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Digital Transformation and Technological Innovation on Higher Education Post-COVID-19

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Abstract: The university is an important pillar in sustainable development; however, COVID-19 imposed new dynamics that called for rethinking university praxis to achieve this mission, and although the systematization of good practices is a powerful mechanism for understanding educational success, this perspective of positive change has been little developed. Hence, the present study aimed to identify positive cores of faculty in their successful post-COVID-19 performance. A qualitative methodological approach was deployed, with the Netnography method, complemented with elements of positive psychology, appreciative inquiry, and management of formative potentialities. The online community consisted of 1238 university teachers from 10 Latin American countries, who participated for two months in an appreciative interview as an asynchronous journey of constructive proposals, for the active co-construction of post-COVID-19 success factors. The findings reveal multiple affirmative topics grouped into nine positive cores, identifying two target categories: digital transformation and technological innovation, as well as the processes directly associated with their dynamization. Finally, the epistemic implications of the findings in theory and practice, and their relevance in the creation of a formative agenda of positive change for Latin American Higher Education, are presented.

Keywords: digital transformation; technological innovation; digital literacy; digital engagement; digital competence; digital technologies; online community; virtual environments; ICT; COVID-19

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1. Introduction

Higher education is currently undergoing a process of digital transformation. Many of these changes originated with the COVID-19 pandemic, imposing a new dynamic in the way of thinking and doing education; not being able to attend classrooms in person made educational technology occupy a predominant place, becoming one of the essential factors for the sustainable development of higher education [1]. Hence, authors argue that "technology applied to education has become the most effective instrument for transforming the pedagogical model" [2] (p. 3); however, "the university needs to rethink itself in order to face a crisis that precedes the pandemic" [3] (p. 5). In this regard, a bibliometric analysis on the effectiveness of digital technology in education during the COVID-19 pandemic stands out [4], and although it consequently identified and classified the main thematic groups, all have been focused on the pandemic period itself, evidencing the need to develop other studies that address the projections and practices in the post-pandemic COVID-19 era.

Digital transformation is understood as the process of disruption and change where organizations use strategic responses to create value [5] (p. 118). This digital transformation is related to multiple actors, with the teacher as one of the central actors, because as explained by [6] "the figure of the teacher plays a key role in the integration of digital technologies in the teaching-learning process" (p. 1).

In relation to the above and recognizing that the determining variables for the appropriation of digital technologies from the context of teachers are attitude and self-efficacy [6], it is necessary to rethink a way to explore these positive cores of teachers. Hence, the present study follows the epistemological route of positive psychology and appreciative inquiry, emphasizing the management of formative potentialities of university faculty, thus transcending the deficit-based change perspective, and recognizing the relevance of a positive change perspective based on amplifying good practices, aspirations, hope, wisdom, creativity, future-mindedness, courage, spirituality, responsibility, and perseverance [7–9].

Many investigations have concluded that any educational change must involve technological innovation, pedagogy of competence, and emotional education [2], and the influence of empowering teachers as leaders in the implementation of ICT in schools is highlighted [10], hence the need to promote motivational springs, such as "creative self-efficacy, motivation for self-learning, self-confidence and psychological empowerment" [11] (p. 371), as a basis for promoting the scientific research leadership of the teachers for the transformation of the university context [12].

An important study by [3] expresses the need to rethink the university and establishes didactic principles that accompany the process of integration of digital technologies, because, as [13] argues, success in the application of technologies to education is not enough only with technological mastery, but also with pedagogical mastery and mastery of disciplinary content, all of which together make up the dialectical triad of TPACK.

The pandemic took education by surprise; university teaching was suspended. The almost immediate instrumental response was to rely on digital technologies to continue with the teaching tasks; however, the university has not taken advantage of this time to study the changes it needs to make to link up with the demands of 21st century society [3] (p. 3).

Hence, the present study is committed to a perspective of positive change, and taking into account the importance of teacher attitudes toward ICT in higher education for teaching and research [14], the objective is set to identify teachers' positive cores for their successful performance in the post-COVID-19 pandemic era, recognizing the relevance of learning from success in the use of digital technologies to drive educational transformation [15] while recognizing important aspects, such as ICT literacy and digital equity, in developing country contexts [16].

Recent research on Latin American university teachers demonstrated the urgency of managing positive mental health of teachers [11]; hence, the present study places special emphasis on this area and examines among the positive nuclei those affirmative topics related to socioemotional well-being. It is evident that distance education, even though it was an alternative to continue with classes in the pandemic, also had negative consequences for teachers, such as deterioration of health and emotional exhaustion, because their work–rest balance was altered; therefore, it is necessary to apply health practices when working in virtual environments [17]. This perspective continues to support a positive change model rather than a deficit-based change model; according to one study, the COVID-19 pandemic has provided an opportunity for education stakeholders to reflect on visions of healthy schools and how to better organize schools to support these visions, with the premise that the socioemotional well-being of teachers is important to the health of school organizations [18], which should be part of this teacher preparation for the virtual age [19] and should be included in the formative agendas of digital transformation [5].

2. Materials and Methods

For the present study, the methodological route of epistemic mapping [20] was used, which consists of 10 methodological aspects: 1.- Paradigm of scientific research, 2.- Research approach, 3.- Type of research, 4.- Type of study, 5.- Scope of the investigation, 6.- Method (design), 7.- Techniques and instruments for data collection, 7.1.- Procedures for data analysis, 8.- Theoretical methods, 9.- Population and sample (type of sampling), 9.1.- Ethical aspects, and 10.- Categories and subcategories.

To identify positive nuclei for digital transformation and technological innovation in higher education in the post-COVID-19 era, we proceeded to use the interpretive paradigm with a solid hermeneutic and dialectic basis that allows constructions of senses and meanings using hermeneutic techniques, and they were compared through a dialectic exchange [21]. In line with this, a qualitative approach was deployed whose focus was on the systematic interpretation of the contents of the applied appreciative interview, being a type of basic research that allowed the generation of new knowledge, and that did not consider a pre-established theoretical framework, but was shaped by the responses of the interviewees. Likewise, it is a cross-sectional study that considered the application of the appreciative interview technique in the period June–August 2022, achieving an explanatory scope. The main research method was Netnography (Netnography), a method specifically designed to study online cultures and communities [22], as part of this general method specifically assumes Active Netnography that provides the opportunity to conduct research that brings value and narrative continuity to online spaces [23]. In this sense, the participants of the different online communities contributed their perspectives in a space called "constructive propositions day" [8], so that it did not stand as a passive monitoring of online communities, but rather the actors of these communities were able to participate in co-creation. As [21] explains, "Active netnography involves the netnographer and other members of online communities contributing to an ongoing online conversation through the co-creation of mutual texts" (p. 8).

The main technique applied was the appreciative interview that was deployed as a constructive propositions journey, and the Atlas.ti software (version 8.0) was used for the content analysis, employing the theoretical method of analysis–synthesis that allowed the disaggregation and systematization of the discursive codes. The appreciative interview was applied online, consisted of three open-ended questions, avoiding preconceived ideas or dichotomous answers, and the three questions were designed for participants to openly express their projections about the teaching role for a successful performance in the post-COVID-19 era; as a dynamic component, the period that the interview was open was called "constructive propositions day", and participants were encouraged to share success stories and hopeful discourses based on their professional practice, as well as their longings and hopes. The thematic component did not anticipate any technical terms, such as technological innovation, digital transformation, and digital competencies, but these were emerging from the dialogic and co-participative analysis. The virtual portfolio had two phases, the individual response phase, where participants did not have access to each other's comments, and the collaborative phase, where they could interact and comment on each other's responses.

Based on the criteria of voluntariness, confidentiality, and anonymity, the participation of 1238 higher education teachers from 10 countries was achieved (Table 1).

Table 1. Distribution of participants by country.

Country	Number	%
Brazil	260	21%
Peru	197	16%
Colombia	156	13%
Ecuador	123	10%
Argentina	140	11%
Mexico	110	9%
Chile	104	8%
Uruguay	101	8%
Venezuela	27	2%
Cuba	20	2%
Total	1238	100%

Criteria considered were voluntary willingness to participate in the study, teaching experience in a Latin American university, teaching experience during the critical period of COVID-19 (2019–2021), teaching experience in online educational communities, teaching experience in the use of educational technology, and willingness to share good practices or successful experiences. Table 2 provides a general sociodemographic characterization of the participants.

Table 2. Composition of participants by sex, age, and last degree obtained.

Sex	**Number**	**%**
Female	640	52%
Male	598	48%
Total	**1238**	**100%**
Age	**Number**	**%**
20–40	359	29%
41–60	507	41%
>60	372	30%
Total	**1238**	**100%**
Degree Obtained	**Number**	**%**
Bachelors's degree	211	17%
Master's degree	561	45%
Doctorade	359	29%
PhD	107	9%
Total	1238	100%

3. Results

The categorization process followed the logic of the inductive–deductive method, and in this sense, we did not have a previously established theoretical framework, but it was the result of the categorical construction from the discourse analysis. Thus, the starting point was the experience [23] of the participants; we did not have a priori categories; we did not know what we would find there, and we had those valuable 1238 experiences, from which we grouped common discursive codes—affirmative topics—from which the emerging categories—positive nuclei—were revealed, which are shown below in Table 3.

Table 3. Affirmative topics (codes) and positive cores (emerging categories).

Affirmative Topics (Codes)	**Positive Cores (Emerging Categories)**
Openness to new trends in educational technologies Knowledge and use of Big Data and Data Mining Knowledge and use of Artificial Intelligence Machine Learning Data Science STEM education Digital Adaptation Education 2.0, 4.0, and 5.0 Neurotechnology in the classroom Technological disruption Bioinformatics learning Hybrid classrooms or HyFlex Intelligent tutoring Intelligent tutoring	**Digital transformation**

Table 3. *Cont.*

Affirmative Topics (Codes)	Positive Cores (Emerging Categories)
Educational innovation with ICT TPACK Capacity for innovation with educational technology ICT-based didactic–methodological updating Creation of online content Willingness to innovate with ICT Innovative, active, interactive, and collaborative pedagogy. Innovation of pedagogical practices with digital didactics Adaptation of curricular content with ICT Pedagogical training of different professionals Mastery of pedagogy for digital education Enhancing various pedagogical strategies Innovative ways to manage disciplinary contents with ICT Use of technologies from a pedagogical perspective	**Technological innovation**
Openness to educational digital change Acceptance of new learning technologies Positive attitude toward technological innovation Intention to use technologies Positive beliefs about the use of technology in education Decision to use new technologies in the classroom Didactic use of technologies Willingness to innovate with ICT Perception of the usefulness of ICT (perceived usefulness) Expectation of effort (perceived ease of use) Expectation of good teaching performance through the use of ICT Social and organizational influence on teachers' work with ICT Facilitating institutional conditions for technological innovation Sustainable technological infrastructure and equipment	**Adoption of digital technologies**
Online self-training and self-preparation in ICT Ongoing ICT training Learning about Hybrid or HyFlex classrooms Learning about Big Data management (Big Data) Training on innovation with ICT Continuous and ongoing training Teacher training in learning technologies Online updating and leveling Teacher empowerment in ICT Reflection and systematization of good practices in educational technologies Motivation for self-learning in technology	**Digital literacy**

Table 3. *Cont.*

Affirmative Topics (Codes)	Positive Cores (Emerging Categories)
Digital culture Digital competencies of teachers and students Being digitally competent Proficiency in educational technology, digital tools, and networks Being prepared for online educational work Skills in virtual teaching Good didactic use of technologies Management of digital skills in the classroom Effective performance in online teaching platforms Creation of online content	**Digital competence**
Design interactive and creative environments Promote multimodal activities Promote e-mentoring Develop e-learning, b-learning, and m-learning Train in hybrid educational environments Performance in HyFlex environments Promote online cooperative work Manage synchronous and asynchronous classes Evaluate relevance of resources for virtual and face-to-face classes Use online assessment tools Learning to work with groups of different sizes Design environments that facilitate communication and collaboration Use active learning methods Personalized treatment and closeness with students Promote active listening and empathy Time management and design of diverse activities Use stimulating and motivating interactive dynamics	**Virtual environments**
Big Data for decision making in educational research Promoting technological research Educational research associated with ICT Transfer technological knowledge in education Systematize good practices and share them Learning communities to manage knowledge Linking educational technology projects Promote research seedbeds in education and ICT Participate in scientific events on educational innovation and ICT Generate scientific publications on educational innovation and ICT Evaluation and continuous improvement on the use of ICT	**Research and knowledge management in and from ICT**

Table 3. *Cont.*

Affirmative Topics (Codes)	Positive Cores (Emerging Categories)
Digital participation Openness to new trends in educational technologies Reconfiguration of the online teaching role Commitment to the collective construction of online learning Commitment to educational quality through the use of ICT Enthusiasm for the use of technology Dedication of time to self-preparation in ICT Openness to educational digital change Acceptance of new technologies Good attitude toward technological innovation Intention to use technologies Positive beliefs about the use of technology in education Decision to use new technologies in the classroom Willingness to innovate with ICT Expectation of good teaching performance through the use of ICT	**Digital engagement**
Taking care of mental health before, during, and after virtual work Positive management of well-being, emotions, and stress Proper management of online workload Taking active breaks during synchronous and asynchronous work Adequate planning of virtual work times and schedules Identifying elements of interpersonal conflict in the online community Assessing the psychological impact of exposure to screens Give priority attention to psychological health and sleep Be clear about the goals of virtual work Space for recreation and leisure activities Quality time with family and friends outside the virtual scenario Develop relaxation and physical exercise activities Taking care of the working posture in front of technological devices Achieving assertive communication in the virtual space Expressing emotions and uncertainties generated by remote work Training in soft skills, resilience, psychological self-care, and pleasant social relationships	**Social–emotional well-being in the online community**

The analysis–synthesis of the discourse from the positive principle of appreciative inquiry [8] allowed the co-construction of semantic networks processed with Atlas.ti software (version 8.0). To organize the analysis of the nine positive nuclei (emerging categories), a classification was made into target categories and tool categories [23]. In this sense, two target categories were determined, and where the proactive projections and transfers of the participants remain anchored, they behave as patterns of achievement; these are digital transformation and technological innovation. In turn, seven tool categories were revealed, which are projected as premises, constitute starting points, aspects that must be guaranteed, and previous steps that must be developed to achieve digital transformation and technological innovation. These tool categories are digital literacy, adoption of digital technologies, socioemotional well-being in the online community, digital competencies, interactive multimodal environments, research, and knowledge management in and from ICT, and digital engagement (Figure 1).

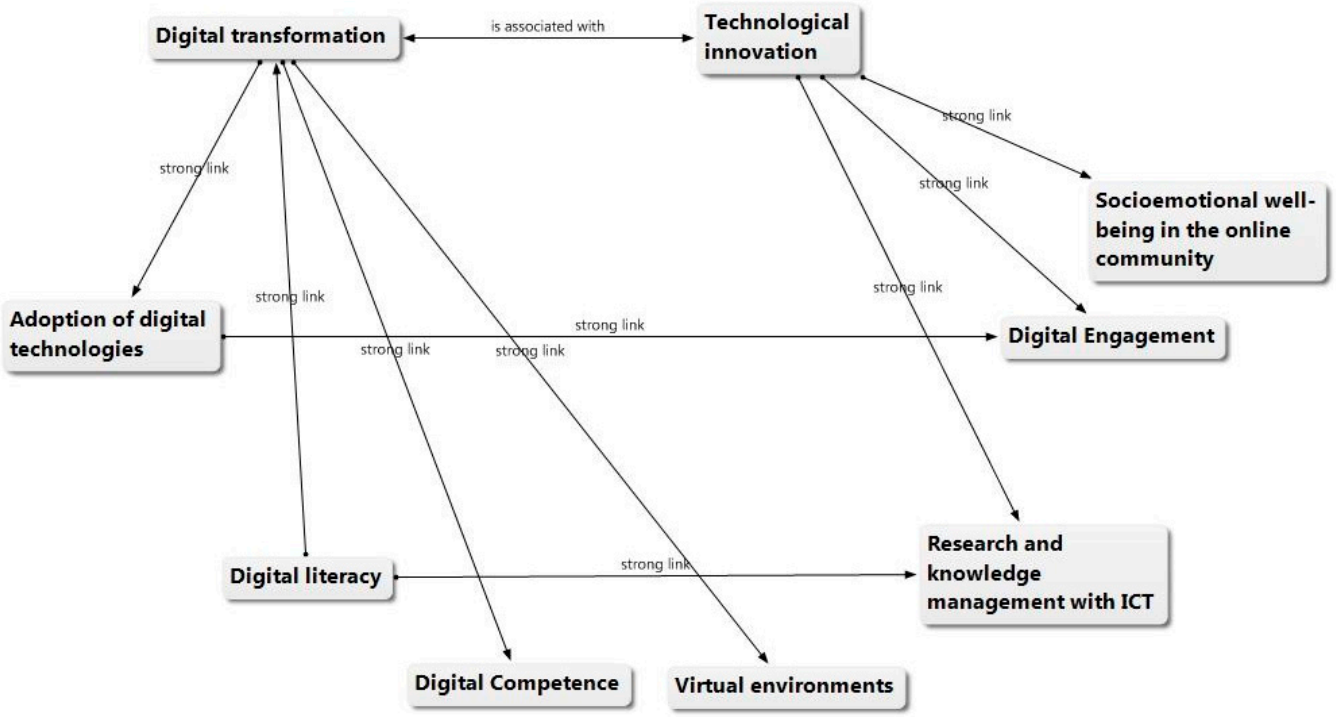

Figure 1. Semantic networks extracted from Atlas.ti.

In turn, although there are multiple connecting nodes that relate all the categories to each other, a more specific analysis found that the most direct relationships associated with the dynamization of digital transformation are with digital literacy, adoption of digital technologies, digital competencies, and interactive multimodal environments. Likewise, they are more directly associated with the dynamization of technological innovation, digital engagement, socioemotional well-being in the online community, and research and knowledge management with ICT. At the same time, two direct relationships with a very strong link are revealed: digital engagement with the adoption of digital technologies that share more than 50% of their codes and digital literacy with research and knowledge management with ICT. This last relationship is quite interesting, and further study can shed light on the effective link between digital transformation and technological innovation.

4. Discussion

The discussion section was developed considering scientific evidence to relate, contrast, refute, or validate the affirmative topics revealed. Studies indexed in Scopus, one of the main scientific databases worldwide, were considered as the main scientific context.

Consequently, the decision was made to perform a simulation in Scopus using VOS viewer, which is a computer tool to build and visualize bibliometric networks; the search equation used was TITLE-ABS-KEY ("Digital transformation" AND "Technological innovation").

We were positively surprised that the emerging topics from the VOS viewer are strongly related to the findings from the empirical data collection; the network extracted from the VOS viewer is shown below (Figure 2).

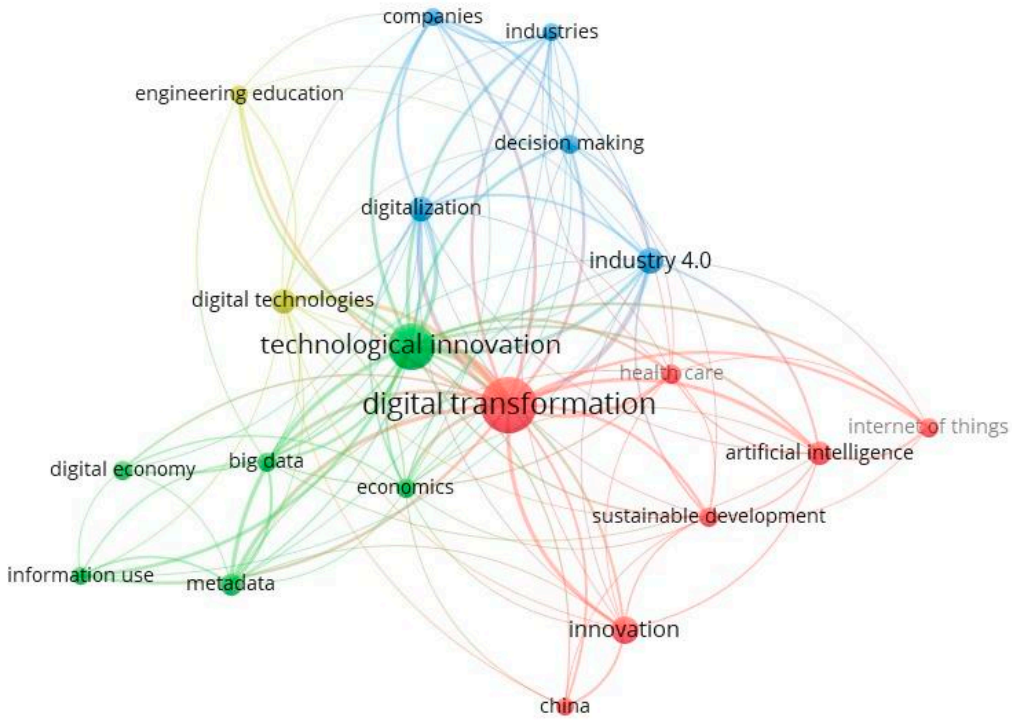

Figure 2. Bibliometric network extracted with VOS viewer.

The topics of the VOS viewer are closely related to the empirical information, and in this sense, the following are directly coincident aspects: engineering education, decision making, digitalization, digital technologies, industry 4.0, health care, artificial intelligence, sustainable development, innovation, Big Data, information use, and metadata, and the following aspects are not directly revealed in the empirical information: companies, industries, Internet of Things, China, digital economy, and economics; it would be im-portant in future studies to deepen the implications of these aspects at the educational level in the framework of digital transformation and technological innovation. Based on the coinciding elements, the scientific discussion of this research unfolds.

4.1. Toward Digital Transformation and Technological Innovation in Higher Education

COVID-19 imposed a new dynamic on educational contexts [24], successful educational institutions, during the pandemic, were able to make the right decisions in situations of changes in their environments, means, and strategies, while pursuing quality education. The use of e-learning and b-learning in higher education institutions favored flexible learning environments supported by digital technologies. This happens if both educational methods are built within the framework of a previously defined educational model and promote the formation of learning communities, and the right choice of technological resources that best support the chosen educational model has been achieved [15].

In this line, artificial intelligence, Big Data, data mining, education 5.0, among others, are topics that have not yet been widely investigated, especially to understand how they can favorably impact education. In this sense, ref. [25] agrees that higher education institutions should work together with educational policy makers and society in the implementation of the SDGs, specifically in the financing of new projects, the protection of intellectual property rights of researchers, and the strengthening of interdisciplinary research and information flows between the university and the community. Along these lines, ref. [26] also concludes that the lack of funding for research activities and training in scientific writing are two of the main obstacles identified by teachers in their expectations of the operational framework of Education 5.0, which mainly affects female academics.

On the other hand, ref. [27] finds that using project-based learning activities in Education 5.0 can significantly improve various student competencies, such as analytical thinking, reflective judgment, self-efficacy, and employability.

The authors of [28] conclude that the modern world demands an education that is contemporary and purposeful, but also mindful and holistic. In this sense, they find that innovating through collaborative learning among educational institutions, which popularizes the vision of Education 5.0, and promotes the acquisition of hard and soft skills in students, making use of virtual learning environments, is challenging, but at the same time successful and motivating, helping to reduce the gender gap in education.

Finally, ref. [29] agrees that the paradigm of Education 5.0 transcends by applying technology in the fields of ethics and humanism in the training of new professionals who will lead the technological singularity, thus guaranteeing human rights and contributing to the construction of a society that is global, sustainable, and equitable. At the same time, ref. [16] synthesizes among future trends aspects such as Intelligent Tutoring, Content Generation, User Control, Career Counseling, and Integration with web2.0.

ICT offer new ways of helping students: it changes pedagogy [29,30]. Hence, the integration of technologies, pedagogy, and disciplinary content is a necessary linkage in higher education that became more present after the pandemic; in this regard, a recent study reveals that:

> COVID-19 imposed a new dynamic to educational contexts, which involved an almost total transfer to virtual learning environments, where the use of ICT has been an essential element that has required educational innovations and online entrepreneurial methodologies. The above has strongly revealed the Technology-Pedagogy-Content (TPACK) trinomial as a key to the success of educational processes [24] (p. 104).

This shows the importance of energizing aspects that have become components of educational innovation with ICT, such as an innovative, active, interactive, and collaborative pedagogy; the innovation of pedagogical practices with digital teaching tools; the adaptation of curricular contents with the use of ICT; and the pedagogical domain for digital teaching, which will have its expression in innovative ways to manage disciplinary contents with ICT, using technologies not only from its technical domain, but especially from a pedagogical support. In this regard, ref. [31] emphasizes the importance of incorporating educational innovation in the classroom to generate relevant learning.

Especially in the Latin American context, a study on educational innovation with ICT with 154 professors from four universities in that region found "three critical success factors for educational innovation with ICT: 1.- participation in professional learning communities with ICT; 2.- ongoing training and updating in ICT; 3.- implementation and equipment of laboratories with Internet access in universities" [32] (p. 145). This coincides with the results found in the present research as the need for a didactic–methodological update based on ICT, from a predisposition to innovate with ICT, which increases the innovative capacity of teachers, being a constant concern for greater pedagogical training.

University education requires not only professional experts in their subjects, but professionals who have skills to communicate these contents are needed, so a good psychology teacher is one who dominates the professional field of psychology and knows how to transfer that knowledge to their students.

It is noteworthy that digital divides did not emerge as a prevalent element, which does not mean that in our Latin American region there are no such divides; however, this research amplifies the perspective of positive change from the appreciative inquiry [8], noting that there are also positive nuclei and affirmative topics that allow a positive change in the process of digital transformation of higher education.

This change of perspective emphasizes "the management of formative potentialities of the actors of the educational process and the recognition of potentialities of studies on Higher Education in the region, allowing to contextualize the updating, access, learning, innovation and use of ICT" [32] (p. 145). For this reason, the present study identified

two target categories, namely digital transformation and technological innovation, whose drivers are detailed below.

4.2. Adoption of Digital Technologies

The educational technology research community has published numerous papers on the needs and effects of ICT use in the classroom. Some of these studies are more teacher-centered, focused on identifying the needs and barriers for the adoption of ICT in the school [19]; however, fewer studies focus on formative potentials and affirmative topics for the adoption of technologies to be positive; hence, the present study opens a space for reflection and systematization on 15 affirmative topics related to the adoption of digital technologies from a positive perspective.

For the present study, the perspective of the adoption of technologies offered by [33] is assumed. This author argues that the adoption is the decision to use or not to use the technology, and that this depends largely on the beliefs and attitudes that are generated around these technologies, so, the more positive these beliefs and attitudes are, the more positive the adoption will be. In his doctoral thesis, the author explains the basis of some behavioral models based on attitudes, such as the theory of reasoned action and the theory of planned behavior, which are based on the attitude–intention–behavior relationship. Likewise, as part of the technological acceptance model, he underlines the importance of four factors: 1. performance expectancy (the level of belief that an individual has that the technology helps him/her to perform better facilitates the process of adopting it), 2. effort expectancy (belief about the degree of ease of use associated with a technology), 3. social influence (work, institutional, and group or social demands on the use of technology), and 4. facilitating conditions (to what extent the person perceives that there is an adequate technical infrastructure and support organization for the use of technology).

"The success of the educational process mediated by technology; depends, to a large extent, on the adoption and use of digital technology by teachers" [34] (p. 1). In this regard, it is necessary to consider the dimensions of higher education teachers in the process of ICT adoption; these are ownership, interest, importance, perception, and attitude [34].

According to [35], to form digitally literate citizens, teachers must significantly include technology in the teaching and learning process, as it allows us to (co-)create, collect, store, and use knowledge and information, as well as to connect with people and resources around the world and to collaborate in the creation of knowledge. This integration process is complex and is influenced by several determinants. On the one hand, the Unified Theory of Acceptance and Use of Technology explains four determinants: the expectation of performance and effort, social influence, and facilitating conditions. In addition, gender, age, experience, and voluntariness of the teacher will have an influence. On the other hand, the Technology Acceptance Model presents central user motivation variables, such as perceived ease of use, perceived usefulness, attitudes toward technology, behavioral intentions, and technology use. Finally, it is explained that a teacher who perceives himself as more competent in TPACK domains [13], will accept and integrate technology in his teaching with a higher probability of success. As well as TPACK, other pedagogical models that integrate technology should be deepened, and these models should be explicit and established as part of the organizational culture of universities so that they can intentionally guide educational innovation with ICT for the development of relevant learning [31].

The process of teachers' adoption of technology in their instructional practice has long been a focus of research [36]. Regarding the integration of digital technologies with learning, barriers and facilitators were identified. On the one hand, the main barriers were teachers' unfamiliarity with technology and poor group cooperation, as well as time, expense, teaching load, and resistance to change. On the other hand, the main facilitator was the action research deployed by the teacher when integrating digital technologies. That is, the process of reflection that allows improving learning tasks and activities that employ digital technologies with a pedagogical purpose [37].

During the pandemic, digital technologies have demonstrated their usefulness in three ways [4]. First, they have enhanced digital education. In that sense, they have generated useful spaces to guide, inform, and support staff and students through synchronous, asynchronous, and video sessions, among others. They have also had a significant impact on the human capital market in terms of training and the exchange of information on all types of knowledge, promoting eco-social community development. Secondly, they have led to a more sustainable community. For example, new jobs have been generated by the wider diffusion of digital technologies through applications. In addition, learning is no longer exclusive to formal education, but is also accessible through platforms, such as YouTube, Lexia, Khan Academy, and other teaching aids. Finally, they have contributed to the modernization of medical education. Since the pandemic, there has been an increased use of technology to facilitate medical student learning and trainings, such as videos, podcasts, simple virtual reality, computer simulations, as well as real-time mobile video tools and applications, artificial intelligence for adaptive learning, and virtual reality.

Digital technologies are an important support for transformation, but they are not a foundation in themselves, as they alone will not transform education, nor the didactic act [3]. For 30 years, digital technologies have been present in the educational system; however, this does not ensure that they are being used in a didactic way. Virtual classes have shown a cultural void and social inequality, where many students had to drop out due to lack of equipment and connectivity. Although classes were reestablished during the pandemic, university life was not restored, because discussion spaces were replaced by videoconference screens. Digital technology was more focused on the lecturer's exposition, instead, more participatory, and collaborative didactics was required.

Likewise, in the face of the pandemic, universities had quick responses to continue with virtual classes, but this did not represent an opportunity to restructure higher education or to think of itself to resume its social and academic functions. Modernization is sought by accessing the digital world, but there is no reflection on its academic project or on what society really expects from education. Therefore, in the post-pandemic society, digital transformation must go hand in hand with the reinvention of teaching work from a didactic renewal based on principles of the construction of a learning environment.

Those teachers who incorporate pedagogical innovations in their classrooms must also adapt to technological changes, as these enhanced technologies positively influence methodologies, such as design-based research (DBR), STE(A)M (Science, Technology, Engineering, Arts and Mathematics) education, and inverted classroom. An example of this is the digital version of GeoGebra 3D. Those teachers who adapt to these changes succeed in developing creative, collaborative, personalized, and supportive learning environments [37].

4.3. Digital Literacy

Digital technologies encompass both hardware and software devices, which enable the individual to communicate, access, transmit, store information, and learn in digital environments. However, digital technologies are often used only to support the session in visual presentations and virtual platforms, but do not focus on the active role of learners, such as the use of social networks, blogs, or augmented reality.

Despite their broad advantages, many teachers do not integrate digital technologies in their teaching, sometimes only using them sporadically and inconsistently [38], while they do not fully grasp the specific dynamics of virtual environments and end up transferring some traditional environments in the classroom, which limits a contextualized and efficient performance. On the other hand, institutions need to implement fixed policies of evaluation, incentives, time, and training, combating in addition the technophobia, the generation gap, the resistance related to digital change, and the shortage of professionals trained for the integration of digital technologies, hence the importance of a critical perspective on the use of information technology in teaching and learning [39].

According to [40], m-learning or mobile learning is an affordable, economical, and adaptable educational tool, which contributes to achieving "Education for All", as it allows

people with reduced mobility or in remote locations to study, and it also helps to improve motivation for learning. It actively employs multimedia content, such as text, image, video, and audio through mobile devices, such as smartphones, iPads, laptops, and netbooks, as well as the use of personal computers.

Among the fundamental principles of mobile learning are available educational environment; tracking of learning outcomes; use of cloud technologies; transparency and learning outcomes; using technology for gamification; distributed nature of access to the educational environment; student participation in the educational process; ensuring diversity in all aspects of learning; E-Institute curation and management; implementation of the principles and technologies; ensuring stable and continuous online access on a regular basis; and implementation of an innovative approach to teaching.

According to [41], self-learning is the process of acquiring knowledge and experience for oneself to develop the cognitive, action, and reflective components of professional competence. Its development requires self-improvement, determination, discipline, systematicity, independence, reflexivity, and creativity from the cognitive sphere.

To speak of Big Data means to refer to the massive amounts of information that has been produced by humanity, the environment, and its interrelationships. Likewise, in education, we speak of Educational Big Data, which are those technological tools used by academics in education to collect useful data in a short time and at a relatively low cost. Big Data are characterized by five aspects or 5 Vs [42]: volume, due to the enormous amount of information they can store; speed, as they facilitate rapid analysis; variety, as they are fed from different sources, types, and formats; veracity, due to the quality of the data; and value, as they generate high value in return. Likewise, a bibliometric study, reveals new trends on Big Data, related to e-learning, online learning, student engagement, the potential of psychological factors, and social media.

In the framework of distance education that can be synchronous (students and teachers simultaneously) or asynchronous (non-simultaneous), the proposal of a hybrid classroom, where students who are face-to-face in the classroom and remote students from various locations, study at the same time, arises as a necessity [43]. This type of education has organizational benefits, as it increases the enrollment rate and pedagogical benefits, as students can access educational content regardless of their physical location. In short, it spreads educational equality. Its implementation requires certain conditions: pedagogical and technological training to instructors, platform training to students, scheduling appointments in the cloud calendar, storing and exchanging documents online, allowing video conferencing (video and sound), everyone seeing the same content, recording the class for asynchronous distance learning, allowing to form work groups, creating online quiz and exercises, investing small budget taking advantage of the original classroom equipment and, finally, allowing students to access from any device.

According to [16], the trends of self-learning and ICT are intelligent tutoring, content generation, user control, career guidance, and Web 2.0 integration. As for developing countries, there is a trend to investigate ICT literacy and digital equity.

The most research on ICT relates it to teacher empowerment in structural, psychological, and resource ways [44]. For the success of an institution in adopting innovative pedagogical projects, it is necessary to ensure the conditions linked to teacher empowerment [10].

4.4. Digital Competence

Digital competence is a driving force for recent educational policies and is mainly composed of four elements: (a) technical and practical skills in the use of technologies; (b) ability to use and apply digital technologies for work, study, and daily life actions; (c) ability to understand and critically evaluate digital technologies, their limitations, and challenges; and (d) motivation to participate and engage with digital culture [45]. Likewise, [45] concludes that it is necessary to deepen the discovery of the most efficient

ways to learn digital competence, especially in education professionals, with the aim of producing scientific evidence.

Currently, the development of professional digital competence should be integrated into initial training programs for future teachers, as there is a strong positive correlation between the self-reported efficacy of teacher educators and digital competence. In addition, access to technology and the teachers; attitude toward it influence their decision to integrate or not to integrate it into their teaching practice [46]. However, they conclude that it is necessary to take a closer look at how and where digital competence is developed in initial teacher training in educational institutions.

On the other hand, ref. [47] states that professional digital competence is of great importance in the classroom because digital media have already become part of the daily activities of teachers. Despite its importance, they conclude that newly qualified teachers report that both quality and ICT training were deficient during their teacher education process, so a continuous effort is required to monitor the quality and develop the self-efficacy of initial teacher education. It is important to know the pain points in this process, to correct them, and to take full advantage of the potential of ICT in education.

Finally, for [19], digital didactic competencies point to the flexibility and updating of initial teacher training programs, which should evolve at the same speed as new digital tools are introduced and be integrated or disseminated in the educational ecosystem. This would ensure that teachers can adequately use digital technologies and devices to integrate teaching and facilitate learning and be able to critically evaluate their use. In addition, the teacher must be able to work in a context where the educational system is already immersed in a digital environment and adequately engage their teaching work. Hence, it is important to examine digital competence in depth in initial teacher training.

4.5. Virtual Environments

The online community of teachers participating in the study considers that virtual environments in education should be multimodal interactive environments. A study finds five design principles of multimodal learning environments that promote student learning: (a) guided activity, where the teacher directs their cognitive process; (b) reflection, where students are asked to reflect on their meaning-making process; (c) feedback, being explanatory rather than corrective; (d) pacing, allowing the student to process small chunks of information; and (e) prior training, emphasizing relevant prior knowledge [48]. to achieve this purpose, the teacher must be prepared to use ICT in the classroom [47].

The authors of [49] conclude that haptic force feedback, which is technology that creates a tactile experience by applying forces, vibrations, or movements to the learner, has the potential to enhance learning, through a deeper understanding of STEM conceptual knowledge, versus environments that are purely visual. In addition, visual and haptic modalities combine better when they are planned one after the other, rather than presented at the same time. Therefore, when the learner is exposed to virtual learning environments enhanced with haptic force feedback, the pleasant learning experience is enhanced, but not the ease of use or interpretation.

4.6. Research and Knowledge Management in and from ICT

One of the positive aspects expressed in the study was related to researching and managing knowledge in ICT, which is not the same as researching and managing knowledge using ICT. For example, society delegates to universities the responsibility of creating, transmitting, and disseminating knowledge through teaching–learning, and this process is enhanced by the intervention of ICT, as it contributes to better knowledge management [50,51]. This clearly evidences the importance of ICT in knowledge management; however, the present study proposes a complementary approach that means researching and managing ICT knowledge.

In recent years, there has been increasing interest in the use of information and communication technology (ICT) to improve learning in schools. There are several reasons

for this growing interest. First, ICT can change the nature of the disciplines: it changes the type of questions that can be answered and the way in which what is understood is represented. Second, ICT offers new ways to help learners: it changes pedagogy. Third, ICT opens access to information, and some argue that it provides the opportunity to broaden access to education [30].

The positive core ICT research and knowledge management reveal among its affirmative topics the use of Big Data for decision making in educational research, as an influential study points out: "higher education institutions operate in an increasingly complex and competitive environment and Big Data has a high potential to address these challenges" [52] (p. 904).

Learning communities that manage knowledge are once again positioning themselves as a strategic element for educational innovation with ICT in Latin American universities [53].

One of the main variables that predict teacher attitudes toward ICT in education for research is participation in projects and teaching in face-to-face and/or online universities [35], which shows the importance of involvement in educational technology projects, promoting ICT research seedbeds, participating in scientific events on educational innovation and ICT, and generating scientific publications on educational innovation and ICT, with publications, events, projects, networks, etc., being indicators of the scientific research leadership of university teachers [12].

Research on the incorporation of ICT in higher education shows that it has been used transversally in the curriculum and in formative research processes, both face-to-face and virtual. However, it is still necessary to deepen ICT as a tool to support the disciplinary and research fields [54].

In general, with respect to ICT research, a study whose main objective was to examine, at the global level, research during the period 2000–2019 on the management of ICT for sustainable education in the context of higher education was clarifying; it analyzed the global trends of research on this topic during the period 2000–2019, in a sample of 1814 articles selected from the Scopus database: "Research at the international level presents an increasing trend of publication that allows determining the relevance of research on ICT management for sustainable education in the context of higher education" [1] (p. 1). The above allows to legitimize in a convincing way the importance of researching and managing knowledge in and from ICT; it is then committed to continue developing the digital research skills of higher education teachers [14].

4.7. Digital Engagement

A positive core for digital transformation and promoting spaces for technological innovation is engagement or digital commitment; it has been shown that engagement has a positive influence on digital competencies in Latin American university teachers [11]. Several of the affirmative topics that are revealed in the digital engagement are the same as in the adoption of digital technologies, so it is found that these elements are closely related, and the beliefs we have about the use and functionality of technology are intertwined with the enthusiasm and dedication about it. Therefore, one of the main affirmative topics is digital participation, and teachers must be open to participate in the digital world; they must break traditional barriers on the use of cell phones and social networks and be open to more contemporary forms of learning, such as e-learning, b-learning, and m-learning [55].

Rethinking the teaching role in virtual learning scenarios is an imperative for post-COVID-19 higher education; however, at present, there is still insufficient scientific literature on digital engagement and university teachers; studies that examine digital engagement in higher education put more emphasis on students [56,57].

Studies are needed to better understand this engagement in the collective construction of online collaborative learning, and recent research emphasizes this learning from the dimensions of 1.- Socioemotional skills for online collaboration, 2.- Positive online interde-

pendence, 3.- Online information sharing, 4.- Digital skills, and 5.- Internal regulation of the online team [58].

4.8. Social–Emotional Well-Being in the Online Community

Finally, one of the most powerful aspects associated with successful and healthy performance found as one of the three major challenges for teachers in the face of digital teaching is undoubtedly the self-management of positive mental health [31]. Hence, ensuring socioemotional well-being is a top priority in the post-pandemic stage. Circumstances of the pandemic have shown that teachers are one of the professionals who, having exercised service work toward the community during the confinement, have experienced a great sense of emotional distress [59], as they manifested "lower resilience, lower life satisfaction, higher levels of coronavirus-specific anxiety, avoidance of information about the pandemic, higher levels of distrust towards institutions and lower ratings of team climate" (p. 7). These symptoms of distress reflect a compelling need to join efforts to make social–emotional well-being one of the goals of organizational culture in an educational institution. As [18] argues, people "experience our emotions through the lens of our cultural and professional identities" (para. 6). Therefore, promoting teacher well-being should be an important part of teacher training and development policies and initiatives. The following is an analysis of the main aspects to be considered to ensure the socioemotional well-being of teachers in the online community.

Regarding mental health care in the exercise of virtual work, it needs to be addressed at the organizational level. According to [18], investment and efforts in emotional care should go beyond providing training and teaching emotional regulation strategies. One could replicate, for example, initiatives, such as the Happy Teacher Revolution (HTR) group, where different teachers, administrators, doctors, and psychologists are invited to discuss their own experience to provide advice on how to set boundaries to prioritize their well-being. These spaces are zoomed in and have already spread to countries, such as the United States, Canada, Africa, and Latin America. In this way, taking care of mental health becomes a concern before, during, and after virtual work that should be assumed not only by the teacher, but also by the institution.

Virtual work involves challenges, but if teacher participation in these scenarios is not adequately regulated, their emotional state could be affected. According to [17], incorporating information and communication technologies in teachers' virtual work is a source of stress that can cause emotional exhaustion. Faced with this, feeling vulnerable and asking for support should be a way to experience well-being at work and feel validated. However, many times, teachers repress their emotions behind professional perfectionism in order not to be seen as a weakness. Therefore, ref. [18] reaffirms the idea that organizational leaders should reform their school cultures to recognize the difficult emotional work that teachers engage in daily and send the message that experiencing a wide range of emotions is not a reflection of personal weakness. In that sense, negative emotions experienced in virtual environments should not be a cause for admonishment, but an opportunity to learn how to manage them in a positive way.

Apparently performing online work is lighter compared to face-to-face work; however, this is not the case, because with virtuality, new tasks arise that must be attended to appropriately. Studies, such as that of [58], show that teachers who perform online work often have additional tasks, such as attending to household chores at the same time as work tasks; this situation is more common in older female teachers. Worse still, [18] explains that, in virtual work, the excess load is often linked to tasks that do not contribute to the identity of being a teacher, which causes them to lose focus on their main task. This feeling of not investing their time and efforts in their teacher training affects their socioemotional well-being. Therefore, it is necessary to promote an adequate management of the online workload, mainly attending to the need for professional training and adapting to personal needs.

According to [60], the advance of technology has increased sedentariness and passivity in virtual work, because in the past, to obtain some information, we used to move, or to buy something, we used to stand up, and this meant a pause in our activity, but now it is enough to communicate by e-mail, instant messaging, or phone call. Although this has represented a faster way to obtain information, it has also taken away moments of active pauses that are important to be more productive at work.

The transition from face-to-face to virtual classes has generated a negative psychological impact on teachers. This is reaffirmed by the authors of [59], when they explain that teachers now perceive altered work and rest schedules, a greater number of electronic devices in use, and more screen time associated with work. If teaching work used to be arduous, now it is much more intense and generates emotional exhaustion. Therefore, it is advisable to regulate the time and form of exposure to screens, not only for the sake of the visual sense, but above all for socioemotional well-being. In this regard, [61] recommends that the upper part of the monitor should be slightly farther away from the eyes than the lower part; otherwise, if the lower part of the monitor is farther away from the eyes, this may cause a negative effect on neck posture.

Regarding the importance of clarity in virtual work goals for teachers' psychological and emotional well-being, ref. [18] states that "teachers' emotions are so deeply intertwined with their professional goals (. . .) when teachers do not experience alignment between the teacher they want to be and the roles and responsibilities they are assigned, they run a high risk of emotional exhaustion" (para. 5). Thus, during virtual classes, the lack of natural interaction between the teacher and his or her students, as well as the difficulties that virtuality brings, could negatively influence the perception of the achievement of their formative objective. Therefore, it is necessary to clearly and objectively specify the goals that are expected to be achieved in virtual education.

Regarding recreation and leisure times during virtual work, most people prefer to finish a long day's work and then rest, even if this means physical and emotional exhaustion. In response, ref. [60] states that our body and our concentration benefit from regular breaks to be able to continue working. However, despite the benefits of finding a moment of relaxation in the middle of work, only 7% of teachers knowingly interrupt their work process every 2 h to take an active break, while the remaining percentage of teachers do not do so or do so for physiological needs. Clearly, we lack greater awareness of how to work healthily in the virtual world.

In relation to the importance of promoting quality moments with family and friends outside the virtual scenario, ref. [18] emphasizes that to achieve better learning, especially in virtual scenarios, it would be possible to take advantage of experiences where the family is integrated. They demonstrate this in their research where they analyzed the daily activities of families during COVID-19 through a daily text message protocol (experience sampling method). They found that families with lower economic resources valued academic and non-academic activities more than those with a higher economic status, which influenced more positive than negative emotions in students from those families.

Focusing our attention only on virtual work and neglecting important activities, such as physical exercise and relaxation, is detrimental to socioemotional well-being, as it generates stress, exhaustion, depression, and anxiety. Studies, such as that of [58], show that an excess and intensity of virtual work could imply a lack of regular exercise sessions, having less than three meals a day, and not paying attention to the energy value of the food consumed. Consequently, a high percentage of overweight teachers and a higher incidence of becoming sick are observed. Thus, low physical activity and inadequate nutrition generate physical health disorders, obesity, and excess body weight and disturb socioemotional well-being. Therefore, it is urgent to deploy preventive programs for teachers who perform virtual work, to reinforce aspects such as the "safe use of communication devices, the balance between work and rest, the principles of rational nutrition and optimal physical activity". Ref. [60] recommends expert-supervised physical activity twice a week for 45 min during working hours. Likewise, the authors propose teaching mindfulness as relaxation

activities that are positively related to positive emotions, such as resilience, job satisfaction, and empathy. Mindfulness of the "here and now" teaches teachers to cope with, explore, and alleviate suffering, such as stress, pain, and illness. In this way, physical exercise and the constant practice of relaxation activities, such as mindfulness, are protective factors that contribute to a better emotional state of the teacher who performs virtual work. Let us not forget that a teacher with a healthy lifestyle will positively influence the lifestyle of his or her students.

Constant exposure to the screen in virtual work could be affecting the posture of teachers. This is demonstrated by [17] when the authors state that the "increased load on the visual analyzer is associated with ailments in the musculoskeletal system". Even low back pain is one of the main causes of disability in 160 countries (WHO). In this sense, it is evident that the way of life of teachers has changed, and for this change not to be detrimental to their health, the conditions in which they work in virtual environments must also change. The above should imply a change in the peculiarities of organization of the educational process in the virtual modality. In this regard, the authors of [60] recommend that if we spend a third of our daily time at the computer doing remote work, we should procure an ergonomic work chair that helps us to have better posture; this should be slightly tilted backwards, allow the angle between the body and the legs to be 90° or more, and we should support most of our body weight on the seat when we are seated.

Regarding the importance of maintaining assertive communication in the virtual space, ref. [18] pointed out that educators are often under pressure to be upbeat most of the time with their students, especially during the pandemic. However, teachers also experience negative and positive emotions, so it would be healthy to provide a space that validates teachers' own stress and is a moment for them to let off steam. Not every moment is conducive to express their emotions with total transparency; for example, a teacher should not react with anger to a student's sarcastic comment. However, they should then receive professional advice to help them channel the frustration that is often felt when our mission as a teacher is not perceived as accomplished.

In relation to the need to express emotions, feelings, and uncertainties about remote work for teachers' psychological well-being, ref. [18] notes that "when teachers feel they need to constantly fake or repress their emotions to comply with the cultural norms of the school, they may experience increased burnout" (p. 7). The authors also explain the risks of a culture of toxic positivism or professional perfectionism, where it is often seen that in educational institutions, there are implicit rules that pressure teachers to repress their emotions, and if they need help, they choose not to express that need for support, as it would be considered professional vulnerability. These institutions also generate the feeling that one is constantly being evaluated or "under siege", which decreases the possibilities of asking for support and improving in the weak points that one may present. Therefore, in the face of the challenges and uncertainties that virtual classes generate, it is necessary to recognize our own vulnerability and imperfection and to be able to ask for and receive help to improve our pedagogical practice.

4.9. Limitations and Prospects of the Study

One of the limitations of the study is the focus only on teachers; we believe that further studies should be extended to students and university administrative staff. Students are essential educational actors in the digital transformation; although studies recognize that "the success of the technology-mediated educational process depends, to a large extent, on the adoption and use of digital technology by faculty" [6] (p. 1), other studies have found that successful ICT implementation requires student engagement [30].

There are multiple studies that address digital engagement, and while most of them are focused on the use of social networks, politics, advertising, and marketing, there is still a theoretical gap in the digital engagement of teachers as a psychological configuration that accounts for the vigor, dedication, and absorption of teachers in the knowledge and use of technology.

At the same time, it is necessary to continue searching for opportunities to use real-time participatory (active) netnographies for the benefit of online educational communities, in the sense that if researchers participate more actively in real time in their netnographies, they could also contribute to important online social narratives [23].

The findings of the present study confirm the need to fill theoretical gaps in the field of adequately planning virtual work times and schedules, identifying elements of conflict in distance education, prioritizing psychological health, sleep, and addressing teachers' socioemotional well-being from the organizational level.

In the bibliometric analysis with VOS viewer, aspects not directly revealed in the empirical information of the teachers participating in the study were identified, such as companies, industries, Internet of Things, China, digital economy, and economy; it would be important in future studies to deepen the implications of these aspects at the educational level in the framework of digital transformation and technological innovation.

From the theoretical and practical points of view, it is necessary to continue deepening this subject, and although there is a large number of studies on digital transformation and technological innovation studies, these are mostly separated, and there are still few studies that link these two important processes; however, while the findings of this research show that both elements are presupposed and complementary, it can be assured that further deepening in the strategic links between these factors can help to boost the sustainability of higher education in the post-COVID-19 pandemic era.

In this regard, there are important precedents that support this important link, as is the case of the study by Liu and collaborators [61] who argue that the effect of digital transformation on technological innovation is reflected in quantity and quality, confirming the empirical data that the impact of the digital transformation on the efficiency of technological innovation has a significant effect, and in turn, this impact of the digital transformation on the efficiency of technological innovation in institutions is validated by other studies [62], which state that this directly influences high quality. Finally, a third study [63] argues that the digital transformation has become an essential component of organizational development, especially since COVID-19, which in many sectors was an opportunity to amplify and bring to light the positive nuclei and potentialities in digital innovation.

As a significant aspect, it is worth noting that although there are multiple challenges, stumbling blocks, and difficulties related to the digital transformation and technological innovation in higher education, this study focuses on an appreciative inquiry perspective based on positive psychology, so it is centered on the strengths and opportunities; however, the appreciative inquiry does not ignore the problems, but rightly argues that by amplifying the positive core of human systems, weaknesses and threats are being eradicated [8], and this is complemented by the view of Morozova and colleagues [63], who evidence that despite the crucial negative consequences of the pandemic of the early 2020s, there are data analyzed in their study that testify that COVID-19 was a kind of driving factor that forced companies to develop more actively. In this sense, the study is more forward-looking in nature and points to an agenda for positive change in the direction of achieving university sustainability in the post-COVID-19 era.

5. Conclusions

The findings reveal a total of nine positive cores consisting of multiple affirmative topics. From these results, two central cores (target category) were identified: digital transformation and technological innovation, noting that the most direct relationships associated with the dynamization of the digital transformation are concretized with digital literacy, adoption of digital technologies, digital competencies, and virtual environments, while the dynamization of technological innovation is associated with digital engagement, socioemotional well-being in the online community, and research–knowledge management with ICT.

At the same time, two direct relationships with a very strong link are revealed: digital engagement with the adoption of digital technologies that share more than 50% of their codes and digital literacy with research and knowledge management with ICT. This last relationship is very interesting, and further study can shed light on the effective link between digital transformation and technological innovation.

The VOS viewer results are closely related to the empirical data, coinciding directly with engineering education, decision making, digitalization, digital technologies, industry 4.0, health care, artificial intelligence, sustainable development, innovation, Big Data, information use, and metadata.

Teachers agree that it is necessary to include, in the initial teacher training, strategies that favor flexible virtual learning environments based on the use of new digital technologies applied to education (Big Data, bioinformatics, artificial intelligence, and neurotechnology) in such a way that they fit, support, and develop the framework of the educational model previously defined in their institutions, synchronized with the changes presented in the educational environment from COVID-19, which is an environment increasingly aware of reality and that is holistic—all this in the search for a quality education where the student can develop essential competencies, such as analytical thinking and reflective judgment. In addition, the student can acquire hard and soft skills to apply them in the field of ethics and humanism to contribute to the construction of a society that is global, sustainable, and equitable, within the vision of Education 5.0.

Most studies on the adoption of ICT in schools focus on needs and barriers, but very little on their formative potential for successful integration. Therefore, to understand the process of technology adoption, it is necessary to conceive this process as a decision made by the teacher based on a set of positive attitudes and beliefs that impact the attitude–intention–behavior relationship. This adoption is influenced by determining factors, such as the expectation of performance and effort, as well as social influence and facilitating conditions. One facilitating condition is action research, i.e., lesson after lesson reflection to improve learning tasks and activities that employ digital technologies with a pedagogical purpose. Aspects, such as gender, age, experience, and voluntariness, of the teacher also play a role. Finally, the adoption of technology alone will not transform education, as it must go hand in hand with the reinvention of the work of teachers, who must be trained to build a creative, collaborative, personalized, and supportive learning environment.

The main trends regarding self-learning and ICT, especially in developing countries, are related to the need for digital literacy and equity. For an educator to recognize the importance of digital self-learning in his or her professional competence requires internal conditions, such as the need for professional development, discipline, systematicity, and creative–reflective thinking. Likewise, teacher empowerment in ICT is becoming more and more urgent; according to studies, social networks contribute greatly to such empowerment. In addition, the implementation of educational innovations in universities, such as m-learning or mobile learning (smartphones, iPads, laptops, and netbooks), facilitates education for all, but its success requires the automation of services and digital skills of the teacher to ensure diversity in all aspects of learning. Another important learning for teachers is the use of Big Data in education to collect more and more useful data in a short time, at low cost and taking advantage of the characteristics attributed to them, such as veracity, variety, value, speed, and volume. Finally, a post-pandemic teacher will have to be pedagogically and technologically trained in the hybrid classroom, because the trend now will be face-to-face students and remote students studying at the same time.

Professors point out that it is essential to develop digital competence, which allows them to achieve skills in the didactic use of digital tools and in the mastery of technology. This makes it easier for them to integrate the digital environment with the educational work they do, achieving high quality standards. Achieving training in these digital skills goes beyond the knowledge and use of platforms, or the use of digital tools and their networks, but transcends into their daily lives, creating a digital culture, enhancing the creation of unique, flexible, and constantly updated content, evolving at the pace that new digital tools

are disseminated in the educational system. This will also help them to assume their own attitude for a critical evaluation of their use, identify limitations, and make proposals to solve their challenges.

The stress experienced by teachers during and after the pandemic is often generated by work overload—especially activities that do not contribute to their teaching identity—as well as altered work and rest regimes and increased use of electronic devices. At the end of the pandemic, many study modalities have maintained virtual classes. This format that includes information and communication technologies also presents challenges that, if not strategically addressed, could become risk factors affecting the socioemotional well-being of the post-pandemic teacher. In this sense, emotional care should not only be the responsibility of teachers, but also of organizations, which should provide the necessary conditions before, during, and after virtual work. Among the recommendations that should be adopted by the institutions are to generate spaces for dialog where professional vulnerability and not work perfectionism is the starting point for expressing one's emotions and learning to manage them positively; in addition, it is urgent that organizations regulate the roles assigned to their teachers, ensuring that these are aligned with their identity and professional objectives. With respect to teachers, it is suggested that they include active breaks during their virtual work to reduce sedentarism and passivity; it is also necessary to regulate the time and form of exposure to the screen, ensuring a healthy distance between the eyes and the monitor, and the use of ergonomic chairs. Fixed spaces for physical exercise and relaxation, such as mindfulness, should be institutionalized, because studies show that a high percentage of teachers dedicated to the virtual world are overweight and suffer from a higher incidence of illness.

Finally, in relation to the digital transformation in connection with technological innovation, several trends that teachers experience as challenges are being recognized, namely Big Data and Data Mining, Artificial Intelligence, Machine Learning, Data Science, STEM Education, Education 2.0, 4.0, 5.0; Neurotechnology in the classroom, Bioinformatics, Hybrid Classrooms or Hy Flex, Intelligent Tutoring, and TPACK, and these technological contents should be part of the training agendas, mentoring and coaching teachers in their continuous training process. The fascinating digital era is calling for a new know-how, linked in a special way to know how to be and live together to transform society in a sustainable way; therefore, together with technological content, the promotion of socioemotional well-being in online communities must be a decisive priority, so that training agendas must resolutely incorporate aspects related to soft skills, resilience, psychological self-care, and management of pleasant social relationships.

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