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A strategic approach of the crucial elements for the implementation of digital tools and processes in higher education

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Abstract

Implementation of digital tools and processes in Higher Education Institutions (HEIs) as an emergent activity depends on the sociomaterial relationships between institutional factors that dynamically interact with each other. This article systematically explores through a literature review some of the most relevant and up-to-date published studies to identify the 'important factors' to consider for the implementation of digital tools and processes in HEI. The goal of the paper is to turn these factors, conceived initially as previous conditions or characteristics of the institutions or people, into a list of strategic elements to be fostered by HEI leadership teams to promote better implementation of digital tools and processes in their institutions. In the final part of this work, we propose a framework that reflects these elements in a visual approach that highlights the activity-centred character of the framework as well as the emergent character of the implementation process itself.

KEYWORDS
digital tools, digital transformation, higher education, strategic processes of institutional change, systematic literature review

Abstract

La implementación de herramientas y procesos digitales en las Instituciones de Educación Superior (IES) como actividad emergente depende de las relaciones sociomateriales entre los factores institucionales que interactúan dinámicamente entre sí. Este artículo explora de manera sistemática a través de una revisión de la literatura algunos de los estudios publicados más relevantes y actualizados para identificar los 'factores importantes' a considerar para la implementación de herramientas y procesos digitales en las IES. El objetivo del artículo es convertir estos factores, concebidos inicialmente como condiciones o características previas de las instituciones o de las personas, en una lista de elementos estratégicos que deben ser impulsados por los equipos de dirección de las IES para promover una mejor implementación de herramientas y procesos digitales en sus instituciones. En la parte final de este trabajo, proponemos un marco que refleja estos elementos en un enfoque visual destacando el carácter centrado en la actividad del marco, así como el carácter emergente del propio proceso de implementación.

1 | INTRODUCTION

The implementation of digital technologies in Higher Education Institutions (from here on, HEIs) has been a challenge for societies for decades and occupies—and worries—our institutions, to the point of becoming the focus of initiatives at many different levels (Alexander et al., 2019; Hodges & Prater, 2014). From management and administration to teaching and learning processes, the advancement of technologies has resulted in changing the structure of institutions and the work of its members (Jackson, 2019). There have been changes concerning many aspects in the institutions: digital tools can inform teaching and policy decisions, communication tools enable professional collaboration between stakeholders, and education is evolving for the digital age (Abad-Segura et al., 2020).

For a long time, HEIs have acted as a sort of innovation labs that have tried to introduce technologies at many different levels and processes, with a variety of results, some of them desirable and some of them not (Castañeda & Selwyn, 2018). The analysis that took place previous to the CoVid-19 crisis about the needs for a more transformational approach to digital implementation at HEIs pointed to the need of understanding better the socio-technical imaginary related to technology, that understands the digital paradigm as something in permanent change and as a socio-material reality (Adell et al., 2018).

Digital transformation processes that started before the CoVid-19 crisis have evidenced that there are many different approaches to institutional change (Garcez et al., 2022). Nevertheless, most of them demonstrated a lack of systemic character, even if 'digital education' together with some aspects of 'eGovernance' are actually included in some digital implementation plans (Castañeda et al., 2022). Although there is a great deal of data, reports and

papers that show the critical investments made by HEIs to foster some aspects related to 'digital transformation', most of these efforts are still just focused on technology investments and do not consider other aspects that are essential for real changes (Abad-Segura et al., 2020; Czerniewicz, 2020).

The CoVid-19 crisis did not just increase those concerns, but rather made them more profound and wide. The CoVid-19 lockdowns have exposed everybody in HEIs to the experience of using technologies, not just for teaching and learning but also for managing, researching and even for finding virtual mobility opportunities (Rajagopal & Mateusen, 2021). Digital transformation processes have turned from a desirable horizon to an unavoidable reality in just over a year -firstly in an emergency mode but lately in a more long-term perspective (Bozkurt et al., 2020; Hodges et al., 2020). Actually, what this crisis has shown to our HEIs is that, even if many steps have been taken in digital-tool implementation at the universities (specially in provision of technologies), many crucial appropriation processes of those technologies are still incomplete or only just beginning to develop (Núñez-Canal et al., 2022). In addition, if HEIs are not aware enough of the relevance of getting in control of those transformations, the adoption of technologies could be essential but also traumatic, taking into account a missing general approach to innovation, poor pedagogical perspectives, inequality and danger of privatization (Beetham et al., 2022; Bolin, 2022; Williamson et al., 2020; Williamson & Hogan, 2020).

But how to guarantee the best conditions for implementing digital transformation in HEIs? There are some models in the literature that try to explain what are the factors that impact on the success of technological implementations, such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Technology Acceptance Model (TAM) (Davis et al., 1989), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2012), the Innovation Diffusion Theory (IDT) (Lee & Tsai, 2011), including some more recent proposals, such as the Awareness Incentives Demand and Support (AIDS) (Asabere et al., 2017) or the digital transformation and academic entrepreneurship (DT-AC Framework) (Garcez et al., 2022).

The wide majority of those proposals are focused on what are the conditions that any institution must have to implement digital elements and, consequently, what factors guarantee success or act as barriers to the process. According to these models, the responsibility for the success or failure of the implementation lies in the previous conditions of the institution either the characteristics of people that intervene. Implementing digital does not appear in these models as a strategic process that creates the conditions to integrate the use of technologies, but as a mere application of a treatment under certain conditions. These models understand the conditions of the institutions as static and, to a certain extent, immutable, and not as factors to be fostered to promote a better implementation, which would be a more situated and proactive perspective.

Looking at recent literature, it became clear that no systematic review on important factors for the implementation of digital tools and processes in HEI found from a holistic point of view, but that the focus was on partial aspects such as eGovernance or technology investments. To the best of our knowledge, a systematic review presenting a more holistic picture of appeared to be lacking, and the reviews available analize the factors, but do not go in deep how the factors are reunited or what are the epistemic conceptions around the crucial topics (what is the University nature and goals, what is education, etc.) behind those proposals (Fitzpatrick, 2019; Goodyear, 2022).

Alternatively, this study understands the implementation of digital tools and processes in HEIs as an emergent activity (Goodyear et al., 2021; Yeoman, 2018) that depends on the sociomaterial relationships between institutional factors that dynamically interact with each other and that could be improved, fostered and changed during the process (Connell, 2019). Under this perspective, HEIs are systems that have the power of promoting the better implementation of digital tools, instead of passive mere recipients of pre-conditions to improve this implementation, and the factors and conditions that interact in the HEI development process should be systematized to contribute to create a guiding list of possible policies to foster this implementation, but which does not forget the educational aspect of the HEIs (Papadimitriou, 2020).

It seems that for a deep analysis such the one is needed, the traditional approaches to systematic literature reviews are not entirely efficient and should be desirable to explore other approaches (Grant & Booth, 2009).

Therefore, this article systematically explores—flexibly but systematically—some of the most relevant and updated literature to identify the 'important factors' to be taken into account when implementing Digital tools and processes in HEIs. For doing so, this paper analyses some of the recent literatures that focus on the implementation of ICT in HEIs, from an institutional point of view, takes the factors identified as crucial, and systematizes them as a strategic list of elements that should be used by the HEI leadership teams as goals to achieve in order to promote the desired changes during the implementations of digital tools and processes.

The ambition of this paper is not to carry out another traditional review summarizing the results of previous work, but to try to take advantage of the work of these previous analyses to reconstruct a model that allows us to understand the factors that converge in the digital transformation processes of HEIs in a new way. This holistic focus that considers HEIs as a development system depending on factors to foster but able to be dynamically empowered, rather than one conditioned by characteristics of the organization and its members themselves, represents the radical novelty of this paper.

2 | METHOD

This study started from the perceived need for a change of perspective into a more proactive strategic vision regarding the implementation of digital technologies and dynamics in HEIs and the factors that condition them.

Therefore, for studying what are the key factors referred to as important in the implementation of processes and technologies derived from the use of technologies in HEIs, the research team decided to do an exploration of the specific papers that reflect processes of integration of ICT or digital structures, dynamics or tools in HEIs.

The exploration was done carrying out a systematic—but limited—literature review (Booth et al., 2012); it means the review reduced its scope to benefit to go deeper in the analysis (Grant & Booth, 2009). The review used as principal search system the Web of Science –including the Web of Science Core Collection, Medline and all the databases offered by the main WOS search engine –, understanding that this search system will include not only educational papers, but generalistic papers (including some from management or other approaches) and that it is 'well-suited to evidence synthesis in the form of systematic reviews' (Gusenbauer & Haddaway, 2020, p. 208). Moreover, the Social Sciences Citation Index (SSCI) database, included in WOS, is one of the most recognized databases indexing core journals in the social sciences.

The search string used was as follows, without any time limitation: TOPIC: (integration or implementation) *AND* TOPIC: (digital or ICT) *AND* TOPIC: ('higher education' or university) *AND* TOPIC: (institutional) *AND* TOPIC: (factors or strategy). In the first phase of identification, 106 documents were obtained from WOS database. Each document was reviewed by two researchers, and in the event of doubt, another researcher was asked to review it. By reading the title and abstract, they excluded a total of 75 documents, according to the previously agreed inclusion and exclusion criteria (Table 1).

Thirty-one papers were sought for retrieval, and those papers unable to be found on the Internet (6) were excluded. In the full-text screening, the papers that did not identify implementation factors (2) were excluded. The entire flow diagram is summarized in Figure 1.

The main questions regarding the implementation of ICT and Digital tools at HEIs that guided this exploration—which coincided with our research questions—were:

> *RQ1: What topics were included in the literature review of the analysed papers?*
> *RQ2: What topics did the results of the analysed papers include?*
> *RQ3: What general crucial factors did the analysed papers highlight?*

Twenty-three papers in total were analysed, with a range of publication between 2009 and 2020. From them, just two papers were exclusively theoretical approaches (Anthony et al., 2020; Cochrane et al., 2017), and the others included experiences from a wide open plethora of international institutions from Argentina

TABLE 1   Inclusion and exclusion criteria

| Inclusion	Exclusion
Higher Education Institutions	From other educational levels or study cases with less than one university or a complete centre (faculty or research centre)
Studies that identified implementation factors of digital technologies	Studies that did not identify implementation factors of digital technologies
Written in English, Spanish, Catalan, Portuguese or Italian	Written in other languages
With Internet access from the University	No Internet access from the University
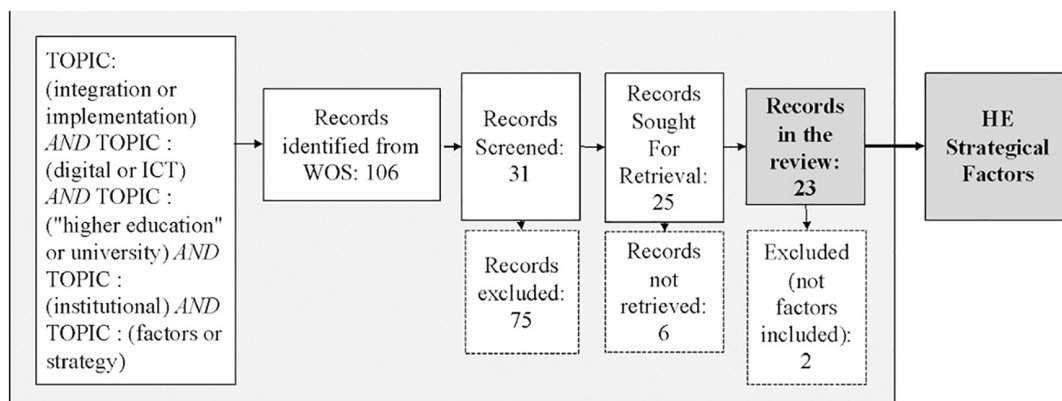
FIGURE 1   Review flow diagram

(Grasso et al., 2019), Australia (Birch & Burnett, 2009), Canada (Taylor et al., 2018), Chile (Arancibia et al., 2019), Croatia (Zuvic-Butorac & Nebic, 2009), China (Fong et al., 2014), Denmark (Haase & Buus, 2020), Ethiopiala (Seifu, 2020), Fiji (Kumar & Daniel, 2016), Jordan (Abusalim et al., 2020), Kazjastan (Vyortkina, 2014), Nigeria (Alabi & Mutula, 2020), Portugal (Correia & Martins, 2011; Sanches, 2016), Saudi Arabia (Naveed et al., 2017), Spain (Correa & Paredes, 2009; Marcelo & Yot-Dominguez, 2019), Turkey (Altun et al., 2011) and USA (Coles et al., 2020); or from collections of countries as in the paper leaded by Altinay et al. (2019), where they analysed data from institutions from Turkey, Spain, Sweden, India, Egypt and Canada, or the paper signed by Murphy and Farley (2017) that includes data from China, Japan, Republic of Korea, Malaysia, Indonesia, Laos PDR, Cambodia, Singapore, Vietnam, Pakistan, Russia, Australia, New Zealand, Papua New Guinea, Samoa and Fiji, which gives the study a clear global perspective.

In this case, the final sample was analysed in a two-cycle coding process, with an initial InVivo coding strategy to identify the elements of each RQ in the papers, followed by a second cycle of coding based on an Axial Coding that relates the categories extracted from the aspects coded in the first cycle and specifies the properties and dimensions included in them (Saldaña, 2015). Results are presented with a metanarrative review approach (Zawacki-Richter et al., 2020).

In the first coding cycle 38 factors were identified. This included successful factors as well as institutional barriers/inhibitors mentioned in the papers. We extracted them either from the previous literature review or theoretical framework or the results and conclusions of the studies. In the second cycle of coding, we identified six big categories that differentiate the nature of the factors. The 38 factors classified in the six categories: Physical Infrastructure, Policy Infrastructure, Training Topics, Training Strategies, Stimulus policies and Communication.

3 | RESULTS

The results of the literature exploration are presented below following the metanarrative guided by the research questions already proposed. After analysing these papers we suggest 38 crucial factors for a successful digital implementation in higher education derived from the literature review.

3.1 | What topics were included in the literature review of the analysed papers?

From the 23 papers analysed, nine of them (39.1%, almost a fourth) do not include any reflection or data about the topics that influence the implementation of technology in HE on its literature review (Altun et al., 2011; Anthony et al., 2020; Correia & Martins, 2011; Grasso et al., 2019; Haase & Buus, 2020; Murphy & Farley, 2017; Sanches, 2016; Vyortkina, 2014; Zuvic-Butorac & Nebic, 2009).

From those that did it, it is interesting to note that, although all these studies focus on the implementation of technology-based processes in HE, it is possible to detect to a certain extent the expectations of the papers by reviewing the literature they are based on. On the one hand, some papers start from searching for "success factors" for implementations (e.g., Cochrane et al., 2017). On the other hand, there are other four that emphasize the search for barriers to implementation, and the majority of their literature review is focused on the "lacks" to be avoided in an implementation process (Birch & Burnett, 2009; Kumar & Daniel, 2016; Naveed et al., 2017; Seifu, 2020).

Many studies highlight that the previous literature remarks the weakness of the reasons that led an institution to undertake the introduction of digital technologies in their models. They highlight the simple approach of some institutions to develop, monitor, and evaluate the implementation process. Three of them mentioned that some HEIs implemented blended-learning models 'just because they have some material available for students online' (Abusalim et al., 2020, p. 1204), without a careful previous curricular analysis (Birch & Burnett, 2009) or deep understanding of the teaching conditions (Kumar & Daniel, 2016). This simple motivation and lack of profound ideas (Seifu, 2020) consolidate a superficial approach to the digital technology integration that "integrated [the technology] in ways which reinforce the status quo rather than bringing innovation in teaching" (Kumar & Daniel, 2016, p. 2). For their part, Fong et al. (2014, p. 8) stated that going beyond the registration of "surface features" and exploring the "why" and "how" the implementation process happened are crucial for the monitoring and the evaluation.

Two papers hold on the idea that good technological provision and infrastructure are fundamental for digital implementation. It is mentioned as one "essential component" in Abusalim et al. (2020, p. 2), as a "necessary condition", a "determinant" for it (Seifu, 2020, p. 4). The lack of an adequate or inadequate technological provision is also remarked as an obstacle (Alabi & Mutula, 2020; Birch & Burnett, 2009; Kumar & Daniel, 2016; Naveed et al., 2017; Taylor et al., 2018) and is pointed as a factor that makes instructors feel that their online or blended approaches to HE are worse than their face-to-face ones (Taylor et al., 2018). One of the studies highlight the importance of the high cost of this technological staff as a problem for institutions (Alabi & Mutula, 2020), and two emphasize the relevance of providing technology adequate to the conditions of the context, not the best either the most advanced, the most adequate (Seifu, 2020), observing that "institutions with limited resources should start small" (Birch & Burnett, 2009, p. 6).

Six articles allude to how the literature stresses the importance of the existence and stability of the technical, pedagogical and administrative support for participants (Altinay et al., 2019; Birch & Burnett, 2009; Coles et al., 2020; Kumar & Daniel, 2016; Seifu, 2020; Taylor et al., 2018), and many times, associated with this, the importance of precise implementation planning, policies and strategies (Arancibia et al., 2019; Birch & Burnett, 2009; Cochrane et al., 2017; Kumar & Daniel, 2016; Seifu, 2020) and the need of creating communities of support (Cochrane et al., 2017).

The problem of increasing the workload of participants in the implementation is remarked in the literature reviews of four papers (Abusalim et al., 2020; Taylor et al., 2018). In some cases, previous literature declared that this overload of work would result in less time for other activities—such as research—to some teachers (Birch & Burnett, 2009), or poorer integration of technologies into teaching (Kumar & Daniel, 2016).

Consequently, in four of the sources reviewed by the papers, it is not strange that the importance of motivation mechanisms is highlighted as rewarding and recognition (Birch & Burnett, 2009; Coles et al., 2020; Fong et al., 2014; Seifu, 2020), and one also remarks the importance of finding intrinsic motivation mechanisms to implement (Fong et al., 2014).

One of the main topics stated in almost every paper is the importance of participants' training. Faculty skill training—technical as well as pedagogical—is uttered as one of the most significant variables for digital implementation (Abusalim et al., 2020; Kumar & Daniel, 2016; Seifu, 2020; Taylor et al., 2018). In this regard, the literature of six papers must emphasize the relevance of not training only using workshops, but implementing different training models, such as mentoring programmes, peer-to-peer programmes, one-to-one assistance, good practice documentation and identification of faculty champions, among others (Birch & Burnett, 2009; Cochrane et al., 2017; Coles et al., 2020; Correa & Paredes, 2009; Fong et al., 2014; Taylor et al., 2018). Additionally, training is underlying as a success factor not just for increasing skills, but for becoming familiar with ideas and promoting the confidence and willingness of participants to implement the programmes (Fong et al., 2014; Kumar & Daniel, 2016; Marcelo & Yot-Dominguez, 2019), and also for increasing the perception of easiness, usefulness and relevance of the implementation itself, which are essential factors for guaranteeing the implementation (Alabi & Mutula, 2020; Arancibia et al., 2019; Fong et al., 2014; Marcelo & Yot-Dominguez, 2019; Seifu, 2020; Taylor et al., 2018).

Finally, we would like to highlight that in the literature review of the revised papers, the importance of topics related to students is remarked. Three of them utter the importance of student-centred approaches to teaching technology integration (Abusalim et al., 2020; Kumar & Daniel, 2016; Marcelo & Yot-Dominguez, 2019), and other five emphasize the increase in students' participation and satisfaction (Abusalim et al., 2020; Birch & Burnett, 2009; Cochrane et al., 2017; Naveed et al., 2017; Taylor et al., 2018).

3.2 | What topics did the results of the analysed papers include?

After the authors' own research, they identified certain topics. Anthony et al. (2020) suggest that the institution should provide the central technological infrastructure—hardware and software—necessary for the digital implementation. Accounting for a proper infrastructure and its maintenance seems to be a common conclusion among the studies (Altun et al., 2011; Grasso et al., 2019; Murphy & Farley, 2017; Seifu, 2020). Authors, such as Vyortkina (2014), also consider the importance of appropriate off-campus access, taking into account different contexts.

Alabi and Mutula (2020) and Fong et al. (2014) suggest that effort expectancy is one of the variables that significantly influence academics' use of ICTs in teaching. Indeed, Seifu (2020, p. 12) supports the fact that 'the integration of ICT in teaching-learning practices depends on the relative advantage, compatibility, visibility, ease of use, results demonstrability and trial ability'. This is linked to facilitating conditions, which is also suggested as one of the key topics, which means accounting for a supportive environment to reduce any difficulty in the adoption of technology and its use in learning institutions (Alabi & Mutula, 2020; Coles et al., 2020; Correia & Martins, 2011; Marcelo & Yot-Domínguez, 2019; Seifu, 2020; Zuvic-Butorac & Nebic, 2009). This implies accounting for specific qualified personnel or a staff unit to implement it (Altun et al., 2011; Correia & Martins, 2011; Grasso et al., 2019; Seifu, 2020; Taylor et al., 2018; Vyortkina, 2014).

To make digital implementation sustainable, several ethical and legal aspects should be taken into consideration, such as intellectual property rights (Anthony et al., 2020), private, safe and responsible use, and ensuring equity for disadvantaged populations (Murphy & Farley, 2017).

Participants in Altun et al.'s (2011) study said that a technology plan is an important component for an effective digitalization, as the integration of technology would be successful only if it is considered an essential component of the wider institutional strategies for educational innovations (Altun et al., 2011; Fong et al., 2014). However, prior to its integration, it is important to identify the problems and needs. To this, it is added that the institution should provide clear policies, better structure, accessible facilities and a more organized strategy (Anthony et al., 2020; Murphy & Farley, 2017).

Financial support and change budget should also be included in these plans (Murphy & Farley, 2017; Naveed et al., 2017; Sanches, 2016) and should consider the socio-economically disadvantages of the students (Murphy & Farley, 2017). Together with a clear strategy design, a clear leadership from the institution is considered one of the key topics (Birch & Burnett, 2009). This implementation should be periodically evaluated, which would provide continuous feedback for improvement (Anthony et al., 2020; Vyortkina, 2014).

Management of the resources is also considered a policy key topic. This includes actions such as a proper time management that avoids time overloads (Birch & Burnett, 2009; Correa & Paredes, 2009; Fong et al., 2014; Grasso et al., 2019; Vyortkina, 2014) and the development of reusable resources (Birch & Burnett, 2009; Correa & Paredes, 2009; Vyortkina, 2014).

One of the most mentioned key factors has been the need of training (Correa & Paredes, 2009; Kumar & Daniel, 2016; Marcelo & Yot-Dominguez, 2019), mainly because the more trained the faculty staff is, the easier and more accepted the implementation will be (Naveed et al., 2017; Seifu, 2020). This is linked to the need of raising awareness of the use of the technologies (Altun et al., 2011; Fong et al., 2014; Grasso et al., 2019; Marcelo & Yot-Dominguez, 2019). Teachers should not be the only one receiving training, but also other stakeholders such as the students or the administration staff (Correia & Martins, 2011; Fong et al., 2014).

Different training topics are suggested as needed, such as basic use of technology, mainly for beginners (Birch & Burnett, 2009; Murphy & Farley, 2017; Vyortkina, 2014), learning management systems (Coles et al., 2020); and pedagogical strategies and application of technology (Anthony et al., 2020; Murphy & Farley, 2017; Vyortkina, 2014).

Also different types of training were identified, including general workshops, peer support (Kumar & Daniel, 2016; Zuvic-Butorac & Nebic, 2009) and one-to-one or private meetings to address particular problems (Coles et al., 2020; Fong et al., 2014; Taylor et al., 2018). The latter may require the presence of mentors, role models and 'technology champions' (Birch & Burnett, 2009).

The design of the training should take into account the faculty needs and their level of proficiency (Anthony et al., 2020; Birch & Burnett, 2009; Coles et al., 2020; Sanches, 2016). This means that staff should be involved not only in the design of the implementation, but also of their training (Correa & Paredes, 2009). Correia & Martins suggest that the special trained unit should be the one in charge of this training.

As regards stimulus strategy, according to Anthony et al. (2020), the institution should also provide the enthusiasm and cooperation for digital integration. This enthusiasm and motivation can be achieved by different types of mechanisms (Seifu, 2020), such as rewards (Altun et al., 2011; Birch & Burnett, 2009; Correa & Paredes, 2009; Marcelo & Yot-Dominguez, 2019), financial incentives, tenure and promotion plans (Anthony et al., 2020; Correa & Paredes, 2009; Vyortkina, 2014) and time release (Coles et al., 2020; Naveed et al., 2017). Taylor et al. (2018) consider that professors who decide to make the transition into blended learning could become the in-house leaders.

One of the most common key topics pointed out by the authors was to define clearly digitalization and its implications for the institution (Anthony et al., 2020; Haase & Buus, 2020; Taylor et al., 2018), as it makes it easier to set a strategy when the whole community has a clear definition and/or frame of what is expected. Indeed, some authors go beyond and suggest that all the decisions should be taken together in order to account for the agreement and involvement of all the shareholders (Fong et al., 2014; Grasso et al., 2019; Sanches, 2016).

The collaboration between departments (Murphy & Farley, 2017) and stakeholders (Altun et al., 2011; Anthony et al., 2020) and to keep them informed (Taylor et al., 2018) are key for HEI digitalization, as it contributes to the above-mentioned supportive environment. Indeed, one of the mentioned successful factors

is the commitment of and support from the administration staff (Altun et al., 2011; Seifu, 2020). The other large group of stakeholders, whose collaboration should be required and encouraged, is the students (Altun et al., 2011). This would include enhancing students' ICT skills, e-learning knowledge and motivation (Naveed et al., 2017; Vyortkina, 2014). An important topic is considering students' demographic and social context for their integration and involvement (Altun et al., 2011; Murphy & Farley, 2017). Lastly, also their satisfaction should be taken as an indicator of success (Abusalim et al., 2020; Marcelo & Yot-Dominguez, 2019), together with their expectations and the identification of potential gaps between available services and technologies and student learning needs (Murphy & Farley, 2017).

At an institutional level, dissemination of good practices is identified as a key topic (Grasso et al., 2019; Zuvic-Butorac & Nebic, 2009). According to Correia and Martins (2011) and Vyortkina (2014), a specific unit should be in charge of this task.

3.3 | What general crucial factors did the analysed papers highlight?

In the third research question we have analysed the crucial factors that obstruct or facilitate the implementation of technologies in higher education, according to the different papers analysed.

Some of the crucial factors were related to an institutional level. That is, crucial factors related to ICT infrastructure and installations, resources and support, ICT policies, or teacher training (Birch & Burnett, 2009; Seifu, 2020). In this sense, one of the main obstacles for universities to have adequate IT infrastructures, as well as to train teaching staff, has to do with financial resources and the time devoted to the implementation, of which it is difficult to know which is more important (Abusalim et al., 2020). For Coles et al. (2020), there is a relationship between the integration of ICT in education and the culture of the organization, and in this line, support structures and systems or the allocation of support resources are additive to the positive organizational culture towards online education. Also, the technical support provided at the institutional level influences the perception of usefulness and ease of use (Fong et al., 2014).

At the individual level, the availability of technological resources, as well as teachers' positive attitudes towards ICT use, perceived usefulness and perceived ease, is important elements in their integration into teaching (Alabi & Mutula, 2020; Arancibia et al., 2019). However, in addition to this, as Seifu (2020) highlights, research has shown that teachers' digital competence is a key factor in their effective use, and therefore a predictor of ICT integration in teaching. Conversely, according to Alabi and Mutula's (2020) findings, factors such as social influence do not have a significant influence on the use of ICT in teaching.

In terms of pedagogical critical factors, Murphy and Farley (2017) suggest four levels: (1) learning, that explores learning expectations from the student's perspective; (2) instructional, that examines educators' practices and perspectives; (3) technical, that identifies the supporting infrastructure and availability of supporting resources; and (4) organizational, that concerns institutional policies and practices that support or hinder implementation.

According to Birch and Burnett (2009), pedagogical motivations are determinant in engaging students by making learning more enjoyable and providing a richer, more relevant, meaningful, or applicable learning environment. Therefore, there is a need to support, value and reward research focused on learning and teaching and to consider the time invested by teachers in developing and enriching learning environments.

In addition to the provision of the necessary resources and pedagogical and individual factors, Kumar and Daniel (2016) argue that successful implementation and adoption depend on the ability to address contextual and cultural dynamics, as factors are often associated with the environment and the attributes and preferences assigned to these technologies. According to Naveed et al. (2017), culture, social life or living standards have a tremendous influence on the success of ICT integration in higher education, and this influence can vary considerably from one part of the world to another.

4 | DISCUSIONS

The main objectives of this article were to systematically explore the literature to identify the 'important factors' to be taken into account when implementing Digital tools or processes in HEIs and systematize a strategic list of elements to promote digital implementations in HEIs.

Therefore, the first part of the study reflects the conclusions derived from the literature review according to our three research questions, as it follows.

Regarding the theoretical background of the analysed studies—the first research question—a considerable number of articles focus on the barriers more than on the success factors included in the processes of introducing digital technologies in HEI plans reflected in the literature. The majority of the analysed research is based on ad-hoc models, while a smaller number of studies were based on well-known models of ICT integration (TAM, UTAUT, among others). Most of the papers highlight the superficial reasons that motivate implementations of digital all over the institutions. It is worth to mention that most of the theoretical background of the analysed literature remark the relevance of seven crucial aspects to guarantee the quality of the implementation: (1) a profound curricular reflection which would mirror in a clearer monitoring of the implementation process; (2) adequate technological provision and infrastructure; (3) stability and good work conditions for the support team; (4) avoiding the working overload and overtime of participants of the implementation; (5) motivation mechanisms; (6) participant's training and (7) students' engagement with the process.

In relation to our second research question—success factors and barriers to implementation identified in the studies—several key factors were identified. These factors can be divided into five categories: infrastructure, policy, training, stimulus strategies and communication. Regarding infrastructure, the identified key factors were related to the creation of specific infrastructure for the changes, accounting for specific qualified personnel and/or units and differentiating the changes by contexts. Regarding policy, the following factors were identified: the need of analysis of the strategy, clear institutional leadership, planning and coordination, integration of the policy or strategy into the general politics of the University, a management strategy for the resources to avoid overloading, generating reusable resources and generating a research agenda strategy in continuous evaluation. In terms of training, different strategies were identified: individual assistance approaches, peer-to-peer initiatives (e.g., mentoring), workshops, communities of practice, study groups and programme development. With regard to training topics, the different areas of digital competence in teaching are highlighted, as well as reinforcing its importance, usefulness, usability and metacognition. On incentive strategies, these include extrinsic motivation strategies, such as certificates, promotion assets, hiring conditions, as well as intrinsic motivation strategies, such as the creation of mutual recognition channels between teaching staff and students. As for communication, this category includes all the key factors related to the decision making of the university community, such as the election of framework and strategy to adopt, the co-redefinition of concepts by the community, informing and taking into account the stakeholders and disseminating good practices.

Regarding the third research question, many factors were identified as crucial for the implementation of digital strategies in HEIs. Some of them were more related to the institutional level, such as infrastructure and installations, resources and support, ICT policies, or teacher training; some others were more related to the participant's individual level, such as personal attitudes towards ICT or perceived usefulness. Some factors identified as crucial were more related to a pedagogical level, such as learning expectations, instructional practices, or technical and organizational capabilities, and finally, some others were more related to the contextual conditions of the implementation, associated with the environment and cultural dynamics that strongly influence the success of digital integration.

As the previous paragraphs show, there are many elements that coincide in different RQs, as well as in many different papers; nevertheless, it is remarkable that in the three types of elements analysed (theoretical background, success factors and crucial factors) we have not found elements included in contradictory ways on different papers.

5 | LIMITATIONS AND STRENGTHS

Nevertheless, the present study has a number of limitations. Firstly, it should be noted that it focused only on the analysis of the Web of Science database, including the Web of Science Core Collection, Medline and all the databases of WOS. In future studies, other databases should be included, such as Scopus or ERIC, which is very common in educational sciences. Also, the incorporation of other sources should be assessed, as in many cases these types of publications tend to be reports and grey literature not published in indexed scientific journals. However, although we have only used the Web of Science database, it should be noted that it is the most relevant at the international level in terms of research. Therefore, the limited number of studies analysed may also mean the absence of research on the implementation of digital strategies in universities, which often ends up being published in other types of reports and grey literature.

Secondly, this research has been conducted on the basis of studies on the integration or implementation of digital strategies in higher education and, while these and related factors have been analysed in depth, the effectiveness of these models has not been analysed. Similarly, the present model was not based on a hypothesis for its validation, nor has the framework generated been verified. In this sense, we believe that this model can guide the design of our own institutional policies and the evaluation of existing policies. We believe that this will not only allow the model to be validated, but will also contribute to the improvement of institutional digital strategies, based on data and documented evidence, and that will have an impact on the crucial factors and overcome existing barriers.

6 | CONCLUSIONS DERIVED FROM THE ANALYSIS

As we have previously stated, this manuscript has the ambition of reconstructing a model –based on the factors identified in the studies analysed—that allows us to understand the factors that converge in the digital transformation processes of universities in a new way.

In total, after the exploration we have identified 38 factors that, according to the literature review and its theoretical background, condition the implementation of digital tools and processes in HEIs. The second objective of this paper aimed to systematize these factors in a strategic list of elements. To do so, we have reformulated the 38 factors into a neutral statement and classified them into six strategic areas that would help leaders to use them in their implementation plan and development:

- AREA 1 Infrastructure: for those factors related to the material and technological conditions and which include:

  - Important differentiation by context (not only University context but teachers' and students' context)
  - Technological strategy/policy in campus and online (off-campus)
  - Specific infrastructure for the changes
  - Specific personal (qualified personnel) and units for this (to avoid overwhelming the resources)
  - Support Initiative

- AREA 2 Policy: for intellectual and regulatory factors, such as:

  - Need analysis strategy
  - Institutional CLEAR leadership
  - Clear strategy /policy: planning & coordination (priorities) based on a CLEAR definition of WHAT (see Communication)
  - Integration of the policy or strategy in the general politics of the Uni

- Mirroring of the institutional strategy in the centre's strategy
- Policies to renew academic, institutional & scientific practices (clear institutional policies, processes, protocols and standards)
- Time management strategy (increasing time for the new/different tasks, avoiding time overloading or reassign to time to research/promotion)
- External collaboration (other institutions)
- Students role in the implementation
- Research agenda strategy (widespread the adoption, following the development, clear deliverables and checkpoints, -tangible- goals), and evaluation (quality and satisfaction, why and how, not only what)

- AREA 3 Training topics: that must be approached to know better the details about the implementation and will include:

  - Key concepts /Framework of the implementation
  - Basic Skills associated with the implementation
  - Importance of the implementation
  - Implementation Easiness
  - Usefulness of the implementation
  - Educational background
  - Metacognition (strategies to continue learning) about the implementation

- AREA 4 Training Strategies: Variety of participants' professional development to foster the implementation:

  - One-to-one assistance
  - Workshops
  - Communities of practices/learning
  - Differentiated by area of knowledge/centre
  - Faculty champions, mentors P2P training
  - Multisector (teachers, students, admin) debates and sessions
  - Development programmes/itineraries

- AREA 5 Stimulus Strategies:

  - Rewarding mechanisms (time, money recognition, promotion, extra payment, stipends, teaching time release and funding)
  - Motivation to teachers & students and between them (teachers feel motivation from students)

- AREA 6 Communication:

  - Increasing of awareness of infrastructure and importance of the implementation
  - Clear definition of the concept/framework/strategy to adopt
  - Community co-redefinition of concepts
  - Communication strategy about the project
  - Informing all the stakeholders
  - Exemplars and Good practices (by disciplines/areas of knowledge)
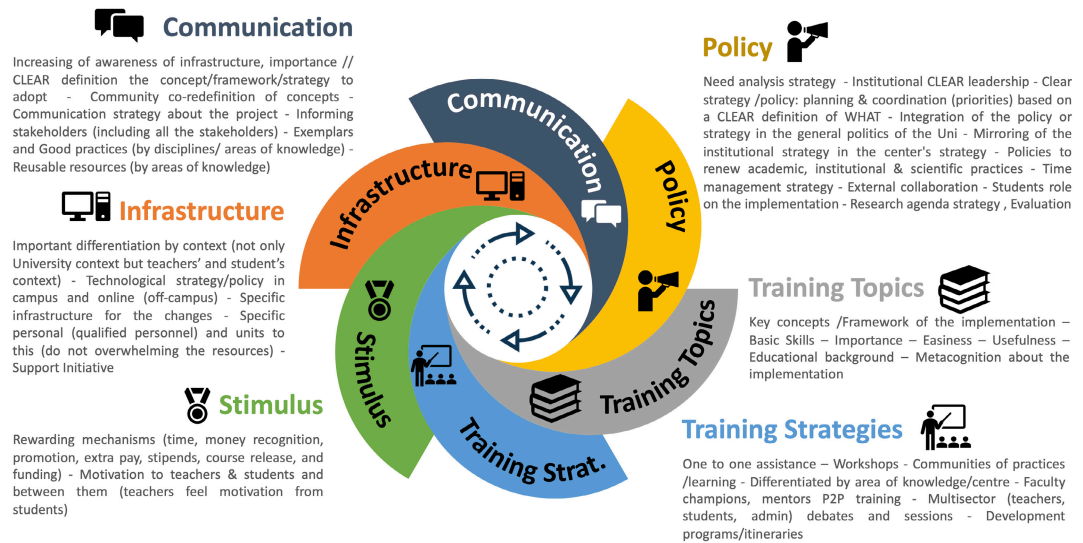 - Reusable resources (by areas of knowledge)

Communication

Increasing of awareness of infrastructure, importance // CLEAR definition the concept/framework/strategy to adopt - Community co-redefinition of concepts - Communication strategy about the project - Informing stakeholders (including all the stakeholders) - Exemplars and Good practices (by disciplines/ areas of knowledge) - Reusable resources (by areas of knowledge)

Infrastructure

Important differentiation by context (not only University context but teachers' and student's context) - Technological strategy/policy in campus and online (off-campus) - Specific infrastructure for the changes - Specific personal (qualified personnel) and units to this (do not overwhelming the resources) - Support Initiative

Stimulus

Rewarding mechanisms (time, money recognition, promotion, extra pay, stipends, course release, and funding) - Motivation to teachers & students and between them (teachers feel motivation from students)

Policy

Need analysis strategy - Institutional CLEAR leadership - Clear strategy /policy: planning & coordination (priorities) based on a CLEAR definition of WHAT - Integration of the policy or strategy in the general politics of the Uni - Mirroring of the institutional strategy in the center's strategy - Policies to renew academic, institutional & scientific practices - Time management strategy - External collaboration - Students role on the implementation - Research agenda strategy , Evaluation

Training Topics

Key concepts /Framework of the implementation – Basic Skills – Importance – Easiness – Usefulness – Educational background – Metacognition about the implementation

Training Strategies

One to one assistance – Workshops - Communities of practices /learning - Differentiated by area of knowledge/centre - Faculty champions, mentors P2P training - Multisector (teachers, students, admin) debates and sessions - Development programs/itineraries

FIGURE 2 Crucial elements of implementation of digital tools and processes

What the literature review also reveals is that those 38 elements (social and materials), organized in the six strategic areas, are intimately interrelated (Figure 2). Those key factors should also be considered as a natural consequence of an institutional, systemic digital approach that engages all the institution stakeholders. They dynamically interact with each other—also during the implementation—and, consequently, could be improved and fostered to enhance the conditions of the implementation itself. Therefore, they could be considered as strategic areas that would be taken into account by the leadership teams of the implementation processes at HEIs as a framework to analyse and design processes of implementation, inspired by another design and analysis activity-centred framework, such as the Activity-Centred Analysis and Design Framework (ACAD) from Goodyear et al. (2021) that is focused on enriched learning experiences.

7 | PRACTICAL IMPLICATIONS AND FUTURE DIRECTIONS

The structure and visualization of the factors grouped in these areas, presented in Figure 2, are intended to contribute to the holistic and relational vision that we have been alluding to since the beginning of this paper. It is not a list of factors that must be covered or resolved in order to digitally—or in any other way—transform a HEI, but rather a set of elements—a framework—that must be involved in a dynamic and interrelational development process that empowers the institution for this transformation. Transformation as a horizon, not as a point of arrival, the factors as spaces for development, not as conditions, and the institution as an interrelated whole, not as a patchwork.

This list of crucial elements of implementation of digital tools and processes in HEIs constitutes an adequate and useful tool for the management of learning and teaching in Higher Education. It would help managers and directives in HEIs to promote more holistic strategical changes that engage more diverse stakeholders and participants in the change processes and avoid changes that are too ad hoc or do not adequately correspond to the institutional context in which they are implemented.

As reality is tough and complex, the design of this framework will remain open and flexible to be adapted to the reality of each HEI. Implementing strategical changes under a relational conception of the factors involved, conceiving factors beyond the aspects traditionally related to the implementation of ICT in HE—as the proposal

presented in this paper stands –, should achieve this goal. Therefore, the challenge from here on should be carrying out strategical processes of change based on relational frameworks like this, and document them adequately to be analysed properly in the next future.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the author(s).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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