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Defining the Meaning and Scope of Digital Transformation in Higher Education Institutions

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Abstract: Digital transformation has emerged as a pervasive force in today's rapidly evolving world, touching almost every sector and industry. In the higher education sector, in which education, research, and knowledge dissemination hold paramount significance for society, the notion of digital transformation per se becomes particularly important. This paper focuses specifically on higher education, acknowledging that it exists in a broader environment. In this work, qualitative methods were applied to explore the meaning and scope of digital transformation in higher education institutions. The systematic literature review formed the basis for in-depth interviews with experts in the discipline to explore the meaning and scope of digital transformation in higher education institutions. Then, for the purpose of preparing the case study, the concepts that emerged from the systematic literature review and interviews with experts were grouped together through a keyword-based pattern. Lastly, a case study was conducted at a Greek university with the aim of better understanding the way in which university members of a particular higher education institution perceive the meaning and scope of digital transformation. Our analysis provides valuable insights into higher education institutions for decision-makers and those involved in digital transformation initiatives, offering a comprehensive definition of digital transformation in higher education institutions. Finally, this paper can also serve as a basis for researchers who are interested in defining the meaning and scope of digital transformation in their own research fields.

Keywords: digital transformation; university; higher education

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1. Introduction

Digital transformation has become an integral part of modern society, profoundly impacting organisations in various sectors. The importance of this issue arises from the extraordinary speed at which digital technologies have diffused all aspects of our lives. A survey conducted by the World Economic Forum (World Economic Forum 2023) highlighted that 87% of companies believe that digital transformation will disrupt their industries, but only half say they are prepared.

At a time of massive social, economic, technological, and demographic changes in society (Brown et al. 2020), higher education institutions, like other organisations, are at a crossroads (Alenezi 2021; Branch et al. 2020), operating in an environment subject to unpredictable changes that they need to cope with, as society expects HEIs to fulfil multiple social and political goals. Furthermore, 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.

The importance of digital transformation for higher education institutions (HEIs) is being strongly debated. As a result of digital transformation and the use of new technologies, both academics and their institutions are changing the ways in which they operate at a faster pace than expected (Kerroum et al. 2020). While some argue for the paramount

importance of digital transformation, others raise questions about it. On the one hand, 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 (Alenezi 2021; Branch et al. 2020). On the other hand, the incessant use of digital technologies in education is considered not only unsustainable but also potentially damaging, and there is a need for a more sustainable and ethical approach to educational technology (Selwyn 2022).

An important note is that while higher education does not operate in a vacuum, it is only higher education that is considered in this study. HEIs are by nature complex organisations, with a unique nature and purpose (Jensen 2019), with many specific features that differentiate them from other organisations, such as teaching, pedagogy, curriculum, and research (Alenezi 2021; Benavides et al. 2020). The notion of digital transformation per se is of significant importance for HEIs seeking to adapt, innovate, and thrive in this evolving technology-led landscape, and moreover, to make HEIs resilient and adaptable in the face of a range of increasingly difficult challenges (Brown et al. 2020).

Digital transformation represents a fundamental shift in the way HEIs operate, deliver education, and engage with students, staff, and stakeholders. It encompasses a wide range of technological developments, strategic initiatives, and cultural changes aimed at harnessing the power of digital technologies to improve the overall effectiveness of institutions and enhance the learning experience. It is worth noting that (Flavin 2017) highlights the deep-rooted resistance of educational institutions to innovation, suggesting a more nuanced understanding of these challenges. Digital transformation is not just about curriculum, learning delivery, student support, and research. It is also about the back office, the operating model, and, fundamentally, a set of key organisational capabilities: flexibility, agility, purposefulness, and evidence-led decision making (Parker 2020).

1.1. Structure of the Paper

The paper is organised as follows. In this Section, after the introduction, we present the research gap and set out our contribution and the research question. In Section 2, the research methodology is described. In Section 3, we present our results from the systematic literature review, experts' interviews, and case study. A synthesis and discussion of the results appear in Section 4. Finally, in Section 5, we present the conclusion, limitations, and future work.

1.2. Research Gap

Although digital transformation in higher education is an emerging research area, the exact scope and meaning of digital transformation in higher education institutions are still not adequately defined. "Digital transformation" in universities has become the subject of much hype and excitement, and the term is often over- and mis-used. With our work, we try to provide rigour and clarity to the on-going discussion.

1.3. Contribution and Research Question

We tried to fill this gap initially by understanding the meaning and scope of digital transformation in higher education institutions, and, subsequently, to better illustrate this, by providing a comprehensive definition of digital transformation in HEIs through the use of qualitative research methods. Therefore, we formulated the following research question: *What are the meaning and scope of digital transformation in higher education institutions?*

2. Materials and Methods

To achieve the goal of this study and answer our research question, we first studied the relevant literature, then we organised and conducted in-depth, semi-structured, and exploratory interviews with field experts, and, finally, we verified the results from the previous phases through a case study.

The purpose of the systematic literature review was to identify the meaning and scope of digital transformation in HEIs. Subsequently, we carried out interviews with experts to enrich, extend, and improve our understanding of this subject (Lopez-Fernandez and Molina-Azorin 2011). Finally, by conducting a case study at a Greek public university, we gained better practical knowledge and verified our findings from the literature and the interviews.

The complementarity and credibility of the interview-based qualitative research was enhanced through the application of site triangulation, as suggested by (Shenton 2004). In our study, site triangulation was accomplished by involving informants from multiple organisations from different continents. This approach helped mitigate the impact of specific local factors unique to a single institution. When consistent findings emerge across different sites, our qualitative findings gain greater credibility. To ensure diversity, we sampled a variety of experts from various organisations, as stated in Section 2.2. This practice aligns with Dervin's concept of "circling reality", which emphasises the need for multiple perspectives to form a more comprehensive and stable understanding of "reality" based on a wide range of observations across different points in time and space (Dervin 1983). By applying site triangulation, we gained a richer and more detailed understanding of the domain, allowing us to provide a more inclusive, structured, and elaborated definition of digital transformation in HEIs. In Figure 1, the process of the following research methods is illustrated.

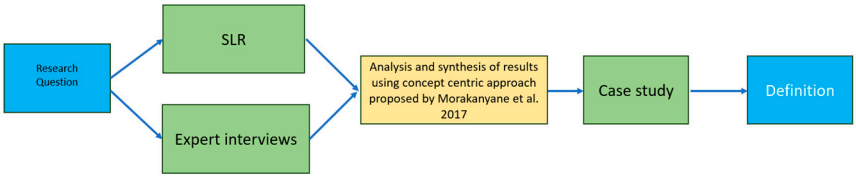

Figure 1. Research method process.

2.1. Systematic Literature Review

The method applied was a systematic literature review (Webster and Watson 2002; Kitchenham 2007). A systematic literature review (SLR) is a research approach for finding, evaluating, explaining, and synthesising the extant literature created by scholars, researchers, and practitioners (Fink 2019). An SLR is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically evaluate the relevant research and collect and analyse data from the studies that are included in the review (Moher et al. 2009). Our work used an SLR as a major component and step, as depicted in Figure 1 and elaborated in Figure 2. As mentioned in (Lacey et al. 2011), the key activities that differentiate an SLR from a narrative literature review are as follows: defining a research question, designing the plan, searching for literature, applying exclusion and inclusion criteria, applying quality assessment, and synthesising the findings relevant to the research question. We used the protocol described in (Kitchenham 2007), which consists of five phases: (1) formulating the research questions, (2) the research process, (3) synthesis, (4) analysis, and (5) evaluation.

Initially, the research question was established: *What is the meaning and scope of digital transformation in higher education institutions?*

Once the research question was set, we started by applying the PRISMA flow diagram (Moher et al. 2009) for the study selection phase. In Figure 2, we present the number of studies identified per phase.

The relevant studies were retrieved from the scientific databases Web of Science and Scopus. We chose these databases because they cover a wide range of academic disciplines and publications from many countries and languages and provide a comprehensive and reliable source of literature for research purposes. These databases 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 for the tracking of articles or author citations, which helps to identify other relevant studies.

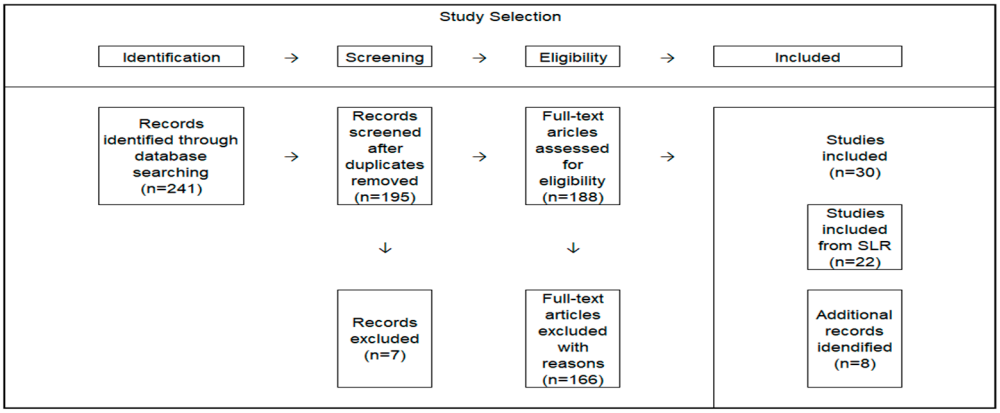

Figure 2. PRISMA process applied for study selection, adapted by (Moher et al. 2009).

For the search, we used string construction, Boolean operators, as well as AND and OR to integrate the selected variables (Kitchenham 2007). For both databases, the query followed was ("digital transformation") AND ("university" OR "higher education"). Searches were performed in February 2023, maintaining the above-mentioned structure. The search was conducted among English sources and covered the period up to the end of 2022. In both databases, we searched the titles. The search yielded 241 studies: 190 articles in the Scopus database and 51 in the Web of Science database. We included articles, conference proceedings, and books.

We then proceeded to check the studies retrieved from the previous step after we removed 46 duplicates, using MS Excel 365 and Mendeley Desktop (version 1.19.8). All titles, abstracts, and keywords were read afterwards. We removed 7 studies that were not fully available, and 188 studies remained from this phase.

Subsequently, we filtered the 188 studies retrieved from the screening process by reviewing the full texts. The papers clearly relate to and discuss the meaning and scope of digital transformation in HEIs. At this stage, we applied the inclusion and exclusion criteria. A total of 188 studies were submitted to check the relevance to the research question.

The criteria chosen to ensure the relevance and quality of the articles were as follows:

1. Papers should relate to the meaning and scope of digital transformation in HEIs;
2. Papers should have the meaning and scope of digital transformation in HEIs at the centres of their analyses.

The exclusion criterion set aimed to exclude studies that did not focus specifically on the meaning and scope of digital transformation in HEIs but referred to them only in their introductions or backgrounds and not in their results, or studies that measured something other than the meaning and scope of digital transformation in HEIs. We ended up with 22 articles that addressed the above criteria.

By applying a Forward and Backward Citation Search, we identified and included another 2 articles. Furthermore, we included 6 papers from the grey literature, as we found them particularly interesting and relevant to our work. Finally, 30 studies were included in-scope for our research.

We present the articles chronologically (Figure 3) and according to the types of documents (Figure 4).

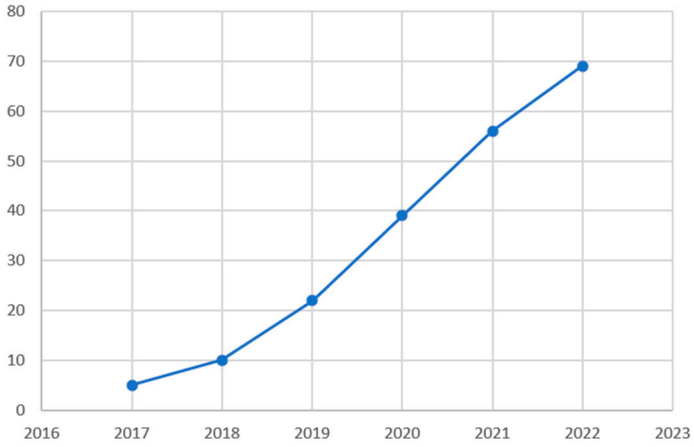

Figure 3. Timeline of research articles on digital transformation in HEIs.

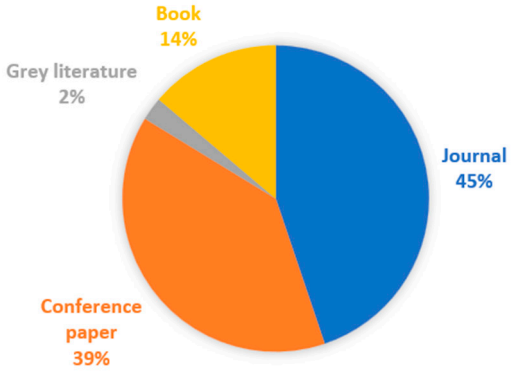

Figure 4. Distribution of research articles by types of documents.

2.2. Interviews

After concluding the systematic literature review, the research continued by conducting in-depth, semi-structured, and exploratory interviews with purposive samples (Ritchie et al. 2013). The use of interviews with domain experts was chosen to achieve complementarity (Lopez-Fernandez and Molina-Azorin 2011).

The interview methodology was designed in accordance with the protocol described by (St. John et al. 2014; Young et al. 2018). It was structured into three steps, as follows:

1. The *initial design*, which included the identification of the research question, the design of the research methods, and the formulation of the interviews questions;
2. The *data gathering*, which included the piloting/refinement of the interviews, an ethical review, sampling, and undertaking interviews;
3. The *analysis and synthesis*, which included the results obtained from the expert interviews.

In the *initial design*, the research question, *"What are the meaning and scope of digital transformation in HEIs?"*, formed the basis for the expert interviews. The interviews with experts were conducted to help us define the meaning and scope of digital transformation in HEIs. We applied a qualitative approach, using semi-structured and in-depth exploratory interviews with experts from academia not only in order to validate our findings, but also, more importantly, to shape and deepen our comprehension of HEI digital transformation in collaboration with the experts. The interview questions were phrased in an open-ended manner. The following questions were posed to the experts for discussion:

1. *What are the special characteristics of digital transformation in HEIs compared to other private or public organisations?*
2. *How would you imagine a "digitally transformed university" 10 years from now?*

In step two (*data gathering*), the entire process was piloted with one expert to test the length, appropriateness of the language, and potential sources of bias (e.g., leading questions). We used the same video conference platform for the pilot and the interviews. At the beginning of each interview, the interviewee's consent was sought. To ensure complete coverage of the population of interest, we chose purposive and goal-oriented sampling. To ensure accuracy and rigour, the sample selected was determined by its ability to represent prominent characteristics and traits relevant to the research (Rashidi et al. 2014). For the purposes of this research, we decided to interview profiles demonstrating a dual characteristic: profound professional connection with their universities; deep expertise in digital transformation. We chose university professors who are distinguished scholars in the field of digital government and digital transformation in the public sector. The idea for this profiling was to involve interviewees with a thorough understanding and deep domain (HEI) experience and, at the same time, who are world-class experts in digital transformation. To identify the interviewees, we used the Digital Government Reference Library (DGRL) (DGRL v16.6) (Scholl 2022). The University of Washington, since 2005, has maintained this reference library with academic literature on digital government. The interviewee sample was selected from the top 25 digital government scholars based on this library (Scholl 2022).

Out of the ten professors contacted, eight agreed to be interviewed. Their names and affiliations appear in Appendix A. Their universities are located in Argentina, Belgium, Canada, Greece, Poland, the Netherlands, and the USA. The interviews were conducted in June 2023, with an average duration of one hour. They were recorded with the consent of the experts to ensure the maximum quality of the data analysis. Interview transcripts were stored on a secure university file server.

2.3. Analysis and Synthesis of Results from Systematic Literature Review and Experts' Interviews

During this stage, by applying the grounded theory (Glaser and Strauss 2017), we first proceeded to codify and analyse the results found in the systematic literature review and expert interviews by adopting the concept-centric-matrix approach (Morakanyane et al. 2017). Once the analysis was completed, we proceeded to jointly synthesise the results obtained from both methods. This synthesis formed the basis for organising and conducting our case study.

2.4. Case Study

The final phase of our research was focused on a specific HEI to confirm or disconfirm the findings. The case study methodology allows for a deeper understanding of a particular social phenomenon (Merriam 1998; Rodríguez-Sánchez et al. 2020) and aims to understand, solve, or improve a real-world problem (Rodríguez-Sánchez et al. 2020). The use of a case study was deemed appropriate for our research, as it involves intensive analysis to identify issues and generate insights (Chapleo and Simms 2010), the collection of data, and the achievement of the research objectives (Yin 2000; Díaz-Garcia et al. 2023).

A properly selected qualitative single case study on digital transformation should support the relationship between the unique and the general, which is "the most discussed issue of all" in case studies (Tight 2017). We selected International Hellenic University (IHU) in Greece as our single case study.

The main reason for this was because all the research team members are staff of the institution and have access to key individuals and information. Our familiarity with the social environment of the university allows us to have insights into what is original and unique at IHU.

Moreover, IHU is the result of a merger of four previous institutions with a very large geographical spread with eight campuses. After the merger in 2019, IHU became one of the largest universities in Greece. IHU has put under one roof different regulatory frameworks, different structures, different academic and administrative functions, and different cultures.

We believe that this diversity and complexity gives IHU qualitative characteristics that makes it an interesting case for studying digital transformation.

To collect the needed information, we decided to conduct a workshop with university staff members. Representatives of the main internal stakeholders (i.e., the governance body, academic staff, and administrative and IT staff) were selected. The criteria for the selection of the individuals of each stakeholder group were their availability and their willingness to participate in our research. The overall case study methodology is presented in Figure 5.

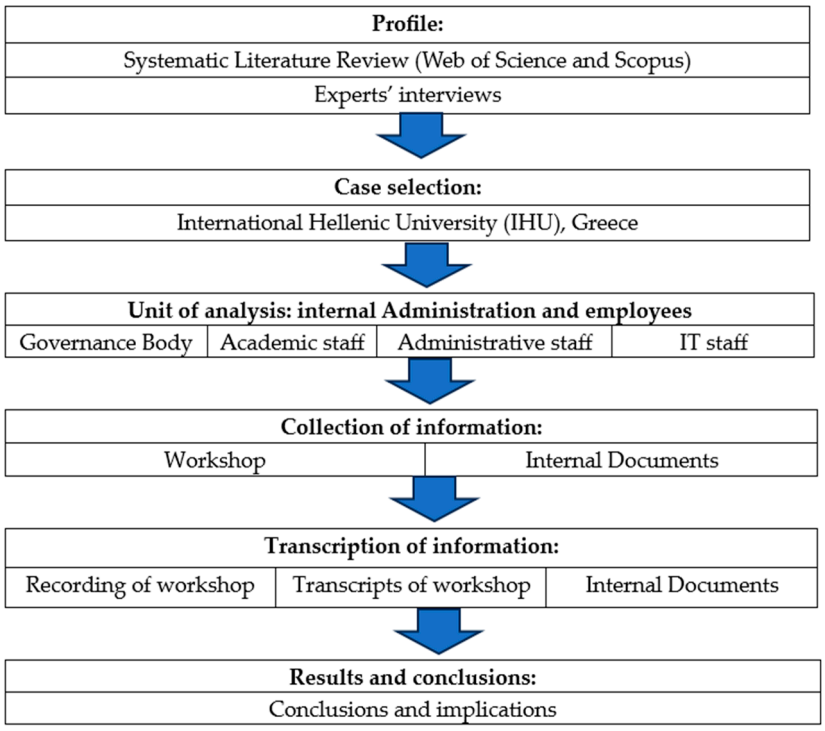

Figure 5. Stages of case study.

3. Results

In this Section, in order to address the research question, we present the results obtained from the systematic literature review. Furthermore, we present the results of the expert interviews. Subsequently, for the purpose of conducting the case study, we attempt to identify and consolidate the concepts that emerged from the systematic literature review and expert interviews. Finally, the results derived from the case study are presented.

3.1. Meaning and Scope of Digital Transformation: Systematic Literature Review

We present below the definitions of digital transformation in HEIs that were found from the systematic literature review (Table 1).

Table 1. Definitions of digital transformation in the context of higher education.

Reference	Definition of Digital Transformation in Higher Education Institutions
(von der Heyde 2022)	Digital transformation is 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 universities.
(Serna Gómez et al. 2021)	Digital transformation for HEIs is 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. Digital transformation is mainly about changing the existing organisational culture.

Table 1. *Cont.*

Reference	Definition of Digital Transformation in Higher Education Institutions
(Iosad 2020)	Digital transformation is a series of deep and coordinated actions on culture, workforce and technology that enable new educational and operational models and transform an institution's operations, strategic directions and value proposition.
(Simonette et al. 2021)	Digital transformation of HEIs is a holistic academic, organisational and structural innovation that transcends new technologies in learning and teaching. It changes the institution itself, the academic culture, impact individuals and society.
(Castillo et al. 2021)	Digital transformation refers to the process of optimizing, and transforming the institution's strategies, activities, operations, decisions, and value proposition through the adoption of digital tools.
(Branch et al. 2020)	Digital transformation is the result of an organisational change in which people, processes and business models can understand technologies as tools that create value between customers and partners.
(Gafurov et al. 2020)	Digital transformation is a series of technological, managerial and organisational changes. It not only involves the use of the latest technologies, but also gives opportunities to deliver new services by creating new connections between people and places.
(Rodríguez-Abitia and Bribiesca-Correa 2021)	Digital transformation is seen as an evolutionary process through which IT becomes a fundamental element of everyday life, affecting all dimensions concerning both people and the organisation itself.
(Wilms et al. 2017; Aditya et al. 2022)	Digital transformation must be understood as a profound and radical process that directs businesses and organisations in new directions and brings them to completely different level of effectiveness.
(Al-Ali and Marks 2022)	Digital transformation is not only the transformation of tools, technologies and processes but it is transformation of entire business model, changing the way, a business operates and interacts internally and with external world.
(Valdés et al. 2021)	Digital transformation can be understood as simple evolutionary processes that allow business models, operational processes, and experiences to be rapidly and efficiently by institutions and agents.
(Maltese 2018)	Digital transformation goes beyond the mere adoption of new technologies and makes it possible to provide services, supply goods, and live experiences, as well as the processing and distribution large amounts of content creating new connections between people, places, and things.
(Rof et al. 2020)	Digital transformation is an evolutionary process, affecting and transforming all the main areas of activity (teaching, research and transfer of research, administration). Digital transformation is not only about the adoption of new digital tools and equipment, but it is also about the transformation and automation of all the processes, thus increasing their effectiveness and eliminating any physical processes and barriers through the increased connectivity and digitalisation of everything.
(Alenezi 2021)	Digital transformation refers to disruptive and holistic changes in the organisation by integrating digital technologies.
(Safiullin et al. 2019)	Digital Transformation for Universities is a process to create a unique university information system that will provide unified data on students, staff, faculty and researchers.
(Faria and Nóvoa 2017)	Digital transformation goes far beyond the implementation of processes, involving an innovative use of new technologies as a way of promoting new services, redefining business models and innovative interactions with its users.
(Goulart et al. 2022)	Digital transformation is leading to changes in higher education, not only in terms of teaching techniques but also in the new skills to be taught, incorporating technical, managerial and non-cognitive skills not previously considered necessary.
(Benavides et al. 2020)	Digital transformation of HEIs is a comprehensive and holistic process aimed at their organisational transformation and the integration of their established pathways.
(Parker 2020)	Digital transformation is about the curriculum, learning delivery, student support and research, the back office, the operating model, the technology and, fundamentally, the sum of capabilities that reside in the organisation: to be flexible, agile, purposeful and evidence-led.
(Grosseck et al. 2020)	Digital transformation is an organisational change at the intersection of technology, business and people through the development of a digital way of thinking by adopting a new mindset.

3.2. Meaning and Scope from Experts' Perspectives

To trigger our discussion with the experts, the following definition of digital transformation in HEIs was used (von der Heyde 2022): "Digital transformation is 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 universities". This definition was proposed by Educause, a USA-based association with a mission to promote higher education through the use of information technology. Educause's membership includes more than 2300 colleges, universities, and educational organisations and 300 companies, with 16,500 active members.

We summarise below the experts' responses collected to the question: *What are the special characteristics of digital transformation in HEIs compared to other private or public organisations?*:

The first issue that was emphatically stressed is that higher education is completely different from other "*industries*". HEIs have unique objectives and goals and very different means compared to other industries. HEIs have a dual, interrelated mission (i.e., education and research), which are both important, critical, and necessary for societal progress and development. The delivered value also has unique characteristics. Value is mostly delivered when students graduate, and it is after some years when they work and contribute to society. One expert even questioned the applicability of the term "*business model*" in HEIs and proposed the alternative use of *"educational model"*, as the purpose of the public university is not profit but a better society and better students.

The second issue mentioned by the experts was the status of HEIs. They can be either private, public, or non-profit entities. All the experts came from public universities, and the distinction between private and public higher education institutions was noticed. There are differences in terms of their objectives, their missions, their legal statuses, the degrees of freedom in their decisions, and, finally, their approaches to digital transformation. One expert argued that "*private HEIs operate more flexible like corporations*", while public HEIs are much more strictly regulated. It was mentioned that public universities are funded by public money, and they must be accountable for how they spend public money and for what purpose, as well as for the quality of the education provided.

Another point highlighted was how the age (new or old), location (central or regional), and size (large, medium, or small) of an HEI can affect its ability to adapt to the demands of digital transformation. It was reported that usually the inertia observed in older universities with centuries of existence is not observed in newer universities. Furthermore, in older universities, bureaucracy is deeply rooted, and often administrative issues take priority over academic ones, while "*bureaucratic and long-standing structures are very noticeable*". Finally, it was mentioned that, in new and small universities, "*where everyone knows each other*", there is a greater level of trust, and digital novelties are easier to introduce.

For some universities located in remote areas with no easy access, digital transformation offers opportunities for reaching audiences that would be impossible to reach under previous conditions. In many regional universities, the operations of which are spread over dispersed geographic areas, the administrations could not work without the use of digital tools. One expert stressed the fact that digital communication and tools open up new channels for HEIs, especially for universities that are far from big cities, and enable HEIs to offer new postgraduate degrees, educational programmes, short training courses, and seminars that they could never have offered without the benefits of digital transformation.

It was mentioned that digital transformation in HEIs is not static and "*it is about some second-degree changes and clarity around what those changes are*" and "*requires structural changes in the organisation*". One expert pointed out that digital transformation is linked to radical change and doing things completely differently. Digital transformation implies significant changes in both internal operations and communication with the external environment. It involves the digital transformation of administrative processes and teaching and learning processes, the updating of educational programmes related to digital transformation, which cross different disciplines, departments, and faculties of the university, and the promotion of interdisciplinary research on digital transformation.

Moreover, there was an emphasis on the role of technology with an impact not only at the operational but also at the strategic level. It was pointed out by one expert that the

strategic use of technology addresses at least four areas, namely, the student experience, teaching and learning, research, and organisational excellence.

Finally, it was pointed out by all the experts that the age group to be educated has broadened, with demand coming from people from practically all age groups. HEIs have increased their offerings for lifelong learning programmes, and this is expected to intensify in the next decades, as the speed of new knowledge and expertise creation is accelerating. Education has now become relevant to all generations.

After covering the first question, we continued with the next one: *How would you imagine a "digitally transformed university" 10 years from now?*

Several significant issues for the future of higher education emerged during the interviews. The experts referred to the evolving nature of higher education in light of both digital technology and emerging trends. Briefly, the experts sketched a picture of a future landscape that focuses on quality, adaptability, and lifelong learning, facilitated by the integration of digital technologies and the proliferation of interdisciplinary approaches.

HEIs are expected to become more adaptable and responsive to external needs and conditions. The COVID-19 pandemic served as a catalyst for higher education institutions to embrace flexibility and resilience in their operations. The lesson learned from COVID-19 can be further capitalised and certainly underlines the importance of being prepared for disruptions and unforeseen challenges.

All the experts highlighted that the number of lifelong learning courses will significantly increase. One expert noted that "*the master's degree goes down, the bachelor's degree goes down, the PhD degree goes down, and we need to teach new quality competences to the students*". The establishment of lifelong communities around continuous education is based on the realisation that education does not end with graduation. The concept of a lifelong association with the university, where graduates return for updates and upskilling, demonstrates a commitment to lifelong learning. One expert mentioned that alumni engagement and support are seen as valuable for both individual and social development and pointed out that there is huge space for universities to develop continuous education. In line with this, another expert mentioned that universities need to develop really tailored actions and programmes. By leveraging cutting-edge technologies, universities can potentially bridge gaps in access to education, ensuring that a broader and more diverse range of students can benefit and access educational services. Increased flexibility in education, with the potential for students to create their own programs, in a radical personalisation mode, is a response to the growing demand for personalised and tailored learning experiences. To keep up with this new demand, academic staff need to continually update their knowledge and skills, ensuring that they remain relevant in a rapidly changing world. Relevance can be seen from both content (i.e., domain scientific knowledge) and processes (i.e., educational methodologies and tools—perspectives).

The acknowledgment that technology plays a pivotal role in delivering education and creating blended portfolios is in line with the ongoing digital transformation in education. The experts stressed the importance of using digital technology not just as another channel for education but also as a means of enhancing pedagogical principles, and they emphasised that technology should be seen as a key enabler for the transformation. One expert pointed out that, to accomplish this, the university strengthened with infrastructure and tools must focus on the quality of education, research, and social outreach.

The importance of and need for interdisciplinary collaboration in solving complex real-world problems in line with the evolving needs of society was also recognized. One expert commented that "*I would imagine a university in which we are blurring the discipline areas in which we are preparing professionals for understanding what is possible with digital in the different areas*".

Finally, the quality assurance of HEIs was highlighted as a critical factor, given the competitive international environment. Quality is now measured not only in terms of research output but also in terms of the preparedness of graduates to become effective contributors to society. To this end, the importance of collaboration with other universities was stressed,

and the possibility for students to take courses at different institutions reflects the increasing globalisation of education. This international perspective offers students a broader worldview and diverse educational experiences. The availability and exploitation of digital tools become key for HEIs to practically realise the anticipated internationalisation.

3.3. Results from Systematic Literature Review and Experts' Interviews

At this stage, the concepts that emerged from the systematic literature review and the expert interviews were identified and consolidated. To do so, we adopted for our analysis the pattern proposed in (Morakanyane et al. 2017), according to which digital transformation is defined as follows:

> "... something with *certain characteristics*; that is *driven by* something; to create certain *impacts*; on certain *aspects of the organisation*".

Considering the above pattern, we analysed the definitions listed in Table 1. More specifically, the definitions were broken down by (a) keywords and variables used to describe a concept, and (b) patterns indicating how these keywords and variables were used.

A concept-centric matrix was then constructed (Table 2), which illustrates the overall understanding of what digital transformation is and its characteristics, drivers, impacts, and transformed areas that emerged from the analysis of definitions found in the systematic literature review.

Table 2. Digital transformation: concept-centric matrix from SLR.

What is Digital Transformation?	
Technology/Tools	(Al-Ali and Marks 2022; Maltese 2018; Faria and Nóvoa 2017)
Process/Actions	(Iosad 2020; Rodríguez-Abitia and Bribiesca-Correa 2021; Aditya et al. 2022; Wilms et al. 2017; Al-Ali and Marks 2022; Rof et al. 2020; Valdés et al. 2021; Castillo et al. 2021; Safiullin et al. 2019)
Business Model	(Al-Ali and Marks 2022)
Phenomenon	(Serna Gómez et al. 2021)
Changes	(Alenezi 2021; Gafurov et al. 2020; Simonette et al. 2021; von der Heyde 2022; Branch et al. 2020; Goulart et al. 2022; Grosseck et al. 2020)
What are its Characteristics?	
Radical	(Aditya et al. 2022)
Disruptive	(Serna Gómez et al. 2021; Alenezi 2021)
Evolutionary	(Rodríguez-Abitia and Bribiesca-Correa 2021; Rof et al. 2020; Valdés et al. 2021)
Mere	(Maltese 2018)
Profound/Deep	(Iosad 2020; Aditya et al. 2022; von der Heyde 2022; Benavides et al. 2020)
Coordinated	(Iosad 2020; von der Heyde 2022)
Holistic	(Alenezi 2021; Simonette et al. 2021; Benavides et al. 2020)
What are the Drivers of Digital Transformation?	
Digital Technologies/Tools	(Serna Gómez et al. 2021; Iosad 2020; Rodríguez-Abitia and Bribiesca-Correa 2021; Valdés et al. 2021; Alenezi 2021; Simonette et al. 2021; Castillo et al. 2021; Gafurov et al. 2020; von der Heyde 2022; Branch et al. 2020; Grosseck et al. 2020)
Culture	(Iosad 2020; von der Heyde 2022)
Workforce	(Iosad 2020; von der Heyde 2022; Grosseck et al. 2020)
Business Models	(Aditya et al. 2022; Valdés et al. 2021)
Operational Processes	(Valdés et al. 2021)
Automation	(Valdés et al. 2021)
What are the Key Impacts of Digital Transformation?	
Technology	(Parker 2020; Grosseck et al. 2020)
Capabilities	(Parker 2020; Rodríguez-Abitia and Bribiesca-Correa 2021; Goulart et al. 2022)

Table 2. *Cont.*

Operational Efficacy: optimised processes; agility; improved decision making;	(Parker 2020; Rof et al. 2020; Maltese 2018; Valdés et al. 2021; Aditya et al. 2022; Serna Gómez et al. 2021; Simonette et al. 2021; Gafurov et al. 2020)
Improved Relationships: enhance customer experiences; engagement	(Maltese 2018; Serna Gómez et al. 2021; Simonette et al. 2021; Branch et al. 2020; Gafurov et al. 2020)
Operational Model	(Parker 2020; Iosad 2020; Simonette et al. 2021; von der Heyde 2022)
Educational Model	(Parker 2020; Rof et al. 2020; Iosad 2020; von der Heyde 2022)
Where are These Impacts Felt (Transformed Areas)?	
Business Model	(Al-Ali and Marks 2022; von der Heyde 2022; Faria and Nóvoa 2017)
Operational Model	(Iosad 2020; Maltese 2018; Castillo et al. 2021; Benavides et al. 2020)
Strategic Direction	(Iosad 2020; Castillo et al. 2021; von der Heyde 2022)
Value Proposition	(Castillo et al. 2021; von der Heyde 2022)
Organisational Culture	(Serna Gómez et al. 2021; Iosad 2020; Simonette et al. 2021)
Connectivity	(Rof et al. 2020; Gafurov et al. 2020; Safiullin et al. 2019)
Value Creation	(Branch et al. 2020)

For clarification, the "characteristics" of digital transformation are the behavioural traits that this phenomenon exhibits. "Drivers" are the attributes that influence and enable digital transformation. "Key Impacts" are the emerging benefits and the effects experienced by HEIs as a result of the digital transformation process. Finally, the "impacted/transformed areas" are the outcomes affecting HEIs as a result of their digital transformation.

The in-depth analysis of existing definitions (Table 1) and the concept-centric matrix from the systematic literature review (Table 2) revealed that, despite the differences in how digital transformation is conceptualised, there is a common pattern in the definition structure, which indicates the way in which central ideas are used to describe the concept.

Below in Table 3, the findings of the systematic literature review and the additional concepts that emerged from the experts' insights are summarised.

Table 3. Proposed concepts from SLR and experts for definition of digital transformation.

Pattern for Definition of Digital Transformation	Concept-Centric Matrix (Systematic Literature Review)	Additional Concepts from Experts
. . . is something. . .	Technology/Tools; Process/Actions; Business Model; Changes; Phenomenon	Second-degree changes; process (administrative, financial, teaching and learning); education operation; changes (internal operations and communication with the external environment)
. . . with certain characteristics. . .	Radical; Disruptive; Evolutionary; Mere; Profound/Deep; Coordinated; Holistic	
. . . that is driven by something. . .	Digital Technologies/Tools; Culture; Workforce; Business Models; Operational Processes; Automation	
. . . to create certain impact. . .	Technology; Capabilities; Operational Efficacy; Improved Relationships; Operational Model; Educational Model;	Agility; resilience
. . . on certain aspects (transformed areas) of the organsation. . .	Business Model; Operational Model; Strategic Direction; Value Proposition; Organisational Culture; Connectivity	Educational model; value creation; operational processes

The above-presented results from the systematic literature review and experts' interviews were used as the basis for the case study.

3.4. Case Study

We proceeded with the results of the International Hellenic University case study. As mentioned in the Materials and Methods Section (Section 2), to collect information and explore the meaning and scope of digital transformation among the members of International Hellenic University, we organised a workshop. As no official policy exists at this time, we could not find any relevant official document. The university board intends to establish a committee consisting of academic and administrative staff to formulate the university's policy on the implementation of its digital transformation.

The group of participants was kept small (i.e., 10–12 participants) to give everyone the opportunity for personal engagement and contribution. The list of participants is presented in Appendix B. The workshop was conducted in November 2023, and out of twelve staff members contacted, ten agreed to participate.

Initially, a questionnaire was given to the participants. After explaining the pattern for the definition of digital transformation, we provided the central concepts as shown in Table 3. We also provided an option of "other" in case the choices included did not cover a concept they considered important in the definition.

During the workshop, the participants were divided into two groups of five members each. Each group consisted of members of the faculty and governance body and administrative and IT staff. Initially, each group was given time to discuss the possible concepts to be included in the definition and to choose the most relevant ones. Subsequently, back in the plenary, each group presented their chosen concepts. In the final step, a consensus was achieved for the most important concepts. The results are summarised in Table 4.

Table 4. Proposed concepts from case study.

Pattern for Definition of Digital Transformation	Proposed Central Concepts From Case Study
. . . is something. . .	• Technology/tools • Second-degree changes • Changes (internal operations and communication with the external environment)
. . . with certain characteristics. . .	• Evolutionary • Holistic
. . . that is driven by something. . .	• Digital technologies/tools • Operational processes • Human factor
. . . to create certain impact. . .	• Operational efficacy • Educational model • Agility
. . . on certain aspects (transformed areas) of the organisation. . .	• Educational model • Organisational culture • Operational processes

4. Synthesis and Discussion

Considering the results as obtained in Section 3, we propose the following definition as an answer to the research question, and we explain the selection of the concepts used in this definition below:

> *"Digital transformation in HEIs is an evolutionary process for a series of deep and coordinated changes characterised by the strategic adoption and integration of emerging technologies to significantly improve educational activities and operational efficacy, transforming the educational model, strategic directions and value proposition of higher education institutions".*

The final central concepts chosen to include in our definition of digital transformation in HEIs are summarised in Table 5. These concepts were chosen considering the results

presented in Tables 3 and 4. We discuss these concepts below, elaborating on those we included in our definition and explaining why we excluded the rest.

Table 5. Final proposed central concepts in our definition.

Pattern for Definition of Digital Transformation	Final Proposed Central Concepts in Our Definition
. . . is something. . .	• Processes • Changes
. . . with certain characteristics. . .	• Evolutionary • Deep • Coordinated
. . . that is driven by something. . .	• Emerging technologies
. . . to create certain impact. . .	• Operational efficacy • Educational activities
. . . on certain aspects (transformed areas) of the organsation. . .	• Strategic direction • Value proposition • Educational model

Characteristics of digital transformation: The concepts "evolutionary", "deep", and "coordinated" were chosen in the definition to convey the sense of gradual, fundamental, and well-planned changes taking place in higher education institutions. These terms are aligned with the idea of the strategic, long-term process of adopting emerging technologies and improving educational activities.

The evolutionary process refers to a progressive and continuous series of actions that cause changes over time. Despite the perception that "transformation" happens once and finishes when the organisation is "transformed", it became clear from all our research sources (i.e., literature, interviews, and case studies) that digital transformation should be perceived more as a perpetual process of continuous changes and not as a process with a clear and finite end point.

Deep and coordinated changes refer to significant and interrelated second-degree changes or transformations and affect various aspects, such as the curriculum, pedagogy, teaching, research, administrative structure, and culture. These changes are implemented in a well-designed and explicitly strategic manner.

We decided not to include the term "radical changes" in our definition, as this implies an abrupt change away from the existing system. Also, the term "disruptive changes" was avoided, as it seems that "disruption" is not always desirable and comes with important risks. The term "mere" implies something minimal or insignificant, which is not appropriate when describing a major transformation in higher education. Finally, "holistic change" implies the consideration of all aspects but does not convey the idea of a coordinated process.

Drivers of digital transformation: The choice of "emerging technologies" emphasises the key drivers and enablers of change, as well as the understanding that technologies are constantly evolving. "*The strategic adoption and integration of emerging technologies*" highlights the importance of technology in reshaping educational activities and operational effectiveness. To remain relevant and competitive, HEIs must continually evaluate and adopt new technologies that emerge over time. Moreover, reacting to technological developments is not enough, as they need to proactively identify and adopt technologies and align them with educational objectives, and integrate them into and utilise them in existing educational and administrative models, processes, and systems.

While "culture", "workforce", "business models", "business processes", and "automation" are all important elements in the transformation of HEIs, it is the strategic use of emerging technologies that can interact with all these other elements and serve as a catalyst for wider change.

Impact of digital transformation: Universities are typical examples of "professional bureaucracies" (Mintzberg 1980). The digital transformation impact can be seen in both the administrative and core (professional) functions of HEIs. Impacts on "*educational activities*" refer to the main academic functions (i.e., teaching, research, technology transfer, curriculum, and administration). Impact on "*operational efficacy*" refers to the ability of an HEI to effectively and efficiently manage its internal processes and resources to achieve its strategic goals and objectives. It involves optimising various aspects of functions to improve the overall performance and delivery of educational services.

The other terms identified (i.e., capabilities, improved relationships, operational model, and educational model) could be considered as dimensions of higher education transformation but are either partially covered by the selected terms (e.g., capabilities, operational model) or not considered central to our proposed definition.

Key transformed areas of digital transformation: The "*educational model"* refers to the framework or structure in which the core activities (i.e., curriculum, teaching and learning methods, research, learning, continuous education, technology integration) are organised and delivered. When talking about transformation, it is vital to emphasise how all changes affect the core way in which education is provided and received. This includes changes in the curriculum design, teaching methods, and overall learning experience.

Aligning strategic goals with the changing educational landscape: The term *"strategic directions"* refers to aligning the strategic objectives of HEIs with the changing educational landscape, focusing more on the offering of new educational services. *"Value proposition"* is about the outcomes and benefits at the organisation level because of digital transformation. Finally, it relates to what the institution offers to the students, faculty, and other stakeholders and the perceived benefits.

The other defined concepts, namely, business model, operating model, organisational culture, value creation, and connectivity, are considered part of our selected terms.

5. Conclusions, Limitations, and Future Work

This study tried to shed light on the meaning and scope of digital transformation in HEIs using qualitative research methods, with the ultimate aim of providing a well-rounded definition of digital transformation in HEIs. Additionally, through the methodology used, this study also seeks to provide a basis and an example for researchers in other disciplines to define the meaning and scope of digital transformation in their fields.

The limitations of this study include the relatively small sample size of the experts interviewed. It is normal that the participants interviewed in this study had their own biases or perspectives, and this influenced the results. Future research could target a more extensive and diverse sample of experts. Whilst the selection of a specific case study is in itself a limitation, the selection of a qualitatively meaningful single case study for digital transformation allows the readership to assess to what extent the results can be generalised to other areas.

Future research could compare the digital transformation efforts of HEIs across countries, continents, and types of institutions. Such comparisons could help identify the best practices that influence success. Also, in-depth case studies of specific HEIs that have successfully navigated digital transformation could provide actionable insights and serve as models for other institutions. As the digital landscape continues to evolve, ongoing research efforts will be vital in guiding HEIs towards successful transformation in an ever-changing environment.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. List of Experts Who Participated in Interviews

A/A	Name	University	Country
1	Joep Crompvoets	KU Leuven Public Governance Institute	Belgium
2	Euripides Loukis	Aegean University	Greece
3	Tomasz Janowski	Gdańsk University of Technology	Poland
4	Elsa Estevez	Universidad Nacional del Sur	Argentina
5	Theresa Pardo	University at Albany, State University of New York	USA
6	Adegboyega Ojo	Carleton University	Canada
7	Marijn Janssen	Delft University of Technology	Netherlands
8	Efthimios Tambouris	University of Macedonia	Greece

Appendix B. List of Participants in IHU Case Study

A/A	Position
1	Professor, Member of the IHU Executive Council
2	Professor, Vice Rector for Internationalisation, Public Relations and Digital Governance of the IHU
3	Professor, Dean of School of Social Sciences, Member of the Senate, and Member of the Research Committee of IHU
4	Secretariat of Vice Rector of the IHU, Academic Fellow as a Teaching Assistant at the IHU, PhD Candidate.
5	Secretariat of School of Social Sciences of IHU
6	Head of Administrative Support Unit, Special Account Management Department
7	Library staff of UCIPS/IHU
8	Public Relations & Communications Office of IHU
9	IT staff
10	IT staff

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