered the 119 studies retrieved from the screening process by reviewing the full text of the articles to identify relevance to the challenges and barriers in HEIs. For this purpose, we applied inclusion and exclusion criteria. A total of 119 studies were submitted to check their relevance to the research question. The criteria chosen to ensure the relevance and quality of the articles were:

1. Papers should relate to the barriers, challenges and obstacles to the implementation of digital transformation in HEIs.
2. Papers should discuss theoretical concepts about these barriers.
3. Papers should use the barriers at the centre of their analysis, e.g., by including them in hypotheses, propositions and/or the research model, to ensure that barriers to digital transformation played a key role in the paper.

The exclusion criteria set aimed to exclude studies that (a) did not focus specifically on the barriers faced by HEIs and (b) referred to the barriers only in their introduction or background and not in their results or measure something other than the barriers of HEIs. We ended up with 23 articles that addressed the above criteria.

Included. A systematic search should ensure that a relatively complete census of relevant literature has been gathered. The review nears completion when no new concepts can be found in the selected set of articles. Of course, there is always the possibility that some articles have been omitted. To this end, by using the references lists in these articles, we identified and included another 14 articles applying Forward and Backward Citation

Search. Furthermore, we included 6 papers from grey literature and 1 paper from our previous work. Finally, 44 studies were included in the study.

Synthesis. To identify the barriers, we first read all the full-text articles to approach the barriers as a whole. It is worth mentioning that some authors follow an author-centric approach and present a summary of the relevant articles. According to [51], the author-centric method failed to synthesise the literature as literature review should be concept-centric. Following this principle, we compiled a concept-centric table of the barriers faced by HEIs to which each article contributed.

Analysis. We present the articles according to their chronological (Figure 2), type of documents (Figure 3) and countries (Figure 4). Such information is important to have a comprehensive picture of the articles we process to answer our research questions. As can be seen, the issue of barriers to digital transformation in HEIs started to concern researchers from 2019 onwards.
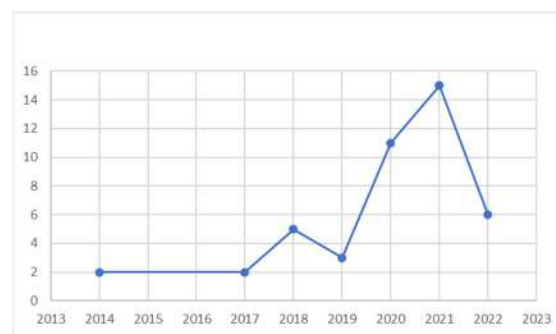

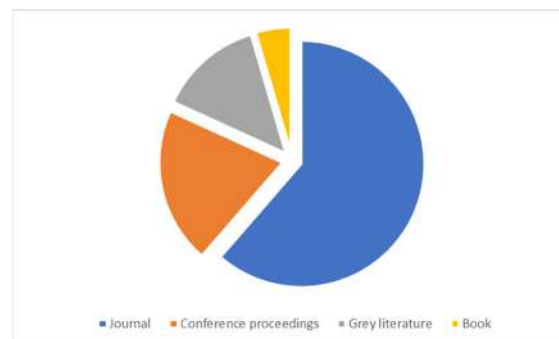**Figure 2.** Timeline of research articles on barriers to digital transformation in **HEIs**.

Figure 3. Distribution of research articles by type of documents.
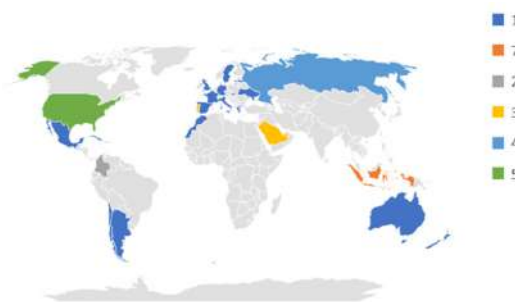

Figure 4. Distribution of research articles by countries.

3. Results

In this section, we define the notion of barriers and answer RQ1: "*What are the barriers of digital transformation in HEIs*". Then, we attempt to answer RQ2: "*How can barriers be organised into broader categories?*". We present different classification approaches we found in the literature, choose a categorisation schema, and place each barrier into a category.

3.1. RQ1: What Are the Barriers of Digital Transformation in HEIs?

In general, barriers can be defined as challenges, obstacles, restrictions or risk that may prevent a person, a group or an organisation from achieving goals and success in a particular context [56]. In the digital transformation literature, barriers prevent, slow down or stop the process of digital transformation [18,57]. Barriers are also defined as features—either real or perceived—of the legal, social, technological or institutional frameworks that work against digital transformation and limit efforts to reshape access to information, people and organisations in technology-enabled ways [58].

We identified twenty (20) barriers in the literature, albeit digital transformation in HEIs is quite a new field. We present these barriers below. The order indicates the frequency the barrier was found in the literature: barriers presented first appear more often.

3.1.1. Lack of Digital Literacy

Digital literacy refers to the skills, knowledge and confidence to use digital technologies. The human factor is considered a pillar of success or failure of digital transformation [59,60]. The barriers identified in the literature relate to inadequate ICT skills of academic staff [24,61–69], lack of skills and knowledge of academics and staff [20,28,70–72], and that students as well as academic and administrative staff may not have sufficient knowledge to use the available digital services [18,28,48,73].

Digital transformation has changed both learning activities and the tools used to support them. The integration of digital technology requires new skills and knowledge [63]. Thus, academic staff who are not used to and do not understand digital technology are not able to use new technologies into the learning environment [35]. The success of digital transformation in HEIs depends heavily on the skills and knowledge of teaching staff and their students [13,14,63].

For universities in the United Arab Emirates (UAE), a lack of critical IT skills was cited as barrier to digital transformation [13,14]. In Cuban universities, there is a shortage of medium and senior technical staff, insufficient staff directly related to the development and use of ICT in universities, frequent changes in existing staff, faculty members of universities are not digital natives, and finally, the administrative structure is not appropriate to coordinate and support the use and development of ICT [26]. Furthermore, the literature mentions the generation gap between students, who are considered indigenous to digital technologies, and the faculty of the institutions, who need to adapt and learn how to use technologies [32].

3.1.2. Resistance to Change and Risk Aversion

In universities, people tend to do things in a certain and defined way and are reluctant to leave their comfort zone [60,70,74,75]. Changing academic culture is a difficult and slow process. Furthermore, loose interpersonal relationships, a characteristic of academic identity, can be an additional barrier to cultural change [63]. Many faculty members are not positive towards the change taking place and tend to be reluctant to change their attitude [12,24,45,60–66]. Faculty resistance to change is found all over the world and in different types of institutions [20,75,76]. Pressure on faculty to adopt digital transformation can create further resistance, and the more change that is required, the more likely the faculty will resist [72]. However, some faculty, if not forced, will never change [20].

Resistance to change [68], fear, uncertainty and concerns that things cannot change as well as the lack of interest of more traditional academics are barriers to digital transformation [67,69]. Another obstacle is the general resistance to the implementation and

adoption of new information systems [26]. Digital transformation also implies changes in organisational structures. Some individuals may be empowered and others may be weakened by these changes [38,69].

Resistance to change can be due to habit, which refers to people's habitual reactions to their environment [77]; security, which refers to the fact that people resist any change that poses a threat to their security [77]; to economic factors, which relate to the potential risk that may arise from the implementation of the change [77]; fear of the unknown, which can be outlined by the replacement of known practices with uncertainty and ambiguity [18,59,77,78]; fear of traceability and the lack of privacy [69]; selective information processing, which refers to the fact that individuals tend to filter and process only information that is relevant to their own belief system [77]. Moreover, digital transformation is hindered by slow reaction and inertia of managers and employees [79].

3.1.3. Lack of Adequate IT Infrastructure

The issue of IT infrastructure and the poorly equipped IT departments [20,69,73,78,80] are mentioned as barriers to digital transformation. Appropriate IT architecture [81], IT infrastructure [12,38,43,67,77,82], and reliable high-speed internet connectivity are prerequisites for the digital transformation process in HEIs [12,24,26,60–66].

Several studies have reported that the lack of appropriate infrastructure has hampered the real use of digital technology, such as Wi-Fi with poor internet access and slow connection speeds [26,63]. Concerns were expressed about the full readiness of the IT infrastructure for the implementation of digital transformation in the UAE [13,14]. In Cuba, there are serious infrastructure problems, including, among others, inadequate equipment, legacy equipment, and insufficient national and international bandwidth [26].

The International Association of Universities (IAU) in its global survey found that unreliable internet, local infrastructures, insufficient processing and storage infrastructures are barriers to digital transformation. We observe the large differences between continents, e.g., in Africa, infrastructure is one of the key barriers to digital transformation, while in Europe, it is completely insignificant in terms of importance [22]. In a survey by the IAU on the Internet infrastructure and the consequences for HEIs, data show that 51% of the world's population uses the Internet. For developed countries, the percentage is 81%, compared to 45% for developing countries, and for least developed countries (LDCs), it drops to 20% of the population [22]. Inequality of access to the internet results in inequality of access to information, knowledge and global networks, and it affects universities too [22].

3.1.4. Budgetary Constraints

Research shows that digital transformation requires large and upfront financial investment. The economic challenges and funding limitations faced by HEIs in combination with the escalating costs of education and the simultaneous reduction in public investment are major barriers to digital transformation [35,43,72,82]. The International Association of Universities found that investment in financial instruments and financial costs are the biggest barriers for digital transformation [22,73]. Specifically, the most important constraint is the lack of national financial support for transformation [22]. Typically, the internal funding resources of HEIs are not sufficient to support the whole digital transformation process [12,24,45,61–66,68,74], as initial investment costs are high [18].

Surveys conducted in countries with different economic context have found completely different results. In the UAE, affordability and constraints are problems for small private universities rather than state universities [13,14]. In Cuban HEIs, international barriers and limited financial and material resources at the national level are significant problems [26]. In most European countries, on the one hand, the limited funding of HEIs from the national budgets, and on the other hand, short-term and in annual grants financial planning of HEIs are considered barriers on the course towards digital transformation [67]. Public HEIs, in particular, face profound uncertainty due in dependencies and changes in the state budget [71,83].

Finally, the financial planning of HEIs is in most cases short-term and mainly based on annual grants and this is also considered an obstacle.

3.1.5. Lack of Leadership for Change

Digital transformation requires not only new technology but primarily new ways of working. In order to achieve real transformation in HEIs, consistent and strong support from the university leadership is essential [59,60,67,69,73]. Leadership needs to provide a supportive framework to motivate and mobilise members of the institution, combined with the bottom-up development of ideas that promote digital transformation [22,83]. Ineffective leadership continues to be serious problem and results in ineffectiveness of digital transformation [24,61–66,71]. A study by [46] found that a lack of institutional leaders' skills to govern digital transformation slows down the digital transformation process. The executive team does not realise that digital transformation needs a lot of work and time to succeed [20]. In the case of Cuban universities, most leaders are not digital natives and tend to leave ICT decisions to experts [26]. An additional barrier is the slow process of decision making [67]. The weakness to mobilise the right leadership, limited scope and poor governance are inhibiting factors for digital transformation [45,48,79,84].

3.1.6. Lack of Strategic Planning

Universities often seem to concentrate on urgent issues rather than important ones [13,14,32,60]. They tend to focus on short-term results and postpone issues that are difficult and time/effort-consuming to address. Digital transformation is not designed on a planned and organised basis, which hinders its seamless implementation and success [79]. This can be addressed through the development of a digital investment prioritisation plan to drive the systematic transformation of the organisation in a successive manner [32].

While the research indicates that the planning and implementation of digital transformation in higher education requires a holistic strategic plan [32], HEIs suffer from a lack of overall strategy and governance [24,46,61–66,71,72], inconsistent strategies [21,71,82], and a lack of strategy to support the teaching and learning process associated with the digital transformation pathway [63,69]. Finally, many HEIs are facing considerable challenges in taking strategic decisions due to difficulties to cope with fragmented data and poor analysis capabilities [77].

3.1.7. Security and Privacy Risk

Security and privacy risks cannot be overlooked [28,43,59,60,68]. The hardware, security and network in certain universities are not prepared to handle potential security threats that could arise with the extension of their digital infrastructure [13,14]. Furthermore, the lack of standards for data exchange and the lack of a legal basis for ensuring the interface of transnational digital systems [69] are cited as barriers. In Cuban universities, it was observed that there is a serious issue regarding securing information leakage and disclosure of confidential information [26]. Finally, users fear the lack of control over their personal information as their data may become fully traceable [24,61–66,69,81].

3.1.8. Attitudes and Beliefs

Transformation barriers are related to internal factors of the individual, such as attitudes and beliefs about their abilities and the usefulness of technology [20]; the lack of trust in digital services and cloud technologies or concerns about their credibility and security [78]; the lack of willingness or interest of faculty to embrace educational technologies [20,85]; attitudes and beliefs about modernisation and personal negative attitudes to it [18,67]. Faculty are usually stuck in the existing organisational culture and values, and they are resistant to adapting to new ideas [72,75,83].

Their beliefs about digital adoption have a positive or negative impact on the transition. Academics who are technologically incompetent but have a positive attitude towards ICT will need less effort to learn skills needed to implement ICT in the learning process.

Changing negative attitudes is important to improve ICT skills [24,60–66]. The challenge remains to change the mindset and behaviour of those who are sceptical about change [26]. Perceptions such as fear of technology and concerns about the negative effects of technology adoption are still widely present among academics making them to fear failure and hesitate to acquire new skills [63]. Resistance to the adoption of new methods can be a major obstacle. There is a high probability that staff will resist change if their job security is jeopardized [79].

3.1.9. Integration of Digital Technologies in Educational Systems

Digital transformation in HEIs is bringing about a shift to digital teaching and learning methods which are transforming access to learning materials, dialogue and collaboration between stakeholders [18,20]. Investments in educational technologies and appropriate tools absorb significant budget, but the lack of faculty willingness or interest in adopting and using educational technologies is a significant barrier for most institutions [20,69]. Technological developments are occurring rapidly and much faster than the pace of their integration into HEI systems. Thus, their embeddedness in HEIs, because of their time-consuming procedures [24,60–67], risks being outdated by the time they are implemented.

The great variety, quantity and complexity in the use of educational technologies and tools, as well as the characteristics and limitations of each, make it difficult for academics to determine which technologies and tools are the most appropriate. As technology tools are frequently upgraded, academics are required to take the time to determine whether new features provide additional uses. Furthermore, many of the technologies used in courses were not originally developed for educational use and are either unfamiliar [20], or not always compatible with existing educational systems [13,14]. As a consequence, academics prepare various formats of material as they are unsure about which technologies would be available in classrooms [20]. There is insufficient use of online educational platforms and a lack of adequately accessible and up-to-date materials [26]. Moreover, a lack of personal interest in using new technologies is a barrier to digital transformation [22]. In Asian developing countries, HEIs lack adequate human resources, especially in the effort to integrate digital technology into teaching–learning activities [13,14,63]. There is also a risk of mismatch between the ICT tools used in different organisational units of HEIs [67].

3.1.10. Lack of Holistic Vision

Digital transformation can be achieved only by sharing a strong and common vision. Leaders and the wider community should work together to achieve shared future goals [32] and realistic expectations [84]. The lack of a holistic vision for digital transformation in HEIs is usual [13,14,24,60–66,82] and creates a complex, rigid and incompetent structure unable to react quickly to a rapidly changing market [78]. Alignment between educational vision, policy and practice is an essential condition to make the goal of digital transformation explicit and clear [63].

Academic communities have different perspectives and lack a shared vision. The multi-level structure of the faculties to which the members of the academic community belong is one of the factors that explains the difficulties for a shared vision [63].

3.1.11. Lack of Time due to Workload of Academic Staff

The introduction of technology into pedagogy demands more time from academics for preparing teaching material, and this can be a disincentive [20]. In many cases, the work overload of HEI personnel does not leave space for creative reflection and collaboration between different groups in the university environment [67]. Time constraints make digital transformation difficult as academic staff are flooded with heavy workload associated with research, teaching and administrative tasks [18,24,60–66,69]. Faculty are usually concerned about the workload [70]. It is overwhelming for academics to simultaneously struggle with new pedagogical methods and new technologies [20].

3.1.12. Inadequate IT Support Service

Adequate and uninterrupted technical support for all services of HEIs is needed as digital transformation embodies several new technologies in its operation. Consequently, appropriate technical support must be in place to provide staff with the capacity and confidence to use digital technology. Also, adequate technical support to students allows them to concentrate on the their studies [24,61–66]. A lack of technical support [8,12,43,60,82], unfriendly support services [78], support that is not focused on the needs of the department, not addressing issues quickly, and insufficient scheduling/timing of support were indicated by the staff as barriers [20].

3.1.13. Lack of Agility

Agility is the ability to adapt quickly to changes, especially in an uncertain and changing environment. A lack of organisational and structural agility hinders organisational change [46,60,68] and is barrier to digital transformation [71]. There are various factors contributing to this situation: traditional hierarchies [79], standardised departmental structures [79], inflexible and bureaucratic administration [67,79], time-consuming and non-standardised administrative processes [26,67], semi-autonomous operation of departments [26], decentralised decision making [32], centrally controlled management processes [67], and a vertical hierarchical model [21,46,48].

3.1.14. Data Fragmentation

Another barrier presented in the literature is associated with data structure, processing and reporting [13,14]. A possible cause of this barrier may stem from the inherent complexity of the university IT ecosystem. HEIs use many different IT systems in order to serve the multitude of business processes in universities: institutional communication, library management, human resource management, teaching and student support, research and technology transfer support, project and revenue management, financial support, IT support, legal support, and many others [86]. This has resulted in data reports relying heavily on data extraction and ad hoc queries and reports [32], also affecting the data quality and information [60,81]. The authors in [77] mention concerns about data quality and uniformity, which impact data validity.

One of the key concerns regarding digital transformation is information and data governance and management. The growth of digital data and the processing, analysis and use of information leads to new ethical issues regarding the right to data privacy, transparency in the use of information and the need for a 'code of conduct' or data policy to ensure that stakeholders are informed and aware of how the data collected is used, thus creating a trustworthy, transparent and secure environment for data management [22,69].

Each IT system targets a specific university service used by a specific number of users, resulting in data fragmentation and diversity. With the increasing use of different systems and entries, more and more data are being generated. The growth of data creates a kind of entropic phenomenon: data about key assets are dispersed across multiple silos of information; data vary in format, metadata, conventions and terminology used; data are duplicated; and inconsistencies and conflicts increase as different versions and descriptions of the exact assets co-exist in multiple IT systems [86]. There is a challenge to merge different technical solutions since faculty are required to be attentive and to check and verify data and information from multiple sources [81]. Due to the existence of fragmented centralised processes in HEIs, the linkage between the different systems, functions and processes hampers the integrated analysis of data [28,77].

3.1.15. Regulatory Framework and Legal Issues

HEIs are vulnerable to a constantly changing environment as well as to government-imposed rules and regulations. The attitude of HEIs towards transformation is influenced by national and international policies [38,60]. There might be a mismatch between the internal needs of HEIs and the regulatory framework set by governments [68]. Restric-

tive regulatory practices that impose rigid rules significantly limit the implementation of digital transformation in higher education [67]. Public HEIs face profound uncertainty due to changes in the legislation imposed on them or in political interventions [71]. Private institutions have more freedom than public institutions [13,14]. Last, legal issues related to intellectual property and copyrights might pose additional barriers to digital transformation [20,72].

3.1.16. Lack of Action Plan and Institutional Policy

Even for HEIs with a strategic plan, there is difficulty in translating the strategy into an action plan [24,60–66]. Planning is not a simple process and requires time and effort [63].

The usual lack of clear institutional policy linked to the goals of digital transformation indicates that HEIs do not have a clear and complete understanding of how to execute digital transformation [63]. This lack of clarity at the level of senior management with the HEI organisational complexity is reflected to academic and administrative staff, resulting in a lack of clarity for digital transformation goals. In addition, the autonomy of faculties may block actual institutional implementation [20].

3.1.17. Conservative/Bureaucratic Culture

Culture is cited as one main barrier for digital transformation, e.g., in Latin America [38] and Europe [38,68,82]. Cultural barriers are considered difficult to overcome [38,60].

True digital transformation can only be achieved when the whole organisation understands the significance of digital culture and embraces it [21]. Digital transformation is not a technology project but more a people and structure one [38]. The International Association of Universities (IAU) also found cultural change as an important barrier to digital transformation as there is a difference between the pace of technological development and the pace of changes in organisational culture and, consequently, in human behaviour. Organisational culture does not change at the same pace as technology [22].

3.1.18. Narrow View of Return of Investment (ROI)

Higher education institutions usually have difficulties to estimate the return on digital investment [32]. For example, maturity in digital skills progresses slowly and benefits like time and cost savings for faculty through more efficient operations and automation, better enrolment, retention, and on-time graduation, improved student experience, etc., are difficult to quantify [13,14,72].

3.1.19. Legacy Systems and Third-Party Systems

The existence of legacy systems in HEIs is mentioned as another barrier in the literature. Due to inadequate IT and data governance [48], many institutions have a large number of systems and software that overlap and are redundant [48,60]. Their operations create significant challenges for data integration, consistency, reliability, integrity, availability, timeliness and confidentiality [32].

The existence of many external systems, not directly controlled by the HEIs, and requiring different data sets and formats are also cited as barriers to digital transformation. As institutions are not responsible for these systems, they are often forced to manually import/export the required data [13,14].

HEIs, like any organisation, are obliged to report periodically to various internal and external bodies using their different systems for data extraction. Data processing and data formatting in the majority of cases is performed by people completely different from those who made the manual entries in the University's internal systems, which leads to errors affecting data quality and subsequently reporting [13,14]. They then format the extracted data extensively using, e.g., spreadsheet applications, in their effort to homogenise them to be able to extract the necessary results [13,14].

3.1.20. Lack of Coordination between Departments

One of the prerequisites for the successful implementation of digital transformation is cooperation and synergy between the various groups within the HEI environment [77]. Faculties and departments traditionally play an intermediate role within the academic system, integrating the academic disciplines and creating the professional structures. They are in fact "invisible universities" within "visible universities" [83].

However, HEIs are facing many challenges associated with cooperation between departments [77,83], a lack of coordination and communication from the university's leadership to the staff, and a lack of appropriate level of communication between different units and departments [60,67,83] as well as loose management linkages between different university faculties [67]. Reasons for this include work overload, inertia of academic staff and a lack of support from senior management. In order to achieve a real culture change in HEIs, consistent support from the University leadership is extremely essential [67].

3.2. RQ2: How Can Barriers Be Organised into Broader Categories?

During the course of reviewing the literature on digital transformation in HEIs, we noted the lack of a homogeneous classification for barriers [57]. At the same time, we discovered interesting models to use for logical grouping of these barriers.

Digital transformation is fundamentally about change that involves people, processes, strategies, structures, and competitive dynamics [87]. People, processes and technology (PPT) have been broadly acknowledged to be the three components that are crucial to the transformation of organisations. This model was first introduced in [88]. As stand-alone elements, people, processes and technology are essential for the implementation of change in organisations. Attempts have been made to extend this model. The initial model was expanded to include organisational culture [89]. Based on socio-technical theory, two interrelated systems, social and technical, were deemed to be important for organisations. The social system includes structure and people and the technical system includes processes and tasks [90]. Two decades later, the following dimensions were proposed: processes, people, culture and structure [91].

Another classification system for the barriers proposes technology, process, faculty, environment, and administration [20]. "Technology" includes the barriers in accessibility, reliability and complexity of available technologies. "Processes" consist of the barriers identifying and implementing new technologies and then helping staff and students through professional development and support. "Faculty" involves the barriers that staff face in adopting instructional technology such as resistance to chance, effective use of technology by faculty and mindsets and beliefs. "Environment" includes the barriers related to the broader environment, such as pressures from different sources (students, parents, governments and businesses), changes in the business models of HEIs to adapt to market needs, legal issues related to ownership and copyright. "Administration" includes barriers relating to both administrative functions such as finance and information technologies, and leadership. Also, administration includes control, institutional support, compensation and time, and understanding of effort required by faculty to adopt instructional technologies.

The authors in [92] proposed a framework of barriers for Global Social Knowledge Management (GSKM), which they categorised into four broad categories. These categories are organisational and contextual, social, technical, and cultural. This categorisation, although provided in a different barrier framework, allows us to observe how the different research fields complement each other and share common types of barriers, while each has its own particular focus.

Another categorisation posits that the distinction between structural and cultural barriers is important for understanding transformation in public sector organisations [58,93,94]. Structural barriers relate to rules, responsibilities, resources or business processes [58,93,94], funding, technology and skills [58]. Cultural barriers refer to the norms, beliefs and attitudes and expectations within organisations, risk aversion, bureaucratic culture, fear of change and resistance to change [58,93,94].

Digital transformation is a socio-cultural phenomenon, highly dependent on culture and people, as they ultimately ensure that technology can be used as a facilitator and multiplier of impact. The technical system of an organisation (process, people and technology) is most affected by new technologies, while the social system (culture and structure) is less affected by this transformation. The social system is the one with the slowest reaction time: changing the organisational culture and the whole organisation is a longer and more difficult process [94]. Table 1 shows categories of barriers as identified in the literature.

Table 1. Categories of barriers.

Categories	References
Administration	[20]
Competitive dynamics	[87]
Cultural	[58,89,92–95]
Environmental	[20]
Faculty	[20]
Organisational and contextual	[92]
People	[87–90,95]
Process	[20,87–90,95]
Social	[92]
Strategy	[87]
Structural	[58,87,90,93–95]
Tasks	[90]
Technical	[92]
Technology	[20,88,89]

Taking the above into account, we organise the barriers we found in the literature in six broad categories: environmental, strategic, organisational, technological, those related to skills and human resources and, finally, cultural. Table 2 presents the barriers accordingly.

Table 2. Lists and categories of barriers.

Category	Barriers	References
Environmental	Budgetary constrains	[12–14,18,24,26,35,43,45,60–68,71,72,74,82,83]
	Regulatory framework and legal issues	[13,14,20,38,60,67,68,71,72]
Strategic	Lack of strategic planning Lack of holistic vision	[13,14,21,24,32,46,60–66,69,71,72,77,79,82] [13,14,24,32,60–65,78,82,84]
	Lack of action plan and institutional policy	[20,24,60–66]
Organisational	Lack of agility Narrow View of investment Lack of coordination between departments	[1,21,26,32,46,48,60,67,68,79] [13,14,32,72] [60,67,77,83]
Technological	Lack of adequate IT infrastructure	[12–14,20,22,24,38,43,60–67,69,73,77,78,80–82]
	Integration of digital technologies in educational systems	[13,14,18,20,22,24,26,60–67,69,79]
	Security and privacy risks Data fragmentation	[13,14,24,26,28,43,59–66,68,69,81] [13,14,22,28,32,60,69,77,81,86]
	Legacy systems and third-party systems	[13,14,32,48,60]

Table 2. *Cont.*

Category	Barriers	References
People (Skills and Human Resources)	Lack of digital literacy	[13,14,18,20,24,26,28,32,35,48,59–73]
	Lack of leaderships for changes	[20,22,24,26,45,46,48,59–69,71,73,83,84]
	Lack of time due to workload of academic staff	[18,20,24,60–67,69,70]
	Inadequate IT support service	[12,20,24,43,60–66,78,82]
Cultural	Resistance to chance and risk aversion	[12,18,20,24,26,38,45,59–69,72,74–79]
	Attitudes and beliefs	[18,20,24,26,60–67,72,75,78,83,85]
	Conservative/Bureaucratic culture	[21,22,38,60,68,82]

4. Discussion

We organise the discussion in this section by groups of barriers.

4.1. Environmental Barriers

The barriers of this group are related to the external environment, cannot be resolved within an institution and play a crucial role in the way universities operate and perform.

The adoption of digital transformation in HEIs is affected by a lack of funding and budgetary constraints, as well as the regulatory framework and legal issues. The literature shows that one of the most important barriers to the successful implementation of digital transformation in HEIs is a lack of funding. HEIs may not have their own financial resources needed to invest in new technologies, upgrade existing infrastructure or hire qualified staff to manage digital transformation. Without sufficient funding, HEIs may not be able to purchase and maintain the necessary hardware and software and therefore may not be able to use the latest technologies to improve their operations. Additionally, the regulations imposed by funding bodies may limit the scope of digital transformation projects. For instance, budgetary constraints imposed by governments on HEIs may result in a delay in investment in new technologies, or in recruiting the necessary staff.

Another concern is that funding in universities is distributed across many different departments and faculties, which potentially causes competition for resources and makes it difficult to fund cross-departmental digital transformation initiatives. HEIs need to prioritise digital transformation projects based on available budget, which can lead to a slower pace of deployment or a less comprehensive transformation strategy.

The regulatory framework refers to the laws, policies and regulations that govern the functioning of HEIs. The regulatory framework can have a significant impact on the adoption of digital transformation in HEIs. For example, regulations that restrict the use of technology or limit the type of technology that can be used in education can act as barriers to the successful implementation of digital transformation.

Legal issues such as data protection and privacy, intellectual property and copyright can be a challenge for HEIs and can affect digital transformation initiatives. Regulations related to data privacy can make it difficult for universities to collect, store and use student data to inform decision-making processes related to digital transformation. Also, legal restrictions on the use of student data may prevent the use of data analytics and artificial intelligence (AI) technologies to improve learning outcomes. An example in the above is the General Data Protection Regulation (GDPR) in the European Union that requires universities to obtain explicit consent from students before collecting or processing their data, which may limit the scope of data analytics initiatives.

Intellectual property and copyright regulations may make it challenging for universities to make use of digital resources such as online course materials, e-books and educational resources. Copyright laws may restrict the use of certain material or require

universities to pay licensing fees, which can increase costs and limit access to digital resources. Compliance with regulations related to accessibility, security and standards can also act as a barrier to implementing digital transformation in HEIs because compliance with these standards requires additional resources and expertise.

4.2. Strategic Barriers

This group of barriers includes issues linked to the internal policies of universities and their governing bodies. The findings reveal that digital transformation is a complex and multifaceted process that can affect all functions of a university and requires careful planning and strategic thinking. It seems that the majority of HEI administrations tend to prioritise immediate issues and problems and postpone critical decisions to strategic issues of a long-term nature.

One of the most frequently cited barriers is the lack of holistic strategic planning for digital transformation in HEIs as well as the development of a broader range of initiatives aimed at improving different aspects of academic life, from teaching and learning to research and administration. A lack of holistic vision is equally important as well as the absence of a clear action plan and institutional policy for the implementation of digital transformation. Creating a clear and strong vision that highlights the benefits of digital transformation and includes students, faculty and staff is particularly important given that digital transformation is a collaborative effort, and it is important to engage all stakeholders in the process. Listening to their concerns and ideas can give impetus to building a vision for digital transformation and ensure that it meets the needs of all stakeholders. A university's vertical structure can hamper aligning efforts, achieving a coherent approach to digital transformation and creating a common vision for digital transformation because different departments may have different priorities and goals.

An institutional policy that is open to establishing partnerships with other universities, industry partners and technology providers can help overcome this group of barriers to embracing digital transformation. These partnerships can provide access to expertise, resources and funding that would otherwise be difficult to obtain. Also, setting key performance indicators for success and prioritising targets can help to ensure that the initiatives are on track and progress is being made.

4.3. Organisational Barriers

The findings of the extant literature, in this group, reveal that agility is vital to the successful implementation of digital transformation in HEIs, allowing them to embrace new opportunities and stay ahead in an ever-changing digital landscape. The fast pace of both societal and technological change and the constantly changing needs of students and faculty require universities to be flexible in adapting quickly and effectively in response to changing internal and external conditions. An agile university can quickly test and adopt new processes and systems, more easily use disruptive technologies to transform the way it operates and ultimately be able to meet the evolving needs of its stakeholders. Agility also allows universities to better respond to external factors such as competition, changing regulations and changes in demand for different programmes and courses.

The vertical structure of universities is a barrier to efficient functioning as it leads to silos, with different departments and faculties operating independently of each other. Moreover, it can further result in isolation and fragmentation, making it difficult to coordinate and implement digital transformation initiatives that require cross-functional collaboration and communication. Vertical structures can also create resistance to change, with faculty and staff often entrenched in their roles and resistant to new technologies and processes that can disrupt established ways of working. Furthermore, the hierarchical set-up of HEIs leads to slow and complex decision-making processes, as decisions are made at many levels of the hierarchy, increasing bureaucracy. As a result, the implementation of digital transformation initiatives that require rapid decision-making and the ability to respond quickly to changing circumstances is hampered.

Additionally, a narrow view of investment can act as a barrier to the digital transformation of HEIs, as it can result in underinvestment in necessary infrastructure and technologies required for the transition, as well as to late adoption of necessary changes in curricula. Since digital transformation is a long-term process, without immediate tangible results, many HEIs may be reluctant to invest in areas where benefits are not immediately visible or may take time to materialise. Moreover, they may be more focused on achieving short-term economic goals or maintaining the status quo. Unfortunately, without sufficient investment, HEIs may struggle to keep pace with changing needs and fall behind competitors investing in digital transformation. This can also result in a vicious circle where universities continue to lag behind, making it even more difficult to catch up.

4.4. Technological Barriers

The barriers of this group can affect the digital transformation of HEIs, limiting their ability to embrace and effectively use digital technologies. Thus, barriers such as a lack of adequate IT infrastructure, IT security risks and standards, legacy and third-party systems, unreliable data quality due to data fragmentation and the integration of digital technologies are very crucial to address so that the organisation can operate seamlessly; all services are now, to a large extent, enabled by technology.

An unreliable network infrastructure can lead to slow and unreliable internet connectivity, making it difficult for students and faculty to access digital learning resources and tools. Inadequate bandwidth, storage capacity and processing power can slow down the adoption of digital technologies and limit their effectiveness. Furthermore, a lack of use of appropriate tools, including hardware and software, and non-application of new digital technologies, such as cloud computing, big data analytics and the Internet of Things (IoT), limits the scope for effective use of new technologies.

Cybersecurity risks, such as data breaches, identity theft and phishing attacks, can discourage HEIs from implementing digital technologies. Compliance with IT security standards and regulations can also be a significant issue, especially when it comes to sensitive student and faculty information. Institutions must ensure that their digital infrastructure meets the required IT security standards to safeguard sensitive data and prevent unauthorised access.

Universities operate many legacy systems that are outdated and not compatible with newer technologies, which renders it difficult to incorporate new technologies, leading to inefficient functions, complex and time-consuming processes and ultimately reduced productivity. In addition, HEIs use third-party systems and software for managing specific functions, such as finance or library management, which can create compatibility problems and security risks, and inconsistencies with the university's digital infrastructure, making integration difficult and time-consuming.

Data fragmentation refers to the dispersion of data across multiple systems, databases and applications. This can be a significant barrier as data are often collected and stored in different formats and in different systems, including student information systems, and learning, research and financial management systems, and make it harder to have a comprehensive view of the data, leading to inconsistencies, redundancies and errors that can compromise data accuracy and reliability.

Data diversity refers to the variety of data types, sources and data structures. In HEIs, data can come from a variety of sources, such as student records, course evaluations, research results, financial transactions, and all kinds of reports. These different types of data may be stored in different formats and structures, making it difficult to combine and analyse them effectively. This diversity can also make it difficult to establish standardised data definitions and quality controls, leading to inconsistencies and errors in the data.

Data fragmentation and diversity are challenges for HEIs attempting to undergo digital transformation. Universities rely on data to make informed decisions about student learning outcomes, research performance, and financial management. Unreliability of data quality can lead to poor decisions, inefficiencies and missed opportunities. In addition,

data fragmentation and diversity can make it problematic to apply digital solutions that require comprehensive and accurate data access, such as analytics, artificial intelligence and machine learning. Further, fragmented data can both hamper staff and faculty access to data they need and also inhibit effective analysis. Risks for data breaches increase as it is more difficult to secure data that is scattered across different systems and departments.

4.5. Barriers Related to People (Skills and Human Resources)

The barriers in this group are related to people, who have a key role to play in accelerating or hindering digital transformation in HEIs. For a smooth transition to the new, HEIs need staff with new technical skills such as programming, data analysis and software development, as well as soft skills such as communication, teamwork and adaptability. Universities have staff with traditional skills, not necessarily aligned with the requirements of digital transformation. Thus, universities need to find ways to attract and retain talent, provide continuous professional development and create a culture of collaboration. At the same time, however, universities may struggle to attract and retain staff with the necessary skills, especially in highly competitive talent markets, as their financial resources are usually limited.

Another vital barrier is the lack of leadership for change. Digital transformation requires strong leadership and governance to ensure initiatives are aligned with the university's overall strategic goals. This includes setting clear objectives, establishing accountability, and providing resources and support for digital initiatives. University leadership plays a critical role in creating an environment conducive to digital transformation. However, leaders lacking the necessary skills or vision can lead to a lack of acceptance by faculty and staff and a lack of resources to support digital transformation initiatives.

Academic staff are often overloaded with teaching, research and administrative tasks, leaving them little time to engage in digital transformation initiatives. Digital transformation initiatives require significant time and resources, including planning, implementation and ongoing support. If universities do not provide incentives and resources to encourage faculty, or if faculty do not have time to devote to these initiatives, they will not fully participate in digital transformation efforts.

Inadequate IT support is another major barrier to digital transformation in HEIs. Universities must provide adequate IT support to students, faculty and staff to avoid technical difficulties, delays and eventually enable them to successfully implement digital transformation initiatives. The literature shows that a lack of appropriate IT staff and availability of necessary resources are causes for inadequate support for digital transformation.

4.6. Cultural Barriers

The cultural barriers address the issue of resistance to change either as an individual phenomenon, i.e., the resistance of people to change, or as a systemic phenomenon in light of the incremental and pervasive change triggered by digital transformation. From a systemic point of view, systems tend to aim for stability and internal equilibrium, which, by default, renders them resistant to change. Since the world is continuously changing, systems need to cope with change.

The inherent reluctance to abandon a comfort zone and try to find new ways of working is a major barrier to the success of digital transformation. Resistance to change at the individual level is found both among faculty and staff.

The HEI shift from old to digital is hampered by the "dominant logic". Dominant logic can be viewed as a two-tiered resistance to change. At the individual level, the prevailing conservative, bureaucratic and risk-averse culture prevents the implementation of digital transformation. At the organisational level, cultural barriers are associated with the changes in organisational values. HEIs are also affected by the resistance to change in mindsets and behaviours, not only on the part of people as individuals but also as an entity. The organisational culture should find ways to embrace the new relationship while retaining the effectiveness of the existing system until the new one is ready to fully take over. In HEIs,

we observe a risk-averse culture, making it challenging to implement novel approaches or to encourage trial and failure.

Also in the literature, inertia refers to the tendency to continue 'business as usual' and resistance to change. Inertia is another serious barrier to seizing opportunities in implementing digital transformation. People may be at ease with their current practices and not feel the need for change. This comfort zone can lead to a lack of motivation to change and adopt new technologies. Faculty may be comfortable with traditional teaching and research methods and staff with existing processes, making it difficult to adopt new technologies and digital tools.

Finally, HEIs usually have a conservative and bureaucratic culture that prioritises stability and tradition over change. This culture leads to resistance to digital transformation initiatives and a lack of support for reform and adaptation.

5. Conclusions, Limitations and Future Work

This paper identifies and analyses the barriers to the digital transformation of HEIs and organises them into broader categories. These categories can be used as the basis for formulating digital transformation strategies.

Twenty distinct barriers were found through the systematic literature review. The most common barriers found are a lack of digital literacy, resistance to change and risk aversion, a lack of adequate IT infrastructure and budgetary constraints.

It is worth noting that some barriers have evolved or diminished with advances in time and technology. Whereas in the past barriers were related to inadequate IT infrastructure and limited access to technology, today, increased reliance on digital technologies, privacy and data security have become more important. It was also observed that resistance to change is a long-standing barrier. In the past, resistance was due to fear of technology or concerns about job displacement, whereas today it stems from the need to adapt pedagogical approaches, redesign the curriculum, address concerns about faculty workload, and manage cultural changes related to technology-based teaching and learning.

Subsequently, the barriers were organised into six broader categories: (1) environment-related, (2) strategy-related, (3) organisation-related, (4) technology-related, (5) people-related, and (6) culture-related. The barriers of each group affect different dimensions of the organisation and require different actions by university authorities.

By combining the comprehensive understanding of the barriers, we facilitate strategies for overcoming them. This study encourages deeper exploration of the barriers and enables the design and implementation of digital transformation in HEIs. Further research is needed to check how these barriers operate in different legislative environments in order to identify similarities and differences. Moreover, it would be interesting to examine the barriers that exist in different public sector bodies, as universities in the broad sense are public sector bodies since their regulatory framework is set by governments and HEIs are often funded by governments. It might also be useful to explore the barriers when implementing digital transformation in enterprises exposed to strong competition. We could then identify both common barriers and differences compared to HEIs.

Finally, it should be mentioned that the barriers were only derived from our literature review. The rather limited number of studies identified may indicate the absence of enough research on the implementation of digital transformation in HEIs.

Therefore, we plan to validate the findings as well as the significance of each barrier through questionnaires and interviews with stakeholders. Based on the validated set of barriers, we intend to identify existing strategies and successful digital transformation implementation practices. This would help HEI administrations to promote more holistic strategic changes and involve as many stakeholders as possible in the change processes.

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