

- ORIGINAL ARTICLE -

A Review of the Literature on models or frameworks for Implementation of Digital Transformation Processes

Una Revisión de la Literatura sobre modelos o marcos de trabajo para Implementación de Procesos de Transformación Digital

Alex A. Torres ¹, César A. Collazos ² and Alicia Mon ³

¹ *ComfacaUCA-UnicomfacaUCA University Corporation, Popayán, Colombia*
atorres@unicomfacaUCA.edu.co

² *University of Cauca, Popayán, Colombia*
ccollazo@unicaUCA.edu.co

³ *National University of La Matanza, Buenos Aires, Argentina*
aliciamon@gmail.com

Abstract

The objective of this document is to provide state-of-the-art information on models or frameworks for the implementation of digital transformation processes in organizations, with an emphasis on actions and initiatives in the higher education sector, and to propose avenues for future research. To this end, a systematic review of the literature was carried out, where 202 articles were analyzed applying the procedure defined by Petersen as a methodology. The preliminary findings made it possible to identify seven (7) common components regarding the definition of digital transformation according to the authors. Likewise, few validated models or frameworks were evident in higher education scenarios to implement digital transformation processes in higher education institutions. higher education. Likewise, the contribution of a collaborative model and digital maturity in universities was not identified, which allows inferring about some knowledge gaps that persist or problems that have not yet been resolved, providing future work opportunities to make a contribution in this area. of the science.

Keywords: Digitalization, Fourth Industrial Revolution, Framework, Digital Transformation.

Resumen

El objetivo de este documento es proporcionar información del estado del arte sobre modelos o marcos de trabajo para la implementación de procesos de transformación digital en las organizaciones, con un énfasis en acciones e iniciativas en el sector de la educación superior y proponer vías para futuras investigaciones. Para ello, se llevó a cabo una revisión sistemática de la literatura, donde se analizaron 202 artículos aplicando como metodología el procedimiento definido por Petersen. Los hallazgos

preliminares permitieron identificar siete (7) componentes en común en cuanto a la definición de transformación digital según los autores, de igual manera se evidenció escasos modelos o marcos de trabajo validados en escenarios de educación superior para implementar procesos de transformación digital en instituciones de educación superior. Del mismo modo no se identificó el aporte de un modelo colaborativo y de madurez digital en universidades, lo cual permite inferir sobre algunos vacíos de conocimiento que persiste o problemáticas que aún no se ha resuelto brindando oportunidades de trabajo futuro para realizar un aporte en esta área de la ciencia.

Palabras claves: Digitalización, Cuarta Revolución Industrial, Marco de Trabajo, Transformación Digital.

1. Introduction

Digital transformation processes belong to the Fourth Industrial Revolution (4IR) or industry 4.0 and have positively impacted economic sectors through the digitalization of processes and adoption of digital technologies, generating a digital culture, changing environments, new development models, new processes, creation of products and services in an organization. [1]

The Fourth Industrial Revolution is characterized by a fusion of technologies, with exponential speed, and unprecedented scope and impact for almost all industries in all countries. The breadth and depth of these changes herald the transformation of entire systems in production, in management, in government, and in everyday life. [2]

Digital transformation is a characteristic of the 4IR, since it is a process of exploiting digital technologies that has the capacity to create new ways of doing things in all economic sectors, generating new development models, processes and the creation of

products, and services, which in turn produce value, mainly through digitalization, which represents the conversion of data and analog processes into formats that can be understood and manipulated by machines (Organization for Economic Cooperation and Development – OECD, 2019). [2]

Globalization, as well as rapid technological evolution, have led to many of these companies being behind and unable to maintain this dizzying pace. It is important to keep in mind that the appearance of new technologies has changed our way of working, buying and even relating. Companies, like higher education institutions, need to join the digital transformation process so as not to become obsolete in scenarios of taking advantage of opportunities through a knowledge society connected in digital culture. This is why digital transformation is emerging as a topic of interest not only in scientific communities, but as increasingly recurrent practices in organizational dynamics, which are subject to the pressures imposed by digital technologies, new business models, that are manifested throughout the value chain, and the personalized demands of users in an environment of hyperconnectivity [3].

Quite a few authors have tried to explore the concept of digital transformation through three main areas of change: consumer behavior, business processes and business models [4], [5], [6]. In the educational sector [7] mentions that “the concept of digital transformation itself is evolving, and there are different points of view, definitions, models and steps for its implementation. In the same way [7] they assure that it is time to reach a consensus so that higher education institutions establish strategies to address this digital transformation that is so requested, desirable and necessary.”

Likewise for the business or educational sector, [7] agree that “Digital transformation is a relatively recent term, and therefore there is not yet a settled and agreed upon body of academic documentation; The concept itself is evolving, and there are different points of view, definitions, models and steps for its implementation.”

That is why it is currently evident that the concept of digital transformation has been defined in many different ways according to the positions of authors, according to the review of the literature, and different conceptual models and frameworks have also been identified, which are not very practical, and with few validations in higher education scenarios to implement digital transformation processes in higher education institutions that contribute to the efficiency of missionary functions mediated by a collaborative environment [6] [8].

This article presents the authors' own definition based on the consensus given by [9] in the taxonomy of digital transformation and the state of knowledge regarding digital transformation frameworks or models as a starting point in the development of a proposal on a framework that supports digital

transformation processes in higher education institutions specifically in their missionary functions initially research.

This document is organized as follows: Section two describes the background and state of the art in relation to the concept of digital transformation and its authors' own definition, section three describes the problem statement and contributions; Section four methodology and research approach. Section five contains preliminary results. Finally, conclusions and lessons learned regarding digital transformation models or frameworks in the education sector.

2. Background and State of the Art

2.1. Digital Transformation Concept

Globalization, as well as rapid technological evolution, have led to many companies being behind and unable to maintain this dizzying pace. It is important to keep in mind that the appearance of new technologies has changed our way of working, buying and even relating. “The world is changing at an accelerated pace. “The increasing use and dependence on digital technologies brings with it a host of important changes in both business and society.” [10]

To talk about these changes, the concept of digital transformation was introduced starting in 2000 [10]; However, it was only after 2014 that the term grew rapidly in popularity by both professionals and researchers, who have proposed numerous and diverse definitions. Additionally, as a result of academic interest, numerous digital transformation frameworks have been published to address different sectors and their needs. [10]

For [11] Digital transformation is part of this change that all types of organizations face. In this context, customer demands have changed, asking for personalized requirements. To do this, organizations will have to respond quickly, with the support of collaborative work.

The different definitions of digital transformation can be much more, generally in three fundamental aspects: organization, technology and society.

The debate around the concept of digital transformation will continue to occur in the research community; Each industry, each field of researchers, will have its own concepts and even many different visions about digital transformation.

Therefore, [12] mentions that it is not easy to find a general consensus on a standard model for digital transformation. Through a review of the literature, the authors consolidated 20 definitions of digital transformation from 2017 to 2022. Table 1 presents the definitions of digital transformation by each of the most prominent or cited authors.

Table 1. Digital Transformation Concepts

Year	Concept	Author	Sector
	Digital Transformation		
2017	It is the economic investment and development of new technologies, mindsets and business and operating models to improve work and competitiveness and deliver new and relevant value for customers and employees in a constantly evolving digital economy.	[13]	Business
2017	An evolutionary process that delivers digital capabilities and technologies to enable business models, operational processes and customer experience with a view to creating value.	[14]	Business Educational
2017	It is the process through which companies converge multiple new technologies, enhanced with ubiquitous connectivity, with the intention of achieving superior performance and a sustained competitive advantage, through the transformation of multiple dimensions of the business, including the business model, experience of the customer (with emphasis on digitally enabled products and services) and operations (processes and decision making), and simultaneously impacting people (including skills, talent and culture) and networks (full value chain)."	[6]	Business
2017	Evolutionary process that leverages digital capabilities and technology to enable business models, operational processes and consumer experiences that generate value.	[14]	Business
2018	Digital transformation is much more than digitization. According to Senén Barro, "it is important that universities understand that the destination of this path must not simply be their digitalization but rather becoming digital universities."	[7]	Educational
2018	Use of new technologies that enable radical improvements in organizations and influence all aspects of customer life. Process of change in an organization or society enabled by innovations and individual projects isolated from the rest.	[10]	Business
2018	Developments in information and communications technologies. It includes the ability to quickly adopt technologies and influence social and technical elements of business models, processes, products and organizational structure.	[5]	Business
2019	It specifically refers to the economic and social effects derived from digitalization, the use of digital technologies and data for the development of new products and services.	[5]	Business
2019	Digital transformation is a series of profound, coordinated changes in culture, people, and technology that enable new educational and operating models and transform an institution's operations, strategic directions, and value proposition.	[16]	Educational
2019	Digital transformation consists of both digitizing and detecting the potential of a technology to drastically transform business processes or create new services or strategic business processes for my organization based on said technology.	[7]	Educational
2019	The digital transformation ended recently, and therefore there is not yet a settled and agreed upon body of academic documentation. The concept itself is evolving, and there are different points of view, definitions, models and steps for its implementation.	[7]	Educational
2019	Digital Transformation (DT) can be primarily defined as organizational change. It is implemented with the use of technology in areas such as operation models, cooperation models with the external and internal environment, services provided, technology used and information management.	[17]	Educational
2020	Digital transformation is something more; This is when we digitize the university's strategy. And that is why digital transformation is not something that universities can implement as	[18]	Educational
2020	Digital transformation is "a series of profound, coordinated changes in culture, workforce, and technology that enable new educational and operating models and transform an institution's operations, strategic directions, and value proposition.	[19]	Educational
2020	essentially cultural paradigmatic change , focused on customer experience and commitment; which occurs in an environment of hyperconnectivity and is characterized by collaboration in all activities of the value chain; is enabled with (disruptive) technologies, new business models and new competencies; and impacts organizational innovations that cause changes in multiple dimensions, with emphasis on business processes and models, and, simultaneously, on people.	[9]	Business
2021	Structural changes in the economy, organizations and society caused by the widespread application of digital technologies and disruptive digital business models.	[20]	Business
2021	Various changes in business and society due to the increased use of digital technologies.	[10]	Business
2021	Digital transformation contributes to the new configuration of the way citizens live, work, think, interact and constantly seek practical experience, improves work efficiency, fundamentally changes the way that citizens work based on the application of modern technology, helps leaders improve their ability to predict and plan the future to achieve the desired progress.	[21]	Business

2021	Digital transformation involves the birth of many innovations, such as the Internet of Things (IoT), digital networks, social networks, artificial intelligence (AI), machine learning (ML) and Big Data.	[22]	Business
2021	Digital transformation is the transformation of business and organizational activities, processes, competencies and models to take full advantage of the changes and opportunities of a combination of digital technologies and their accelerated impact across all industries in a strategic and prioritized manner. , taking into account present and future changes.	[23]	Business
2017	It is the economic investment and development of new technologies, mindsets and business and operating models to improve work and competitiveness and deliver new and relevant value for customers and employees in a constantly evolving digital economy.	[13]	Business
2017	An evolutionary process that delivers digital capabilities and technologies to enable business models, operational processes and customer experience with a view to creating value.	[14]	Business Educational
2017	It is the process through which companies converge multiple new technologies, enhanced with ubiquitous connectivity, with the intention of achieving superior performance and a sustained competitive advantage, through the transformation of multiple dimensions of the business, including the business model, experience of the customer (with emphasis on digitally enabled products and services) and operations (processes and decision making), and simultaneously impacting people (including skills, talent and culture) and networks (full value chain)."	[6]	Business
2017	Evolutionary process that leverages digital capabilities and technology to enable business models, operational processes and consumer experiences that generate value.	[14]	Business
2018	Digital transformation is much more than digitization. According to Senén Barro, "it is important that universities understand that the destination of this path must not simply be their digitalization but rather becoming digital universities."	[7]	Educational
2018	Use of new technologies that enable radical improvements in organizations and influence all aspects of customer life. Process of change in an organization or society enabled by innovations and individual projects isolated from the rest.	[10]	Business
2018	Developments in information and communications technologies. It includes the ability to quickly adopt technologies and influence social and technical elements of business models, processes, products and organizational structure.	[5]	Business
2019	It specifically refers to the economic and social effects derived from digitalization, the use of digital technologies and data for the development of new products and services.	[5]	Business
2019	Digital transformation is a series of profound, coordinated changes in culture, people, and technology that enable new educational and operating models and transform an institution's operations, strategic directions, and value proposition.	[16]	Educational
2019	Digital transformation consists of both digitizing and detecting the potential of a technology to drastically transform business processes or create new services or strategic business processes for my organization based on said technology.	[7]	Educational
2019	The digital transformation ended recently, and therefore there is not yet a settled and agreed upon body of academic documentation. The concept itself is evolving, and there are different points of view, definitions, models and steps for its implementation.	[7]	Educational
2019	Digital Transformation (DT) can be primarily defined as organizational change. It is implemented with the use of technology in areas such as operation models, cooperation models with the external and internal environment, services provided, technology used and information management.	[17]	Educational
2020	Digital transformation is something more; This is when we digitize the university's strategy. And that is why digital transformation is not something that universities can implement as	[18]	Educational
2020	Digital transformation is "a series of profound, coordinated changes in culture, workforce, and technology that enable new educational and operating models and transform an institution's operations, strategic directions, and value proposition.	[19]	Educational
2020	essentially cultural paradigmatic change , focused on customer experience and commitment; which occurs in an environment of hyperconnectivity and is characterized by collaboration in all activities of the value chain; is enabled with (disruptive) technologies, new business models and new competencies; and impacts organizational innovations that cause changes in multiple dimensions, with emphasis on business processes and models, and, simultaneously, on people.	[9]	Business
2021	Structural changes in the economy, organizations and society caused by the widespread application of digital technologies and disruptive digital business models.	[20]	Business
2021	Various changes in business and society due to the increased use of digital technologies.	[10]	Business

2021	Digital transformation contributes to the new configuration of the way citizens live, work, think, interact and constantly seek practical experience, improves work efficiency, fundamentally changes the way that citizens work based on the application of modern technology, helps leaders improve their ability to predict and plan the future to achieve the desired progress.	[21]	Business
2021	Digital transformation involves the birth of many innovations, such as the Internet of Things (IoT), digital networks, social networks, artificial intelligence (AI), machine learning (ML) and Big Data.	[22]	Business
2021	Digital transformation is the transformation of business and organizational activities, processes, competencies and models to take full advantage of the changes and opportunities of a combination of digital technologies and their accelerated impact across all industries in a strategic and prioritized manner, taking into account present and future changes.	[23]	Business

According to the authors focused on digital transformation in the business sector such as the educational sector, seven relevant components stand out in the context: a) the leadership that must exist in the organization in the face of the appropriation and adoption of Digital Transformation processes, b) digitalization of strategic or operational processes, c) investment in adoption or incorporation of new technologies aligned with the organization's strategy, d) promotion of innovation and new business models, e) Reorganization of methods or procedures and strategies in general supported by IT, f) improvement in processes achieving competitiveness and value addition, g) development of new products and/or services in a constantly evolving digital economy.

Consequently, given the positive impact of appropriation and adoption of Digital Transformation processes in an organization, it can be inferred that it is pertinent and necessary to present alternatives or solutions to the educational sector of Higher Education Institutions (HEIs)¹ in their missionary processes such as: teaching, research, and social projection, the same way for administrative management; that originate work methods or procedures from operational and strategic processes so that an HEI is competitive and maintains constant evolution in the midst of a digital economy.

The education sector is one of the last industries that has initiated changes in the face of digital transformation processes because it is classically adhered to old methods and practices [24]. However, due to digital, which is a transversal axis that concerns the entire organization and the adoption of new technologies in the context, changes and challenges undoubtedly arise in the modernization of its services to adapt them to the new practices and needs of the users. stakeholders. These changes given by digitalization as a driving element of digital transformation processes create new market opportunities for organizations by refining the organizational value chain. [25]; impact in all areas, institutional policy, organizational culture vs digital culture, adoption of new skills to the academic community, continuous improvement

of its management processes, human resources, planning and sustainability of services, new necessary cooperation models in this new context of changes such as digital transformation implies. Higher education institutions will need to focus on digital transformation strategy to remain competitive in global education.

Finally, based on the analyzes carried out on the specialized literature, [9] designs the taxonomy of digital transformation expressed in a simple notation such as:

- TTD² = Principles (cultural change, user-centered, hyperconnectivity, collaboration),
- Enablers (technologies, business models, skills),
- Impacts (value creation, operational efficiency, digital economy, customer experience, business models, innovation, organizational culture, ecosystems, human resources),
- Adoption mechanisms (digital strategy, standards, infrastructure, platforms, enterprise architectures, dynamic capabilities, governance frameworks),
- Evaluation mechanisms (maturity model, indicator systems).

In this sense, as their own position regarding the concept and theories of digital transformation, the authors construct the definition of digital transformation *as an evolutionary process of change in the organizational culture that is governed in an environment of hyperconnectivity with certain collaboration principles for the digitalization of processes in all activities of the value chain, which is enabled with the adoption of digital technologies and impacts on management processes, business models, value creation, efficiency and operational performance; feasible to implement from frameworks and can be evaluated through maturity models and key performance indicators.*

In relation to the conceptualization of digital transformation exposed and its effects on organizations, purpose can be highlighted as impact on the organizational structure, value creation,

¹ IES: Higher Education Institutions.

² TTD: Digital Transformation Taxonomy

efficiency and operational performance, impact on the value chain, business processes, behavior in the consumer, adoption of digital technologies and continuous improvement through evaluation instruments or systems.

2.2. Digital Transformation models or frameworks

Regarding models and frameworks of digital transformation, the systematic review of literature [26] showed that there are hardly any contributions of systematic methods as a research methodology on Digital Transformation, while it is more common to find conceptual models, frameworks and strategies; and much more frequent, case studies focused on very specific areas.

In addition to this, as a result of academic interest, numerous digital transformation frameworks have been published to address different sectors and their needs [10]. According to the literature, trends and research gaps have been identified in terms of digital transformation model or frameworks in different industry sectors, including the education sector.

In this sense, according to [10], in a review of the literature, an analysis of 41 digital transformation frameworks was carried out, for different sectors of the industry, from this review they defined a novel comprehensive framework, but determined that from this Research can be expanded by creating detailed versions and contributions in various areas of specific sectors or contexts. Faced with the proposal of this comprehensive framework, they conclude that it can be the first step towards a unified understanding of digital transformation.

In addition to this, a framework with collaboration aspects was identified to support digital transformation processes in the business sector, according to [27] describes the digital collaborative framework, where the communication and work of its collaborators is carried out with all the traceability of strategic and operational processes on a single platform that involves all your employees. The collaborative framework is built by addressing the architecture of a new form of project management, "Open Project Management". Such a framework will allow workers to participate in the organization by contributing a personal lifestyle of social media use, which should trigger a cultural change in the workplace.

Despite the identified frameworks, however, there are few validated frameworks in higher education scenarios to implement Digital Transformation processes, mediated by a collaborative work environment to contribute to the improvement of missional processes, as mentioned [8], there is a shortage of practical, implementable and simple digital transformation models that combine educational technologies, systems and phenomena. This theoretical gap therefore shows that it remains

unclear what type of sustainable digital transformation model(s) could be adopted. [8].

In this sense [10] hope with this proposal that the digital transformation research community will expand its research focus to investigate the larger changes of digital transformation, such as the shift from customer-centricity to the economy of everyone for everyone. [14]. Another avenue of research is to investigate how maturity models can be combined with the digital transformation framework to create maturity stages in each category, in each dimension.

According to the literature, it can be established that there are digital transformation frameworks or models for different sectors or areas of the industry from a conceptual perspective, with very little evidence of practical, implementable frameworks and with achieved results, which indicates a gap in knowledge as a state. solution in the education sector.

This theoretical gap is considerable, impactful and non-ignorable. Therefore, as stated by [8], it remains unclear what type of sustainable digital transformation model(s) could be adopted.

3. Problem statement and contributions

Through a systematic review of the literature, few validated frameworks were evident in higher education scenarios to implement Digital Transformation processes, mediated by a collaborative work environment to contribute to the improvement of missional processes in higher education institutions. This happens due to the absence of a digital culture in the organization, finding itself disconnected from the technological planning of higher education institutions with the objectives of the institutional development plan. One of the primary components that would impact all dependencies and processes of an organization is cultural transformation, as mentioned by [28] without a digital culture there is no successful digital transformation.

Furthermore, according to [9], digital technologies must be available as enabling technologies for digital transformation. Organizations must value and understand the effect of adopting these and other enabling technologies as part of their digital strategies. Likewise [11] recognize that digital transformation is part of this change that all types of organizations face.

In this context, customer demands have changed [29], asking for personalized requirements. To do this, organizations will have to respond quickly, supported by collaborative work [11]. This indicates that another factor of Digital Transformation is Collaborative Work. For [9], end-to-end collaboration throughout the value chain is part of the key principles of digital transformation.

There are also initiatives to digitalize processes in isolation, not aligned with the development plan. There is no route on digitalization of mission processes in HEIs. For [30] Digitalization is the transformation of the business model, processes and operations using digital technologies. In the same way there is no evaluation framework for the readiness of HEIs to face digital transformation, which allows identifying level of implementation/adoption.

In relation to the exposed problem, the state of solutions identified is based on the definition and use of many models, conceptual frameworks, digital transformation frameworks, digital maturity models for digital transformation processes for different sectors or areas of the industry, from a conceptual look. It is worth highlighting that [31] proposes a model to face the Digital Transformation consisting of four steps: a) position the organization in digitalization, b) review of the current state, c) roadmap and d) implementation and validation.

Likewise, a simplified model based on the factors that enable Digital Transformation processes, and its potential results for business and society, is presented in [32]. The authors of this model describe three main components: enablers or “drivers”, a core of Digital Transformation (expressed in technologies, management and people) and the results.

This study revealed a ranking of the factors that affect the Digital Transformation process, with those related to strategy and organizational culture being the most important; as well as the values, the ability to accept changes and the self-motivation of employees.

Regarding models and frameworks of digital transformation, the systematic review of the literature carried out by [33] showed that there are hardly any contributions of systematic methods as research methodology on Digital Transformation, while it is more common to find conceptual models, frameworks and strategies; and much more frequent, case studies focused on very specific areas. In addition to this, as a result of academic interest, numerous digital transformation frameworks have been published to address different sectors and their needs [10]. Currently, there are few validated frameworks in higher education scenarios to implement digital transformation processes in higher education institutions that contribute to the efficiency of mission processes mediated by a collaborative environment [6]. [8].

Considering the knowledge problems mentioned above, the research question arises aimed at developing a project or future work that can answer the following question: How to implement a framework for the implementation of digital transformation processes in a higher education institution?

4. Research methodology and approach

To carry out the systematic literature review, the procedure defined by Petersen et al. [34] [35] However, it is complemented by the research procedures proposed by Hoyos Botero [36]. This review was carried out in three phases: planning, execution, documentation. As indicated in figure 1.

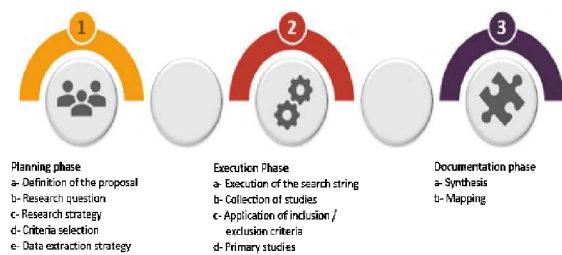


Fig. 1 Protocol for systematic literature review

4.1. Planning Phase

4.1. Definition of the proposal

This systematic review aims to determine and characterize the current state of knowledge on the definition and use of models or frameworks to support the implementation of Digital Transformation processes, which have documentation on their validation to contribute to the continuous improvement of the processes. management, human resources, planning and sustainability of the services of a higher education institution. It was carried out from 2017 to 2022.

4.2. Research questions

The research questions presented in Table 2 allow us to know the current state of work that has made contributions under the theme of digital transformation, such as definition and application of DT frameworks or models in different sectors of the industry to have previous results to be used. as a starting point to define, build or adopt these models in the education sector.

Table 2. Research Questions

No.	Ask
P1	What research has been developed on digital transformation and collaborative work in organizations?
P2	What type of solutions have been implemented to facilitate the adoption of Digital Transformation processes in organizations?
P3	What are the relevant elements or aspects that must be taken into account in Digital Transformation processes in universities?
P4	Is there a collaborative maturity model for digital transformation processes in universities that allows contributing to the continuous improvement of management and planning?
P5	What collaborative work initiatives exist to support digital transformation processes in missionary functions of universities?
P6	What benefits and challenges do the adoption of Digital Transformation processes in organizations entail?

Table 3 Search terms

Main Term	Terms related
Digital Transformation	Digital Transformation, Digital Transformation, Digital Transformation Models, Digital Transformation Models, Models, Models, Framework, Framework, Methods
Collaborative work	Collaborative Work, Collaborative work, Models, Models, Framework, Framework, Methods, Methods, Collaborative Work Model, Collaborative Work Model
Search string used	
(("Digital Transformation") OR ("Digital Transformation") OR ("Digital Transformation Model") OR ("Digital Transformation Models")) AND ("Collaborative Work") OR ("Collaborative work") OR ("Collaborative Work Model") OR ("Collaborative Work Model"))	

Table 4. Quality evaluation criteria

Questions	Evaluation scale
<ul style="list-style-type: none"> The research is developed around the topic of digital transformation. The study contemplates proposals or solutions on the topic of Collaborative Work. The study proposes a framework, route or set of elements described in detail to carry out digital transformation processes in universities. The study presents results of implementation of a digital transformation model or framework in universities. The study presents collaborative work initiatives to support university digital transformation processes. The research presents the construction of a digital transformation model and/or collaborative work in organizations. Describe the benefits and challenges that come with adopting digital transformation processes in organizations? 	Measuring scale: Yes = 1.0 Partially = 0.5 Not = 0.0 Measurement strategy: Maximum rating: 7.0 Minimum rating: 2.0 Minimum acceptance score: 2.5

4.3. Search strategy

The search chain is built based on the steps defined by Kitchenham and Charters [23]. Table 3 describes the terms used in this research to construct the search string. The search was carried out in the engines: Scopus, Science Direct and Web of Science, considering the studies carried out between 2017 and 2022.

4.4. Criteria Selection

4.4.1. Inclusion and exclusion criteria

The inclusion and exclusion criteria according to the methodology allow us to filter out studies that are not relevant to the defined questions. In this case, the inclusion criteria are articles that (1) related to digitalization and digital technologies, (2) published between 2017 and 2022, (3) are applied to

companies and universities, (4) the topic is collaborative work or digital transformation, (5) are the product of research, workshops or conferences. Articles that only present summary, web page content and personal blogs are excluded.

4.4.2. Quality Evaluation Criteria.

To measure the quality of the selected studies and determine the relevant ones, a questionnaire was developed with a scoring system of three values: a) value 0.0 in case it does not comply or there is no answer to the question asked, b) value 0, 5 in case the article complies to a certain extent with some quality questions formulated and c) value 1.0 applies to those articles that answer any of the quality questions formulated. Table 4 shows the issues to consider when evaluating the studies and the score assigned according to the possible answers.

4.5. Data extraction strategy.

As a synthesis method, the information from selected studies was extracted and structured by adapting the bibliographic files proposed by Hoyos Botero [22]: Identification (title, authors, year of publication, keywords), research category, summary, problem, research approach, methodological solution, conclusions, answers to research questions, identified research gaps, quality evaluation (0-7), current research contribution.

4.6. Execution Phase.

This phase describes the stages that allowed the identification of potential primary studies to carry out systematic mapping. Figure 2 indicates 75 documents, equivalent to the total number of articles included during the study selection process. These are detailed in annex 1.

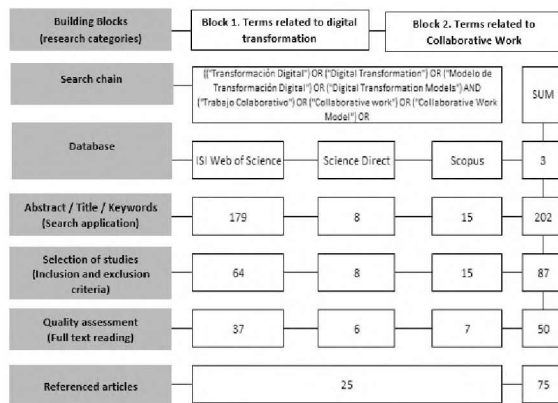


Fig. 2 Study selection process

4.7. Documentation phase.

The *Parsifal tool* allowed documenting the data to be extracted from the articles identified as primary studies within the systematic mapping, as indicated in session E. The results obtained are presented, which correspond to the documentation phase in accordance with the methodology, a response is given to the research questions defined in the planning stage.

Q1: What research has been developed on digital transformation and collaborative work in organizations?

Research on digital transformation and collaborative work was found. 76% of studies emphasize that digital transformation occurs in the adoption of digital technologies in an industry sector, in a specific process or area to make a contribution to a given need. 13.3% of studies adopt digital technologies supported by collaborative work. 28%

of the studies have developed digital transformation models in different organizations. 10.6% of research uses collaborative work frameworks to support digital transformation processes in various organizations.

Q2: What type of solutions have been implemented to facilitate the adoption of Digital Transformation processes in organizations?

In the literature there are many proposals for solutions, but fifteen research projects were found to be implemented. 18.6% of the studies implemented solutions to facilitate the adoption of digital transformation processes in specific areas of their organizations. In the educational sector, three solutions were highlighted, corresponding to studies S01, S04, S07, for other sectors, 11 solutions were identified that are part of studies S06, S06, S11, S12, S17, S22, S30, S58, S59, S60, S68.

P3. What are the relevant elements or aspects that must be taken into account in Digital Transformation processes in universities?

In the primary studies analyzed, eleven investigations (14.6%) were found with digital transformation process initiatives in universities, (S01, S64, S04, S07, S09, S13, S51, S52, S63, S64, S72), where Relevant elements or aspects are highlighted to be carried out in their institutions. Among these relevant aspects, proposals for conceptual solutions were identified to continue advancing in future research that allow the implementation of digital transformation models or frameworks with practical results in missional processes of each institution.

These investigations agree that the education sector is one of the last industries that has initiated changes in a digital culture because it is adhered to old methods and practices. These studies describe the relevant aspects of the studies analyzed. Some common elements have to do with: a) current diagnosis of the university, b) digitization of processes, c) adoption of digital technologies, d) digital maturity, e) adoption of new skills, f) Institutional leadership, g) implementation DT processes. There are other specific elements of each of the primary studies analyzed; Although each study is considered important according to its context, it is considered pertinent to be studied in future work on the implementation of the digital transformation process in universities.

Q4: Is there a collaborative maturity model for digital transformation processes in universities that allows contributing to the continuous improvement of management and planning?

The design and implementation of a collaborative maturity model for digital transformation processes in universities was not evident in the literature consulted. The above may be due to the small number of works that addressed collaborative models as a means to support digital transformation processes taking into account their maturity.

Q5: What collaborative work initiatives exist to support digital transformation processes in missionary functions of universities?

There was no evidence in the literature consulted of collaborative work actions or initiatives to support digital transformation processes in universities. The above may be due to the small number of works that addressed collaborative models as a means to support digital transformation processes.

Q6: What benefits and challenges does the adoption of Digital Transformation processes entail in organizations?

The results show benefits and challenges that come with the adoption of transformation processes in organizations, in the case of Combita, Parra, Blang and Herrera [25] (digitalization experience in the laboratories of the National University of Colombia) affirm that the transformation processes digital transformation in HEIs identify challenges in the areas of technology, teaching-learning, organizational culture and evaluation of how academic-administrative processes are developed, among others.

For their part, [28] mention that digital transformation is part of this change that all types of organizations face. In this context, customer demands have changed, asking for personalized requirements. To do this, organizations will have to respond quickly, with the support of collaborative work.

Likewise [32] highlights the production of new services, new products, new processes, new skills or competencies, achieving as a result improved services, improved processes, better relationships, new policies and impacting the creation of value, organizational change, and a digital society. Likewise in any sector of the organization, [34] describes the following benefits and challenges that digital transformation processes entail in a company: a) promote the culture of innovation in the organization, b) Improve the efficiency of the processes in organizations, c) contributes to promoting collaborative work and internal communication, d) provides a rapid response capacity in a changing environment, e) offers new business opportunities thanks to data analysis, f)

improves the customer experience and its relationship with the brand.

5. Preliminary results

The observations of this systematic mapping are intended to generate a contribution for those researchers who are planning to investigate digital transformation processes in universities and more specifically in frameworks or models that can be implemented in missional processes. As a result of this systematic review of the literature, some starting points can be proposed that could be implemented in higher education institutions.

- Define a conceptual framework on digital transformation processes in universities based on the concepts proposed by researchers from other sectors of the industry and some initiatives from the educational sector.
- Build a collaborative model of digital transformation for higher education institutions based on experiences and results obtained in other industries where systematic mapping highlights the positive impact on stakeholders, especially on collaborators in an organization.
- Develop a digital environment that supports a collaborative model.
- Incorporate a framework with an agile approach, since the systematic mapping also made it possible to show that some universities and organizations consider it with a mechanism to respond to the immediate changes in digital culture.
- Knowing the current state of each of the institutions, for this the digital maturity model identified in the mapping will allow this process to be carried out, to determine the level of maturity and capacity in which an HEI is located.

The literature review allowed us to identify some gaps or future work in the proposal of a new systematic methodology to examine the impact of sustainable digital transformation in higher education institutions. In addition to this, there is the characterization of the different models and/or frameworks of digital transformation obtained from the respective review of the literature, 41 digital transformation frameworks for different sectors of the industry [10], which supports the gaps of knowledge described in section 2.

6. Conclusions and Lessons Learned

Industry 4.0, digital culture and changing environments in any industry sector mean that digital

transformation processes are incorporated into an organization. The education sector cannot be the exception, which is why this systematic mapping allowed us to know the current state of the digital transformation processes in an HEI, allowing us to identify roadmaps, conceptual proposals, framework or theoretical model lacking implementation in the universities.

This will allow researchers to continue advancing in this topic, achieving an impact with tangible results on mission processes, and other components of an HEI in its process map, stakeholders, having a digital culture, commitment of senior management, all of this will result in new business models based on new products and services in accordance with the demand of the actors in the educational system.

The results obtained in the systematic mapping presented in this article demonstrate that talking about the implementation of collaborative digital transformation models with focuses on agile processes, which includes measuring the level of digital maturity and making it sustainable is a novelty in this field and the need to develop This collaborative model will impact continuous improvement processes in management, human resources, planning and sustainability of the services of a higher education institution.

There is a lot of related literature on the topic of digital transformation for organizations. Regarding this topic, there are conceptual, maturity and some exclusive models or frameworks with the name of digital transformation models or frameworks, however, no results are evident. of implementation of digital transformation processes in the higher education sector in a specific area.

“ framework ” will be understood as a standardized set of concepts, practices, guidelines and criteria to focus on a particular type of problem, which serves as a reference in a specific domain and can be used to face or solve new problems of a nature. similar, which may serve as a basis for the implementation of transformation processes in the education sector.

Finally, the implementation of a digital transformation model in higher education institutions or universities that demonstrates the results obtained was not evident in the literature consulted. Likewise, there is no collaborative maturity model for digital transformation processes in universities. However, this mapping is within a research that aims to make a contribution at this point.

Through the literature consulted, a common thread and evidence can be established that justifies the use of collaborative models and digital maturity, mediated by a collaborative work environment to

contribute to the continuous improvement of management processes, human resources, planning and sustainability of university services.

Therefore, it is important to keep in mind that, based on the identified knowledge gaps, the authors will begin, as future work, the definition of a digital transformation framework or model that supports the implementation of digital transformation processes in the education sector. higher, based on the following aspects: a) Development of a collaborative maturity model of digital transformation processes for HEIs. b) The definition of the digital maturity process to identify the current state of each university to implement the proposed model. c) Identification of an HEI that will be the pilot institution to carry out the implementation of the proposed collaborative maturity model.

Competing interests

The authors have declared that there are no competing interests.

Authors' contribution

AT: Conceptualization, formal analysis, research, methodology, validation, original draft writing, review writing and editing.

CC: Supervision, conceptualization, formal analysis, original draft writing, revision writing.

AM: Supervision, conceptualization, formal analysis, original draft writing, review writing and editing.

References

- [1] L. Alunni and N. Llambías, “Exploring digital transformation from within,” *Palermo Bus. Rev.* , vol. 17, pp. 11–30, 2018.
- [2] M. Lucía *et al.* , “NATIONAL COUNCIL OF ECONOMIC AND SOCIAL POLICY CONPES Iván Duque Márquez President of the Republic.”
- [3] T. Delgado Fernández, “Taxonomy of digital transformation,” *Rev. Cuba. Transform. Digit.* , vol. 1, pp. 4–23, 2020, [Online]. Available: <https://orcid.org/0000-0002-4323-9674>
- [4] K. Schwertner, “Digital transformation of business,” *Trakia J. Sci.* , vol. 15, no. Suppl.1, pp. 388–393, 2017, doi: 10.15547/tjs.2017.s.01.065.
- [5] A. Bockshecker, S. Hackstein, and U. Baumöl, “Systematization of the term digital transformation and its phenomena from a socio-technical perspective – A literature review,” 2018.
- [6] MH Ismail, M. Khater, and M. Zaki, “Digital Business Transformation and Strategy: What Do We Know So Far? University of Cambridge,” *J. Univ. Cambridge* , no. November 2017, 2018, [Online]. Available: www.cambridgeservicealliance.org

- [7] A. Fernández Martínez, F. Llorens Largo, and R. Molina-Carmona, "Digital maturity model for universities (MD4U)," *Cátedra Santander-UA Transform. Digit. - Job Doc.*, pp. 1–16, 2019, [Online]. Available: <http://rua.ua.es/dspace/handle/10045/99031>
- [8] MA Mohamed Hashim, I. Tlemsani, and R. Duncan Matthews, "A sustainable University: Digital Transformation and Beyond," *Educ. Inf. Technol.*, 2022, doi: 10.1007/s10639-022-10968-y.
- [9] T. Delgado Fernández, "Digital transformation taxonomy," 2020. [Online]. Available: <https://orcid.org/0000-0002-4323-9674>
- [10] Z. Van Veldhoven and J. Vanthienen, "Digital transformation as an interaction-driven perspective between business, society, and technology," *Electron. Mark.*, 2021, doi: 10.1007/s12525-021-00464-5.
- [11] CP Lopez, J. Aguilar, and M. Santorum, "Autonomous VOs management based on industry 4.0: a systematic literature review," *J. Intell. Manuf.*, 2021, doi: 10.1007/s10845-021-01850-8.
- [12] NH Thanh, "Digital Transformation: Smart Strategy in Administrative Reform in Vietnam," *HighTech Innov. J.*, vol. 2, no. 4, pp. 328–345, 2021, doi: 10.28991/hij-2021-02-04-06.
- [13] S. Etlinger, "The Conversational Business," pp. 1–29, 2017, [Online]. Available: https://andyblackassociates.co.uk/wp-content/uploads/2015/06/ConversationalBusiness_FINAL-1.pdf
- [14] R. Morakanyane, A. Grace, and P. O'Reilly, "Conceptualizing digital transformation in business organizations: A systematic review of literature," *30th Bled eConference Digit. Transform. -From Connect. Things to Transform. our Lives, BLED 2017*, pp. 427–444, 2017, doi: 10.18690/978-961-286-043-1.30.
- [15] Conpes 3855 - 2016, "C Onpes," p. 38, 2016.
- [16] FJ García-Peñalvo, "Avoiding the dark side of digital transformation in teaching. an institutional reference framework for eLearning in higher education," *Sustain.*, vol. 13, no. 4, pp. 1–17, 2021, doi: 10.3390/su13042023.
- [17] M. Deja, D. Rak, and B. Bell, "Digital transformation readiness: perspectives on academia and library outcomes in information literacy," *J. Acad. Librariansh.*, vol. 47, no. 5 p. 102403, 2021, doi: 10.1016/j.acalib.2021.102403.
- [18] D. Abraham and C. Gaibor, "DIGITAL TRANSFORMATION IN TODAY'S UNIVERSITY," 2020.
- [19] CE Miller, "Leading Digital Transformation in Higher Education," no. June, pp. 1–25, 2019, doi: 10.4018/978-1-5225-7769-0.ch001.
- [20] A. de Bem Machado, S. Secinaro, D. Calandra, and F. Lanzalonga, "Knowledge management and digital transformation for Industry 4.0: a structured literature review," *Knowl. Manag. Practical Res.*, vol. 20, no. 2, pp. 320–338, 2022, doi: 10.1080/14778238.2021.2015261.
- [21] TN Hai, QN Van, and MNT Tuyet, "Digital transformation: Opportunities and challenges for leaders in the emerging countries in response to covid-19 pandemic," *Emerg. Sci. J.*, vol. 5, no. Special Issue, pp. 21–36, 2021, doi: 10.28991/esj-2021-SPER-03.
- [22] H. Antonopoulou, C. Halkiopoulos, O. Barlou, and GN Beligiannis, "Associations between traditional and digital leadership in academic environments: During the COVID-19 pandemic," *Emerg. Sci. J.*, vol. 5, no. 4, pp. 405–428, 2021, doi: 10.28991/esj-2021-01286.
- [23] Upadrasta, V. (2021). *Formula 4. 0 for Digital Transformation: A Business-Driven Digital Transformation Framework for Industry 4. 0*. Productivity Press.
- [24] K. Kerroum, A. Khiat, A. Bahasse, ES Aoula, and Y. Khiat, "The proposal of an agile model for the digital transformation of the University Hassan II of Casablanca 4.0," *Procedia Comput. Sci.*, vol. 175, pp. 403–410, 2020, doi: 10.1016/j.procs.2020.07.057.
- [25] P. Kilimis, W. Zou, M. Lehmann, and U. Berger, "A survey on digitalization for SMEs in Brandenburg, Germany," *IFAC-PapersOnLine*, vol. 52, no. 13, pp. 2140–2145, 2019, doi: 10.1016/j.ifacol.2019.11.522.
- [26] C. Gebayew, IR Hardini, GHA Panjaitan, NB Kumiawan, and Suhardi, "A Systematic Literature Review on Digital Transformation," *2018 Int. Conf. Inf. Technol. Syst. Innovation ICITSI 2018 - Proc.*, pp. 260–265, 2018, doi: 10.1109/ICITSI.2018.8695912.
- [27] K. Chowdhury and D. Lamacchia, "Collaborative workspace for employee engagement leveraging social media architecture," *Soc. Pet. Eng. - Abu Dhabi Int. Pet. Exhib. Conf. 2019, ADIP 2019*, 2019, doi: 10.2118/197325-ms.
- [28] J. Hemerling, J. Kilmann, M. Danoesastro, L. Stutts, and C. Ahern, "It's not a digital transformation without a digital Culture," *Bost. Consult. Gr.*, pp. 1–11, 2018, [Online]. Available: <https://www.bcg.com/publications/2018/not-digital-transformation-without-digital-culture.aspx>
- [29] R. Gacitua, H. Astudillo, B. Hitpass, M. Osorio-Sanabria, and C. Taramasco, "Recent Models for Collaborative E-Government Processes: A Survey," *IEEE Access*, vol. 9, pp. 19602–19618, 2021, doi: 10.1109/ACCESS.2021.3050151.
- [30] J. (2017) Clerck, "Digitization, digitalization and digital transformation," 2017, [Online]. Available: <https://www.i-scoop.eu/digital-transformation/digitization-digitalization-digital-transformation-disruption/>
- [31] P. Parviainen, M. Tihinen, J. Kääriäinen, and S. Teppola, "Tackling the digitalization challenge: How to benefit from digitalization in practice," *Int. J. Inf. Syst. Proj. Manag.*, vol. 5, no. 1, pp. 63–77, 2017, doi: 10.12821/ijispm050104.

- [32] N. Verina and J. Titko, "Digital transformation: conceptual framework," 2019, doi: 10.3846/cibmee.2019.073.
- [33] C. Gebayew, IR Hardini, GHA Panjaitan, NB Kurniawan, and Suhardi, "A Systematic Literature Review on Digital Transformation," *2018 Int. Conf. Inf. Technol. Syst. Innovation ICITSI 2018 - Proc.*, No. August 2019, pp. 260–265, 2018, doi: 10.1109/ICITSI.2018.8695912.
- [34] K. Petersen, R. Feldt, S. Mujtaba, and M. Mattsson, "Systematic mapping studies in software engineering," *12th Int. Conf. Eval. Assess. Softw. Eng. EASE 2008*, pp. 1–10, 2008, doi: 10.14236/ewic/ease2008.8.
- [35] K. Petersen, S. Vakkalanka, and L. Kuzniarz, "Guidelines for conducting systematic mapping studies in software engineering: An update," *Inf. Softw. Technol.*, vol. 64, pp. 1–18, 2015, doi: 10.1016/j.infsof.2015.03.007.
- [36] CH Botero, *A model for documentary research: theoretical-practical guide on the construction of states of the art with important reflections on the research*. Editorial Signal, 2000. [Online]. Available: <https://books.google.com.co/books?id=Wa3PAQAACAAJ>
- [37] MN Córdoba and C. Monsalve, "Types of research, predictive, interactive, confirmatory and evaluative," *Fund. Sypal*, pp. 139–140, 2008.
- [38] R. Hernández Sampieri, C. Fernández Collado, and M. del P. Baptista Lucio, *Research Methodology*. Mexico: McGRAW-HILL / INTERAMERICANA EDITORES, SA DE CV, 2005.

Citation: A. A. Torres, C. A. Collazos and A. Mon. *A Review of the Literature on models or frameworks for Implementation of Digital Transformation Processes*. Journal of Computer Science & Technology, vol. 24, no. 2, pp. 153-167, 2024

DOI: 10.24215/16666038.24.e15

Received: January 10, 2024 **Accepted:** July 13, 2024.

Copyright: This article is distributed under the terms of the Creative Commons License CC-BY-NC-SA.

Annex 1. Primary Studies Literature Review

Digital Transformation Actions	Primary studies
Adoption of digital technologies in the laboratories of the National University at various locations. Action focused on the adoption of a technology.	S01
A collaborative work framework to support digital transformation processes between several organizations.	S02
Model of collaborative processes of digital transformation in electronic government	S03
Use of emerging technologies in the Monterrey technological laboratories. Action focused on the adoption of a technology.	S04
A digital collaborative framework, a smart digital ecosystem to bring together multiple organizations and employees along with their work and communication on a single platform engaging all generations of employees. The framework is built by addressing the architecture of a new form of project management, "Open Project Management".	S05
Use of intelligent tools as practical solutions in the context of spatial and territorial development planning supported by collaborative work. (technology adoption in a specific context versus a specific need)	S06
The proposal of an agile model for the digital transformation of the Hassan II University of Casablanca 4.0	S07
Adoption of digital technologies in the hotel sector.	S08
Information Literacy and digital literacy in the face of digital transformation processes in the education sector, specifically the library process.	S09
System-of-Systems architecture models using the Zachman framework	S10
Application of the Zachman Framework with collaborative engineering services for the global automotive supply chain to demonstrate its importance in Agile Digital Transformation.	S11
Proposal Agile digital transformation of business architecture models in engineering collaboration.	S12
Proposal of a conceptual model for sustainable digital transformation in a university	S13
Comprehensive digital transformation framework based on 41 identified frameworks.	S14
Adoption of digital tools for entrepreneurship.	S15
The current state of digitalization in German local authorities. The authors explain the obstacles of implementation, as well as the impact on staff members and citizens, providing explanations and revealing the general interrelationships between institutional changes, impacts and contextual factors of digital transformation.	S16 S17
Management of digital transformation processes from multiple initiatives in companies based in Germany.	S18
A bibliometric review on Digital Transformation in the Construction Industry by the University of Manchester	S19
Study on supply chain risk management in the era of digital transformation: contribution and challenges of blockchain technology	S20
Structured Literature Review (SLR) on the Relationship of Knowledge Management and Digital Transformation (DT) in Industry 4.0	S21
Conceptual model of open innovation that contributes to the digital transformation in three Brazilian multinational industrial companies that have already begun their respective journeys towards Industry 4.0.	S22
A measurement framework to evaluate the digital transformation of cultural institutions: the Italian case.	S23
a conceptual framework for quality 4.0 in the context of digital transformation.	S24
Qualitative model of digital transformation as a driving force to generate competitive advantages for universities through digitalization strategy.	S25
Creation of strategic responses to survive, as an established company, in a market interrupted by digital innovations in the hotel industry	S27
A Digital Business Model: An Illustrated Framework of Cultural Heritage Business	S28
Socially and digitally committed university model in Society 5.0	S30
Theoretical model of interprofessional collaboration competence of individuals	S31
Digital transformation of the agri-food sector through the evaluation of the Farm strategy to Fork (F2F) of the European Union from the perspective of innovation systems.	S32
A standard model to help organizations in their digital transformation where it identifies capacity/maturity to evaluate and improve their current data science capacity.	S33
A conceptual framework that sees an external stimulus as a driver of digitalization, filtered by the entrepreneurial orientation of SMEs	S34
Digital maturity assessment framework for operations in the construction industry.	S35
Collaborative work environment in which students could participate in concrete engineering experiences within their virtual global team projects.	S40
A 4.0 Purchasing process model for industrial clients in digital servitization	S42
Teachers experience collaborative work using a recording and audio board.	S43
Traditional business models to business models based on collaboration and open innovation for the agro-food industry	S47
A systematic review of industry 4.0 implementation from an organizational perspective.	S49
Dashboard Design Patterns Collaborative work management tools	S50
Transition to University 4.0: a conceptual approach	S51
A cyclical conceptual map for the transition to University 4.0 considering the effects	S52

of digital transformation and Industry 4.0 in social and educational processes.	
Digital Transformation in Industry 4.0 a Literature Review	S53
Maturity assessment models and preparation towards Industry 4.0: a literature review	S54
Challenges in the operation of a digital oil field: lessons learned from a collaborative environment.	S55
A Digital Code of Ethics: laying the foundations for digital ethics in a science and technology company	S56
Development and Implementation of a Digital Transformation Maturity Model	S57
Collaborations for Digital Transformation: Case Studies of Industry 4.0 in Brazil. (Conceptual framework of open innovation to support digital transformation)	S59
Industry 4.0 roadmap: framework for digital transformation based on the concepts of maturity and alignment of capabilities	S60
A preliminary literature review: Digital transformation case studies	S61
Digital transformation taxonomy	S62
Driving transformation digital in higher education	S63
Digital maturity model for universities	S64
Digital Transformation in Higher Education Institutions: a systematic review of the literature	S65
Preparation for digital transformation in higher education institutions (HEIs): the case of Kosovo	S66
Definition of digital transformation: results of interviews with experts	S67
Technological Transformation Model for SMEs	S68
Preparedness for Industry 4.0: a new framework for maturity assessment based on a bibliometric study of scientific articles from 2001 to 2020	S69
Avoiding the Dark Side of Digital Transformation in Teaching An Institutional Reference Framework for eLearning in Higher Education.	S70
Digital transformation: A review of the literature and guidelines for future research.	S71
Digital transformation in today's university	S72
Analysis of the digital transformation of Higher Education Institutions. A theoretical framework.	S73
Digital transformation and innovation global in the University 4.0	S74
Understanding digital transformation: a review and research agenda.	S75