Dimensions of digital transformation in higher education institutions for continuing education

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Abstract

To comprehend the need for digital transformation in the field of continuing education, we must first be aware of the existence of a digitized society facilitated by technological changes and the phenomenon of globalization. These changes are reshaping our understanding of the world and how we live in it. It is in this context of digital transformation that society expects higher continuing education to respond to the demands of digitization. With the aim of defining patterns that facilitate transformation processes in our higher education institutions for the development of continuous training programs, this article analyzes, through 26 articles (between 2017 and 2022), selected using the PRISMA methodology, the main dimensions, levels, and actors involved in digital transformation processes. The results lead us to conclude that it is an emerging field of interest, especially after the COVID-19 pandemic, which has accelerated digitization processes.

Keywords: Continuing education, digital transformation, lifelong learning, digitization, higher.

Resumen

Para entender la necesidad de transformación digital en el campo de la educación continua primero deberemos ser conscientes de la existencia de una sociedad digitalizada facilitada por los cambios tecnológicos y el fenómeno de la globalización. Estos cambios están transformando nuestra forma de entender el mundo y vivir en él. Es en este contexto de transformación digital donde la sociedad espera que la educación continua superior responda a las necesidades de digitalización. Con el objetivo de definir patrones que faciliten los procesos de transformación en nuestras instituciones de educación superior en el desarrollo de programas de formación continua, el presente artículo analiza, a través de 26 artículos (entre 2017 y 2022), seleccionados usando la metodología PRISMA, las principales dimensiones, niveles y actores implicados en los procesos de transformación digital. Los resultados obtenidos nos llevan a concluir que se trata de un campo de interés emergente, especialmente después de la pandemia del COVID-19 la cual ha acelerado los procesos de digitalización.

Keywords: Educación continua, transformación digital, aprendizaje a lo largo de la vida, digitalización, educación superior.

Introducción

In our "digitalized society" (González *et al.*, 2018), digital technology is evolving rapidly, especially during the last decade of the 21st century with the emergence of certain technologies such as Artificial Intelligence (AI), 3D printing, robotics, the Internet of Things (IoT), and quantum computing (QC), among others. This period is known as the 4th Industrial Revolution (Penprase, 2018), in which technology has become one of the main external drivers of digital transformation (Hanelt *et al.*, 2021; Verhoef *et al.*, 2021).
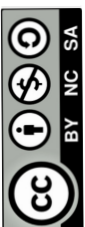
According to the Organisation for Economic Co-operation and Development (OECD, 2017), digital transformation is the result of the digitalization of economies and societies. Other authors consider digital transformation as the best approach to address emerging trends generated by digital technologies (Aditya et al., 2021). In any case, together with the phenomenon of globalization (Branch et al., 2020), digital technologies have forced organizations to initiate digital transformation processes whose purposes, among others, are: a) efficiency and cost reduction, b) value creation, and c) cultural change through the use of digital technologies (Castro et al., 2020; Hanelt et al., 2021; Tekic & Koroteev, 2019). This situation has been increased and accelerated by the 2020 pandemic (COVID-19), affecting all productive and service sectors.

Given this context, higher education institutions are not exempt from transformation, and there are different reasons that lead us to make this statement. First, if we consider Gobble's (2018) words about the social purpose of transformation, higher education institutions, by having social commitment as their third mission (Carrión, 2018; Rojas et al., 2018), play an important role in this context of change towards a digital society. Second, it refers to the need to integrate these technologies into the processes and services (both operational and academic) by automating and digitizing them (OECD, 2000). Thirdly, in a post-digital education context (Fawns, 2018; Lamb et al., 2022), we can agree that students are more connected than ever before (González et al., 2018). These students are digital natives and have higher expectations about the possibilities of digital learning (Henderson et al., 2017). Therefore, the necessary integration of technology cannot be simplified to the context of its use. It requires a transformation process within the institution itself, involving changes in the traditional business model, organizational processes and structures, products and services, and organizational culture (Giang et al., 2021; Teslia et al., 2020; Verhoef et al., 2021). In other words, digital transformation is not defined as a simple process of incorporating technology at the level of teaching or a few processes (Fernández et al., 2019), or "digital transformation in higher education institutions refers to the development of new, more advanced and effective methods and practices in pursuit of the mission of higher education" (Alenezi, 2021, p. 2).

However, the process of digital transformation in higher education institutions poses significant challenges since "the last 100 years show that education has not been transformed or altered by successive waves of technological innovation" (Selwyn, 2016, p. 439).

With the aim of addressing this complex issue, the present study aims to provide an overview of the state of digital transformation in higher education institutions, in the context of continuing education, through a literature review process based on the PRISMA methodology for the last 5 years (2017-2022), in the SCOPUS and Web of Science (WoS) databases. The results of this work are presented in this article, which is organized into the following sections. The present section, where we have presented the framework by which the constructs of digital transformation and higher education institutions for continuing education are related. The "Concepts" section, where definitions of the search concepts are shared and decisions made for the concretion of the search algorithm are described. A section called "Methodology" that describes the protocol followed, the process of data selection, and the results of the analysis process. A

"Conclusions" section that presents the main inferences obtained from the study. A "References" section with the referenced bibliography. And finally, in the "Annex" section, the analyzed articles are listed.

Concepts

For our study, the main terms considered in the literature search refer to digital transformation and continuous education in the context of higher education institutions.

Regarding the first of the terms, "digital transformation" it should be noted that it lacks a single definition (Hanelt *et al.*, 2021), and it was not until 2003 that it was distinguished from the term "digitization" (Pihir *et al.*, 2019). For our study, the term is defined as "a series of profound and coordinated changes in culture, workforce, and technology usage that facilitate new educational and operational models, transforming the operations, strategic directions, and value proposition of the institution" (Grajek & Reinitz, 2019).

Regarding the term "Continuing training" it is understood as education "after initial education and training, [...] intended to help individuals: improve or update their knowledge and/or skills; acquire new skills for a career change or new training; continue their personal or professional development" (CEDEFOP, 2014, p. 51). It should be noted that continuing education is also associated with other terms such as "professional training", "professional development," or "adult education" (Bade-Becker *et al.*, 2009). For our analysis, we understand that the term "professional training" "is attributed to a specific study cycle corresponding to Vocational Education and Training (VET) (CEDEFOP, 2014, p. 292), which is not part of the present analysis. However, we will consider the concept of "professional development" as it is part of the definition of the term "continuing education".

- "Making a European Area of Lifelong Learning a reality" (European Commission, 2001).
- "Recommendations on key competences for lifelong learning" (European Council, 2006).
- "Education and Training 2020" (Council of Europe, 2009).

For this reason, the following terms have been considered synonymous with the concept of "Continuing education": "lifelong learning" "permanent education/training," "adult education."

Methodology

In order to conduct a literature review on the state of digital transformation in continuing education carried out by higher education institutions, with a search date of March 13, 2022, and limited to the last 5 years, the following process based on the PRISMA model (Page, McKenzie *et al.*, 2021; Page, Moher *et al.*, 2021) has been followed, as illustrated in Figure 1.
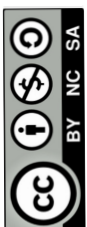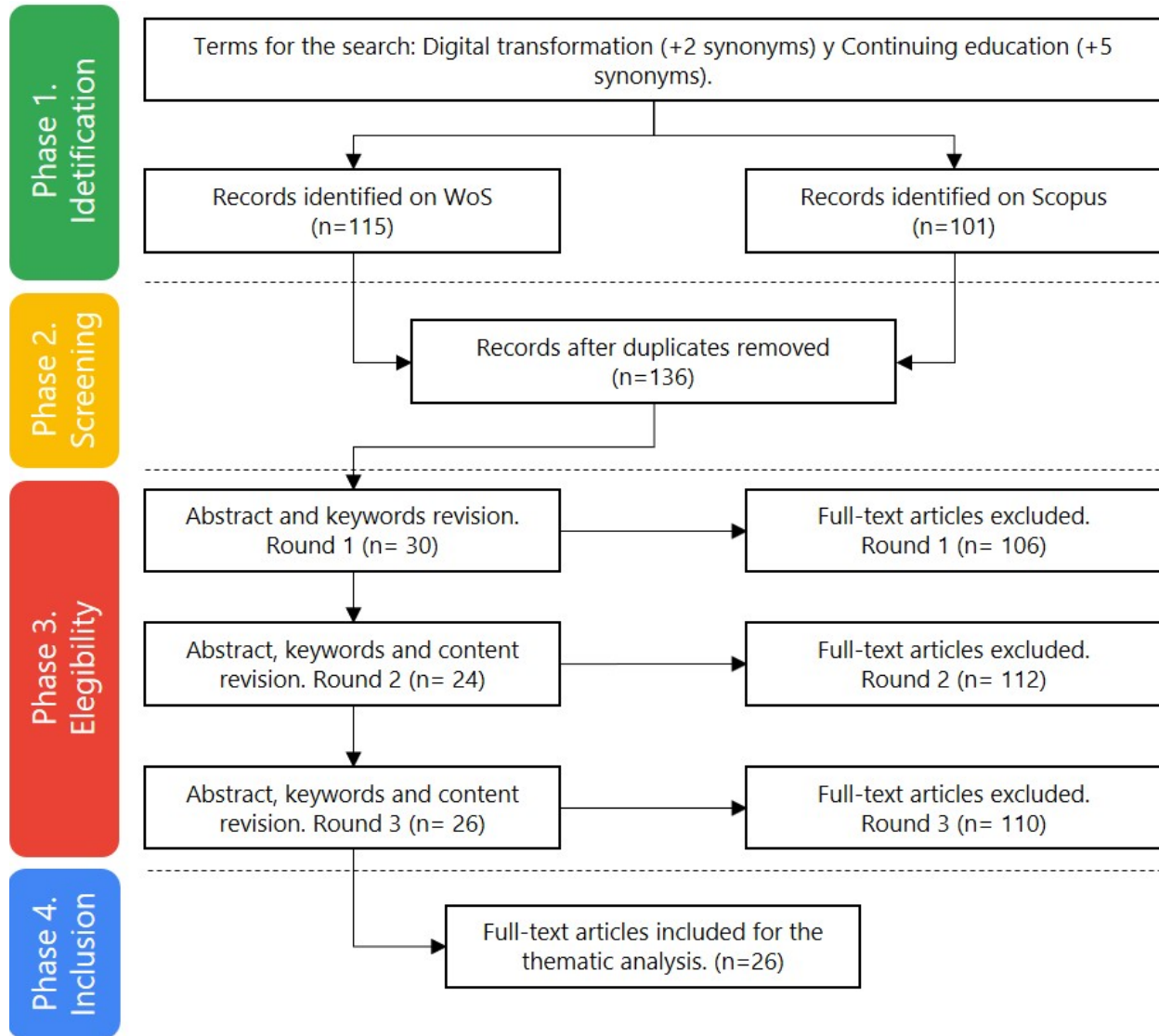
Figure 1
Workflow process (PRISMA methodology)

Phase 1. Idetification

Terms for the search: Digital transformation (+2 synonyms) y Continuing education (+5 synonyms).

Records identified on WoS (n=115)

Records identified on Scopus (n=101)

Phase 2. Screening

Records after duplicates removed (n=136)

Phase 3. Elegibility

Abstract and keywords revision. Round 1 (n= 30)

Full-text articles excluded. Round 1 (n= 106)

Abstract, keywords and content revision. Round 2 (n= 24)

Full-text articles excluded. Round 2 (n= 112)

Abstract, keywords and content revision. Round 3 (n= 26)

Full-text articles excluded. Round 3 (n= 110)

Phase 4. Inclusion

Full-text articles included for the thematic analysis. (n=26)

Note: Original source.

Identification Phase

For the identification phase, the following combinations of terms (in two languages: Spanish and English) were used in the following thematic databases: Web of Science (WoS) and Scopus, limiting the searches to the title, abstract, or keywords defined by the author..

Table 1
Search Algorithms

ES: Title, abstract or author-specified keywords = ("Transformacion Digital" OR "Digitalizacion") AND ("Educacion continua" OR "formacion continua" OR "lifelong learning" OR "formacion permanente" OR "educacion permanente" OR "educacion de adultos" OR "desarrollo profesional") | Year: 2017-2022.

EN: Title, abstract or author-specified keywords = ("Digital transformation" OR "Digitalisation" OR "Digitalization") AND ("Continuing education" OR "Continuing training" OR "lifelong learning" OR "adult education" OR "continuing professional development) | Year: 2017-2022.

Since indexing in different databases is not the same, initially, the analysis has been conducted separately for each database.

Table 2
Search Results in WoS and Scopus.

Results	WoS		Scopus	
	Global	=2017	Global	X>=2017
Spanish	0	1	2	2
English	130	117	117	104
Open Access	48	46	36	35
lid X>=2017	105		101	

Note: Original source.

For the specification of the temporal criterion, 2017-2022, the following parameters have been considered:

1) The nature of the topic itself leads us to the need to narrow down the search to more recent periods to conduct reviews of scientific literature that allow us to access the most updated knowledge on our topic of interest.
2) 89% of the search results are concentrated in the period from 2017 to 2022.

Having established the temporality criterion, the obtained records were reviewed to refine the information with the purpose of obtaining unique records.

Discard criteria:

1) Publications not written in English or Spanish.
2) Those that did not contain information about authors, title, or abstract were categorized as null.

3) Records were considered duplicates if they contained the same abstract, authors, and publication year.

The following table shows the results obtained, taking into account the previous filtering processes (temporal criterion and unique record):

Table 3
Results of the identification phase

Results	WoS X>=2017	Scopus X>=2017
English/ Spanish	93	90
Duplicates / Nulls	-1	-2
Total valid	92	88
Unique records	136	
	48 44 44	

Note: Original source.

As can be observed, in this phase, 80 records that did not meet the selection criteria have been excluded (37% out of 216), leaving a total sample of 136 publications: 48 from WoS, 44 from Scopus, and 44 common.

Eligibility phase

With the aim of delimiting the results to our object of study and determining its distinctive characteristics: dimensions, actors, and levels of implementation; we have proceeded to evaluate the different publications to answer the following questions:

1) Does it describe any digital transformation process in the higher continuing education sector?
2) What dimension(s) and categories do they describe?
3) To what organizational level do they refer?
4) Who are the actors involved?

1. Higher Continuing Education Sector

To analyze if an article addresses the first of the described questions, 3 rounds of reading have been conducted. In these rounds, the abstract and the keywords defined by the author (1st, 2nd, and 3rd round), as well as the content of the publication (in the 2nd and 3rd round), have been evaluated according to the following evaluation table:

Table 4
Eligibility evaluation criteria.

Valeur	Description	Action
Yes	Contains clear references with explicit information.	Include in the following phase as eligible.
Partial	It is inferred, although the information is not explicit.	
Null	With the existing information, the sector cannot be inferred.	Review full article and reevaluate.
Nou	Contains clear references to another sector.	Exclude from the following phase.

Note: Original source.

In each of the rounds, different elements were analyzed according to the following description:
1) Round 1: Reading of the abstract and keywords.
2) Round 2: Reading of the abstract and keywords in all, and content of publications in the "Null" category.
3) Round 3: Reading of the abstract and keywords in all; and content of publications in the "Null" and "Partial" categories.

As a result of the filtering carried out over the three rounds, 26 publications (**Annex 1**) have finally been identified as eligible for the subsequent analysis phases, as shown in the following summary table:

Table 5
Results of the 3 rounds of eligibility.

Values	Round 1	Round 2	Round 3
Yes	30	24	26[1]
Partial	21	27	29[2]
Null	39	14	8
No	46	71	83

Note: [1] They could not be analyzed in further detail as the full article was not available. [2] They couldn't be analyzed because the article wasn't available. Own work.

2.   Dimensions and Categories

Taking a multidimensional view of the digital transformation process or digitization (Aditya *et al.,* 2021; Hanelt *et al.,* 2021; Rodrigues., 2017), which affects any organization in multiple aspects (Giang *et al.,* 2021; Teslia *et al.,* 2020; Verhoef *et al.,* 2021), we have opted to establish different levels of analysis.

At a first level, we will focus on the complexity of the definition of digital transformation itself. As such, according to authors such as Reis *et al.* (2018) or Castro *et al.* (2020), it encompasses three main dimensions:

1) The "technological" dimension, focused on the use of digital technologies.
2) The "organizational" dimension, requiring a change in organizational processes or the creation of new business models (Henriette *et al.*, 2015).
3) The "social" dimension, which affects many aspects of our lives to the extent, for example, of becoming a catalyst for social innovation (Kaputa *et al.*, 2022).

Taking into consideration the three aforementioned dimensions, the following distribution is shown in our sample of eligible publications:

Figure 2
Distribution of dimensions by publication year.
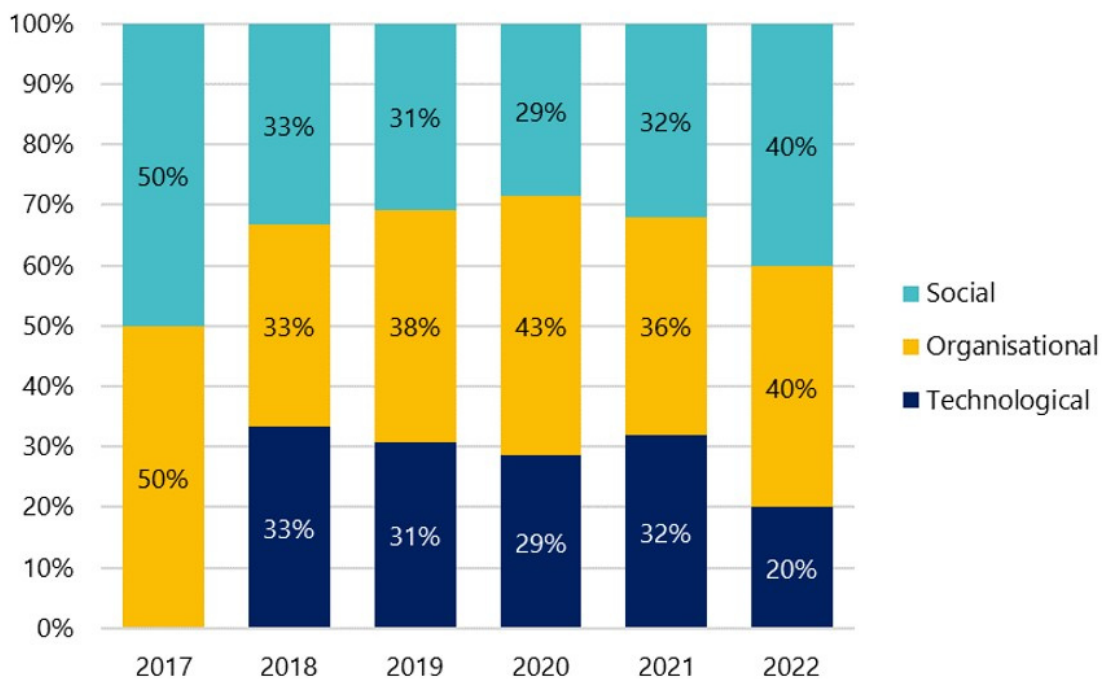
Note: Original source.

As can be observed, the three dimensions participate in similar percentages, reinforcing the idea of the multidimensionality of transformation processes. Similarly, since 2018, a certain increase in interest has been detected in the organizational and social dimensions (Castro *et al.*, 2020). This responds to the fact that the technological dimension is limited to the need to incorporate technology, while there is increased interest in organizational changes (for example, recommending the development of teacher training centers or the need for a legal framework) or in the social dimension (as an asset for improving society and/or the regional context).

As a second level of analysis, publications were analyzed according to groupings established by different authors such as Graham *et al.* (2013), Khalid *et al.* (2018), and Rampelt *et al.* (2019):

- **Strategic Framework [G1]:** institutional policies, strategies, vision, governance, among others.
- **Structural Changes [G2]:** technological, legal, pedagogical, and administrative environment, among others.
- **Support Elements [G3]:** incentives, professional support services, student support, among others.

Figure 3
Distribution of groupings by publication year.
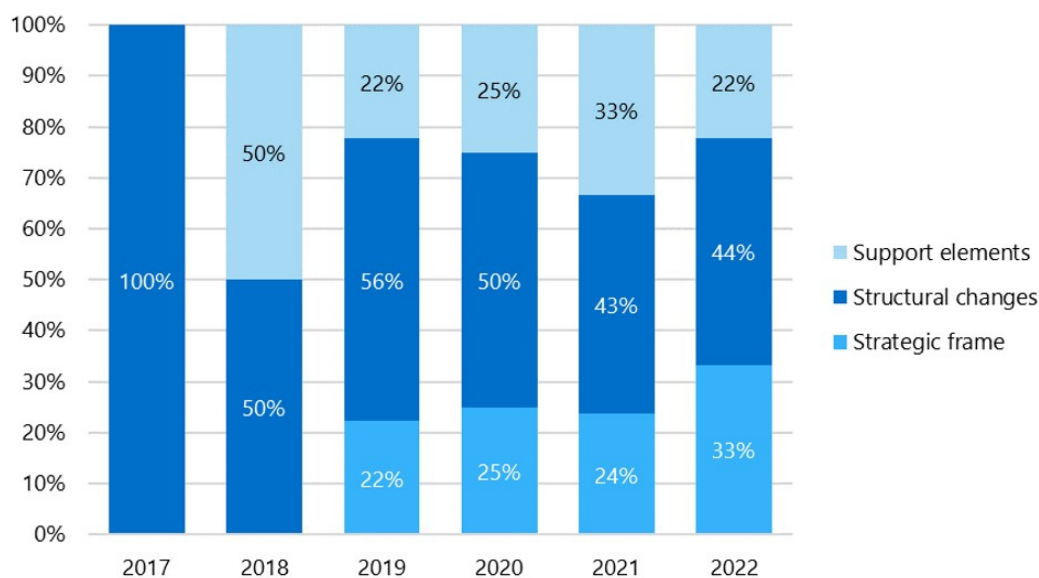
Note: Original source.

Unlike the pattern identified in the earlier dimensions analyzed (Figure 2), the distribution regarding the 3 aforementioned groupings (Figure 3) shows a certain predominance of structural changes, while the conception or development of support elements is the least present group; this trend persists over the years. Additionally, there is an increase in interest in strategic issues (from 0% to 33% in the year 2022).

The following infographic (Figure 4) shows how the previous dimensions and groupings would be combined according to levels of importance identified in the analyzed articles.
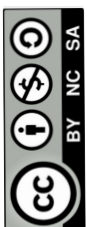
Figure 4
Digital transformation: dimensions and groupings.

Note: Original source.

In each of the aforementioned groupings [G1/G2/G3], we have also identified different thematic categories. The following table shows the distribution of some of the most recurrent themes in the 26 analyzed articles. The following image shows the intersections between the groups and the themes, indicating the number of related articles in each category:

Figure 5
Categories for digital transformation and number of articles.
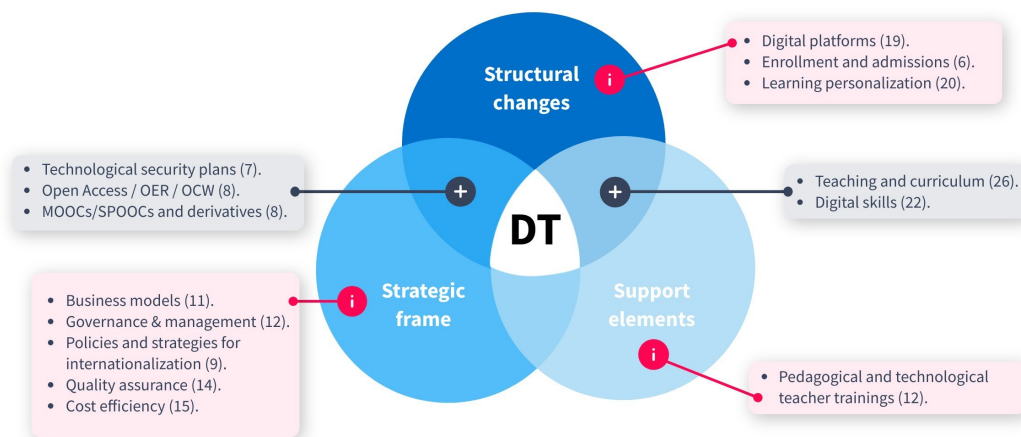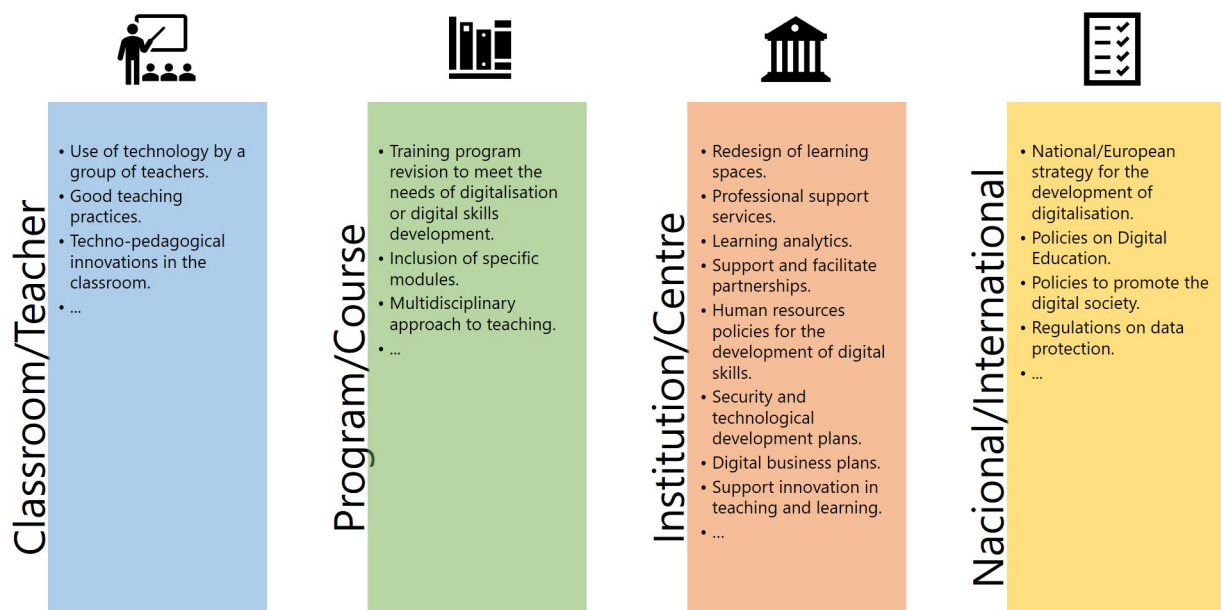

Note: Original source.

3. *Level of implementation of digital transformation*

As would happen in any organization, and higher education institutions are no exception, a process of digital transformation may involve different levels of implementation, from a macro to a more micro level (Arnold & Sangrà., 2018; Hanelt *et al.,* 2021; Johnston *et al.,* 2018). Other frameworks refer to these same levels of implementation using different terms: individual, institutional, and social (Loebbecke & Picot., 2015).

Our proposed analysis suggests a first categorization of the 26 publications based on the level of impact of the expressed digitization process, ranging from the micro level (Classroom/Teacher, Program/Course) to the macro level (National/International), passing through the meso level (Institution/Center):

Figure 6
Levels of implementation of digital transformation

Classroom/Teacher	Program/Course	Institution/Centre	Nacional/International
• Use of technology by a group of teachers. • Good teaching practices. • Techno-pedagogical innovations in the classroom. • …	• Training program revision to meet the needs of digitalisation or digital skills development. • Inclusion of specific modules. • Multidisciplinary approach to teaching. • …	• Redesign of learning spaces. • Professional support services. • Learning analytics. • Support and facilitate partnerships. • Human resources policies for the development of digital skills. • Security and technological development plans. • Digital business plans. • Support innovation in teaching and learning. • …	• National/European strategy for the development of digitalisation. • Policies on Digital Education. • Policies to promote the digital society. • Regulations on data protection. • …

Note: Original source.

The first three represented levels (Classroom/Teacher, Program/Course, and Institution/Center) correspond to the different levels of technology adoption defined by Graham *et al.* (2013). They describe a gradation from a more exploratory and introductory level, limited in risks and without institutional support; evolving towards a more mature implementation with full institutional support.

If we analyze the 26 articles according to these levels (considering that the same article may involve more than one reference level), the results obtained are shown in the following graph (Figure 7):
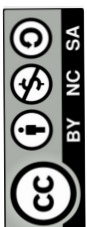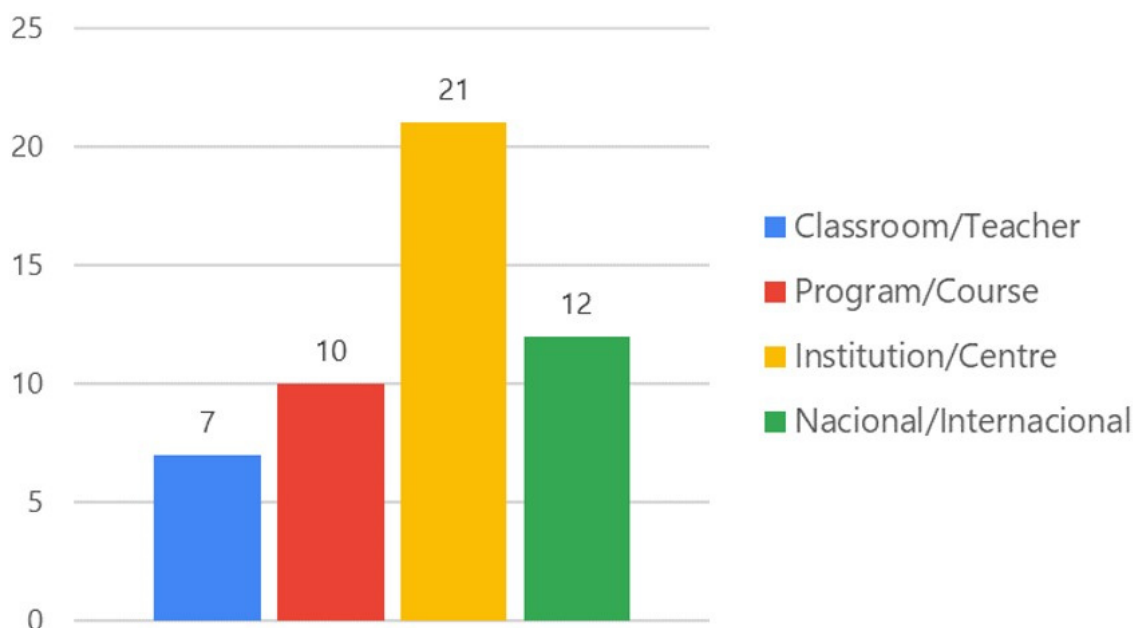
Figure 7
Levels of implementation identified in the articles

Note: Original source.

Below, each of the levels and the relationships found are described in more detail:

- **Classroom/Teacher:** In these cases, institutional support is limited, and teachers, individually or in small groups, explore ways in which they can digitize teaching and learning processes. Under this definition, we have identified 7 references (27%). Only 1 of them focuses on proposals at the Classroom/Teacher level, with the Institution/Center being the most referenced (71%).
- **Program/Course:** It includes value proposals related to the review and creation of programs or courses adapted to the needs of our digital society. In this category, 10 references (38%) have been identified, 8 of them projected at the Institution/Center level, 3 at the National/International level, and 3 at the Classroom/Teacher level.
- **Institution/Center:** This third level is characterized by the adoption of digital transformation actions at the institutional level and experimentation with policies and practices to support the development and growth of digitization. The number of references assigned to this level is the highest of all, with 21 (81%). Like in the previous levels, the number of articles solely assigned to this level is reduced to 4. The rest of the references combine recommendations and implementation proposals at other levels, mainly at the Program/Course (38.10%) and National/International (47.62%) levels.
- National/International: This last level is characterized by the definition or specification of policies and recommendations for the promotion and development of digitization in the

higher continuing education sector. In this category, we find 12 references (46%), with 2 solely assigned to this level, while 10 are combined with the Institution/Center level.

4. Actors

Every digital transformation process in the educational context, besides considering the use of technology, involves taking into account different actors, promoters, and/or recipients of the transformation process itself. In our analysis context, the following actors have been identified:

Figure 8
*Actors involved in digital transformation processes.*
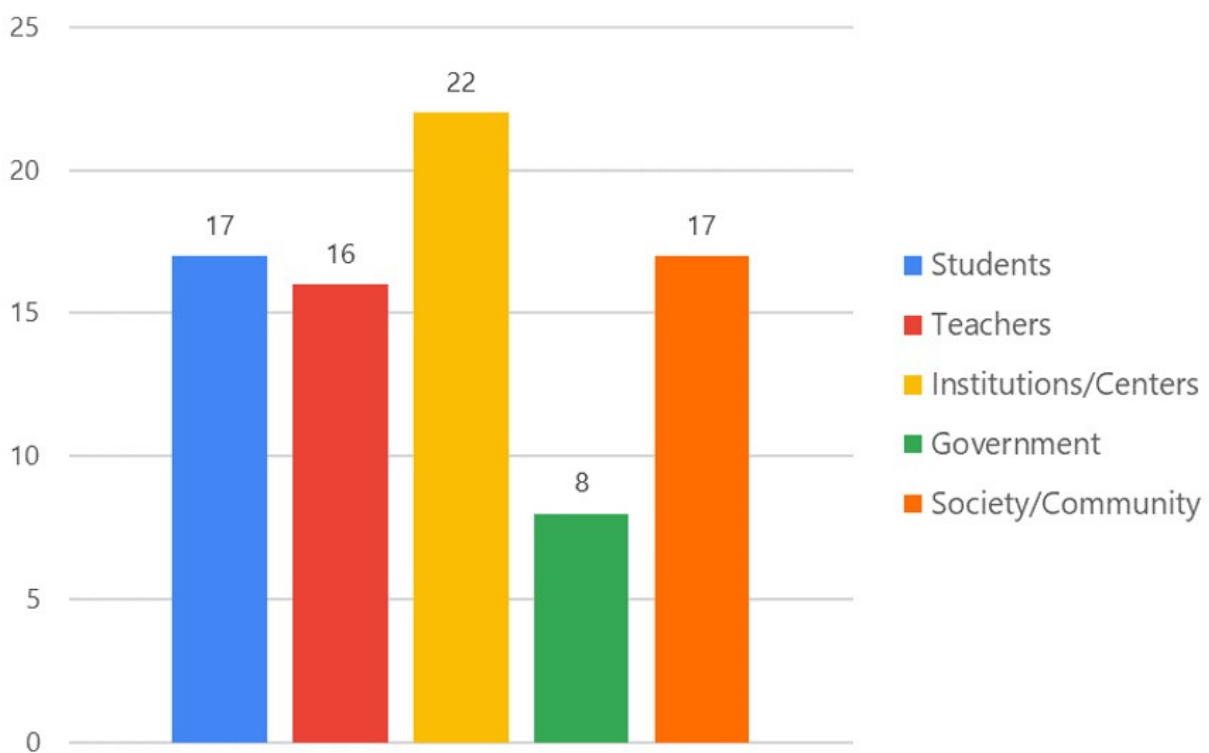
Note: Original source.

As shown in the preceding graph (Figure 8), the main actors are "Institutions/Centers," followed by the group of "Students," "Society/Community," and "Teachers." In the last position would be the "Government."

These data reinforce the results obtained previously, with 85% of the articles again focused at the Institutional/Center level. In all articles in this block, the need for institutional-level changes is defined to:

a) Promote teaching and curriculum improvement by applying innovative methods (100%).
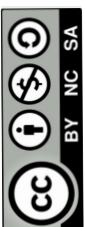
b) Ensure the development of digital skills (86.36%).
c) Offer training proposals based on personalized or individualized learning (77.27%).
d) Implement digital platforms (72.72%) that enable self-directed learning (68.18%).
e) Reduce costs in existing traditional models and be more efficient by improving management (59.09%).
f) Ensure the quality of digitized services (54.54%).
g) Institutionalize support services and training for teachers and students (40.91%).

To a lesser extent, institutional approaches are also found regarding the need for policies and strategies related to internationalization, the use of Open Access resources, or the implementation of the Sustainable Development Goals 2030 (SDGs).

When examining the involvement of students (65.38%), it primarily relates to the challenge that continuing education institutions face in training them in competencies (100%) to meet the needs of a digitized society. To achieve this, the use of various digital platforms is proposed (76.47%), employing innovative methods and tools (100%) that allow for personalized experiences (88.24%) and the promotion of self-directed learning (58.82%), without compromising on the quality provided (47.06%).

The same applies to teachers (61.54%), as they are responsible for promoting adequate training in digital competencies and innovating both in curriculum and methodology (100%), while also maintaining the quality of education (56.25%); performing their duties in digital environments (81.25%). This requires them to develop the necessary methodological and digital competencies through their own training/updating (68.75%).

At the level of society/community as actors (65.38%), the need to review teaching methodologies and existing curricula, adapting them to societal expectations by leveraging the benefits offered by digitization (100%) emerges again as relevant. We particularly highlight the need for digitally competent citizenship (82.35%). At the level of higher continuing education, there is also a demonstrated need to maintain close alliances between higher education institutions and companies or productive agents in society (29.41%), given their relationship with the curriculum (as providers of information on training needs or as facilitators of the necessary environments for their development, whether platforms or practices).

Finally, we only found 8 articles (30.77%) where the direct influence of governments is explicitly indicated as promoters, promoting policies that foster lifelong learning (100%) or the necessary technological infrastructure (75%). These policies may also extend to aspects related to MOOCs - Massive Open Online Courses (37.5%) or intellectual property protection (25%).

Conclusions

The analysis conducted has shown that digital transformation is a complex and multidimensional process, which encompasses dimensions (technological, organizational, and social), multiple

categories (business models, governance and management; support elements; technological environment and platforms, open educational resources, digital competencies, curriculum, teaching and learning processes, or enrollment, among others), and levels of development, ranging from the micro level (Classroom/Teacher, Program/Course) to the macro level (National/International), passing through the meso level (Institution/Center).

In this complexity, the Institution/Center level emerges as the one that garners the most interest with the highest number of referenced articles (Figures 5 and 6). With 81% of the 26 analyzed articles, there is a greater interest in surpassing the Classroom/Teacher and Program/Course levels and establishing a more mature and institutional implementation of digitization processes through the definition of policies and strategic plans that affect different elements within an institution.

As we have been discussing, transformation poses an organizational and cultural change that even affects the business model linked to lifelong learning (Castro *et al.*, 2020; Hanelt *et al.*, 2021; Rodrigues, 2017; Tekic & Koroteev,, 2019). These new business models must be capable of generating value in a digitized society, thereby keeping the third mission of higher education institutions relevant: social commitment (*Carrión, 2018*; Rojas *et al.*, 2018). Some authors even argue that higher education institutions should be leading this change, which they define as cultural (Branch *et al.*, 2020).

As observed in the analyzed articles, for the majority, the concept of adding value is conceived as the need to ensure the development of digital competencies, personalized learning, and the institutionalization of support and training services for both students and teachers. Under this vision, it is logical to consider the revision of educational programs and include the use of technology and the development of competencies in isolation. However, this approach proves to be ineffective and unsustainable. From our perspective, we believe that this process of generating value in a highly digitized society involves elements beyond the program or digital competencies (Branch *et al.*, 2020; Castro *et al.*, 2020).

Similarly to any organization undergoing digital transformation, for a higher education institution, this process also entails structural, technological, and cultural changes; changes in strategy and policies; processes, operations, and services (Gill *et al.*, 2016; Ifenthaler & Egloffstein, 2020; Newman, 2017; Reis *et al.* 2018; Venkatraman, 2017). However, considering its differential value as a continuing education institution, we believe that to achieve this, it should (a) implement innovative teaching practices, (b) offer flexible and customizable training proposals, focusing on the student (c) through digital technologies that enable (d) self-directed learning models; while aiming to (e) improve efficiency in management through agility and cost reduction, always assessing (f) user experience and the quality of services once digitized. All these listed elements have been identified in other studies on digital transformation in higher education institutions (Branch *et al.*, 2020; Castro *et al.*, 2020; Kane *et al.*, 2015; Matt *et al.*, 2015; Mohamed *et al.* 2021; Rodrigues, 2017; Shaughnessy, 2018).

On the other hand, we cannot forget that 46% of the analyzed articles referred to the need to
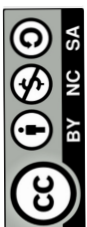
incorporate the National/International perspective. In this context, we encounter different approaches such as: a) the need for regulations on elements like data handling, b) the promotion of a digital culture and/or society in a globalized context, or c) promoting national and international cooperation among different actors (educational institutions, productive sectors of society, governments, among others).

Based on all the aforementioned points, and as a final conclusion, it is evident that digital transformation processes cannot be attributed to a single dimension, category, or level of implementation. In the context of continuing education developed by higher education institutions, this process must continue to be implemented and researched from a more institutional approach, with the existence of necessary policies and strategies, both at the national and international levels, and the activation of plans that allow the generation of new business models focused on improving the student experience, teacher training, and the development of a true digital culture.

Limitations

As a limitation of this study, the difficulty in obtaining a large sample of articles leads us to recommend further research on how higher education institutions, in terms of continuing education, face the challenges arising from digital transformation while responding to the requirements of our digitized society.

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Conflicts of Interest

The authors wish to inform that there are no conflicts of interest associated with the current study, nor does the research involve human participants requiring informed consent.

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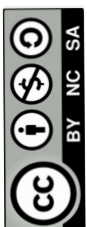
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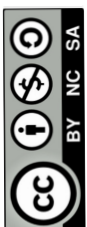
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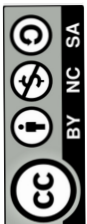
Appendix 1. List of analyzed articles

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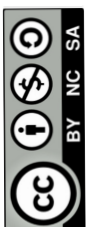
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