

## Strategic approach to digital transformation in higher education institutions

### Enfoque estratégico de la transformación digital en instituciones de educación superior

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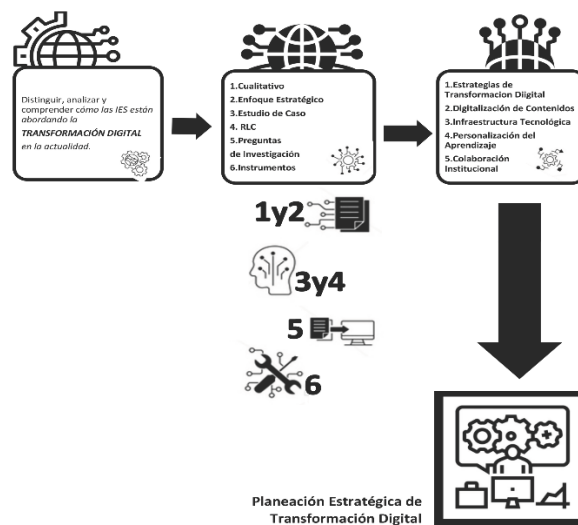
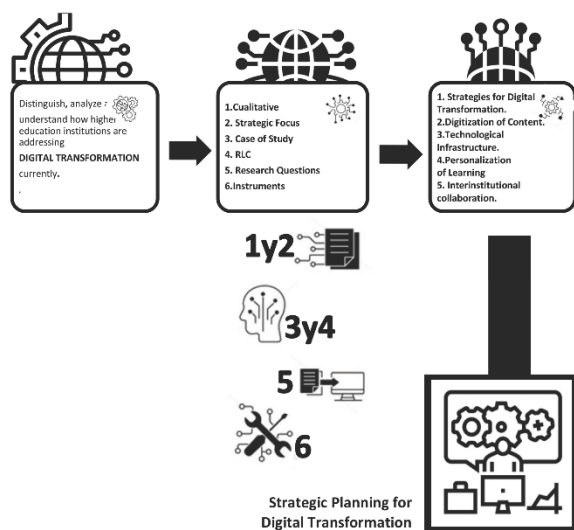
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#### Abstract

The research study titled *Strategic Exploration of Digital Transformation in Higher Education Institutions* aims to comprehensively analyze and understand the approaches higher education institutions are taking towards digital transformation. It takes a strategic approach to explore the conception, initiatives, challenges, and opportunities related to the adoption of digital technologies in this constantly evolving academic environment. The research results, obtained through a detailed review of existing literature in various specialized databases on digital transformation in higher education, indicate that higher education institutions are adopting diverse strategies for digital transformation. These strategies range from digitizing content to implementing online learning platforms. Common challenges are identified, such as resistance to change and the need for investment in technological infrastructure. Emerging opportunities are also highlighted, such as personalized learning and inter-institutional collaboration through technology. The study concludes by emphasizing the importance of solid strategic planning and adaptability in the digital transformation process. It suggests that higher education institutions should address the changing needs of students and leverage digital technologies effectively to improve the quality of teaching and learning. Ultimately, the research provides a valuable foundation for future studies and will guide the strategic decisions of educational institutions in pursuit of digital transformation.

#### Resumen

El estudio de investigación *Exploración Estratégica de la Transformación Digital en Instituciones de Educación Superior* se centra en analizar y comprender de manera exhaustiva cómo las instituciones de educación superior están abordando la transformación digital en la actualidad. Para este caso, se utiliza un enfoque estratégico que plantee su concepción, iniciativas, desafíos y oportunidades relacionadas con la adopción de tecnologías digitales en algunos entornos académicos en constante evolución. Se hace una revisión detallada de la literatura existente en diversas bases de datos especializadas sobre la transformación digital en la educación superior. Los resultados de la investigación indican que las instituciones de educación superior están adoptando diversas estrategias para la transformación digital, que van desde la digitalización de contenidos hasta la implementación de plataformas de aprendizaje en línea. También, se identifican desafíos comunes, como la resistencia al cambio y la necesidad de una mayor inversión en infraestructura tecnológica. Además, se destacan oportunidades emergentes, como la personalización del aprendizaje y la colaboración interinstitucional a través de la tecnología. Se concluye enfatizando la importancia de una planificación estratégica sólida y la adaptabilidad en el proceso de transformación digital. Se sugiere que las instituciones de educación superior deben abordar las necesidades cambiantes de los estudiantes y aprovechar las tecnologías digitales de manera efectiva para mejorar la calidad de la enseñanza y el aprendizaje. En última instancia, el estudio proporciona una base valiosa para futuras investigaciones y para orientar las decisiones estratégicas de las instituciones educativas en búsqueda de la transformación digital.



Strategy, Digital transformation, Education

Estrategia, Transformación digital, Educación

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## Introduction

Today, higher education institutions (HEIs) have had to adapt to the fast-moving technological changes. With the passage of the Covid19 pandemic, HEIs have had to reinvent themselves in a systematic and permanent way in order to face the challenges of an ever-changing environment, the reality of the digital era. On the one hand, Information and Communication Technologies (ICT) have become essential tools for their transformation. On the other hand, ICT are an integral part of the fourth industrial revolution or industry 4.0, characterised by technological and digital advances that are transforming and impacting economically, in all productive sectors (industry, government, society and academia), such as automation, interconnection of devices, data analysis, artificial intelligence, adoption of the cloud, digital transformation, among others (Cabrerá, et al., 2020). Hence, it is not only about HEIs advancing or evolving today, but also about their ability to anticipate the future. It is a fact that everything is changing, new professions, more holistic, multidisciplinary and transdisciplinary. In this sense, they must focus on a vision of a digital world, in which they are already immersed, but there is still a long way to go.

The digital transformation that is taking place in societies around the world has a direct effect on all productive sectors. Celis and Ramon (2023) mention that "technology used appropriately within organisations generates a great impact within them, an organisational culture oriented towards innovation and technological development" ( p. 10), which allows them to continue to advance and grow. Therefore, it is clear that organisations, whatever their field of activity, need to transition to this digital transformation to take advantage of the capabilities that technologies provide them, changing their processes and promoting new organisational models to adequately incorporate themselves into the new digital scenario. In which most areas of human activity are being affected, giving rise to new challenges. Particularly, its impact on the educational sphere is highlighted, in higher education institutions, where this technological evolution has given rise to a re-evaluation of teaching-learning methodologies, access to information, as well as data management within universities.

Therefore, the objective of this study focuses on distinguishing, analysing and understanding how HEIs are carrying out the digital transformation both in their academic programmes and in their academic-administrative processes. The intention is, on the one hand, to identify the effective digital transformation strategies and practices they are implementing. On the other hand, to recognise the challenges and opportunities associated with the adoption of digital technologies in HEIs. To achieve this, this qualitative research applies a strategic approach to explore strategic initiatives and effective practices, and to analyse the challenges and opportunities associated with the adoption of digital technologies in the evolving university academic environment.

Case studies on digital transformation in higher education institutions are presented. The systematic review method is used to define the state of the art of the variable addressed, which makes it possible to delve deeper into the subject, contributing to its understanding, as well as to the relevance of the adoption of digital technologies in this academic environment that must remain in constant change based on the demands of society. In this sense, we start from the following questions *In what ways are HEIs undertaking digital transformation in both their academic programmes and their academic-administrative processes, what are the effective strategies and practices that HEIs have implemented for digital transformation, what are the challenges and opportunities linked to the adoption of digital technologies in HEIs, and what are the challenges and opportunities that are linked to the adoption of digital technologies in HEIs?*

Based on the above, the study was structured as follows: 1) identification of relevant studies, 2) selection of studies, 3) data extraction, and 4) analysis and discussion of findings. The search was conducted using the following databases *Web of Science, Science Direct, Google Scholar*, entre otras. Considerando como criterios: periodo del time from 2020 to 2023, open access scholarly articles.

Descriptors were applied in English and Spanish as: digital transformation, digital transformation in education, digital transformation in education., *digital transformation*, *educational digital transformation*. The study contains the following sections: first, it addresses digital transformation, as well as digital transformation in education, from its conception, characterisation and impact; second, the methodological design; and third, it presents the analysis and discussion of the findings. Finally, the conclusions of the study are presented.

### *Digital transformation*

The use and application of new digital technologies has led organisations to transform their customer relationships, internal processes and value propositions, to develop models, software processes and business systems to improve both revenue profitability and competitiveness. In this sense, it is clear that as with any transformation process, it is necessary to generate major changes, breaking paradigms, where digital transformation is no exception, for everyone it represents a great challenge, therefore, we must work for it.

The Development Centre of the Organisation for Economic Co-operation and Development (OECD, 2019), for its understanding, points out that:

Digitisation (digitisation) is the conversion of analogue data and processes into a machine-readable format. Digitalisation (digitisation) is the use of digital technologies and data, as well as the interconnection that gives rise to new activities or changes in existing ones (p.18).

Accordingly, it mentions that "digital transformation refers to the economic and social effects of digitisation and digitalisation" (OECD, 2019, p.18). In other words, digital transformation incorporates the two previous concepts, taking into account the automation of activities and the development of a culture of automation and innovation. In addition to considering which processes or activities are necessary and those that should be eliminated by the substitution of the digital organisation. It should be noted that digital transformation refers to a change in everyone's way of thinking.

Digital transformation arises from the incorporation of new digital technologies called SMACiT: Social (social networks), Mobile (mobile devices), Analytics (data analysis), Cloud computing (cloud operations) and Internet of Things (Internet of things) (González, 2021). This transformation represents all kinds of challenges for the present and future of any organisation, through the integration of SMACiT and related technologies. Hence, digitally transforming an institution or organisation does not only imply digitising it. It is clear that it requires an organisational change where the actors involved, the processes, as well as the business model understand technology as a tool that generates value among its consumers and collaborators (Schwab, 2016).

Delgado (2021) argues that:

'Digital transformation is emerging as a topic of interest not only in scientific communities, but as increasingly recurrent practices in organisational dynamics, which are subject to the pressures imposed by disruptive technologies, new business models that manifest themselves throughout the value chain, and the personalised demands of users in an environment of hyperconnectivity' (p.1).

While, Demirkan et al. (2016), define it as:

'The profound and accelerated transformation of activities, processes, competencies and business models to take full advantage of the changes and opportunities provided by digital technologies and their impact on society in a strategic and prioritised way' (p. 22).

Westerman et al. (2014) and Vial (2019) refer to it as the use of digital technologies in organisations to improve their performance and reach. While Morakanyane et al. (2017) agree with Hess et al. (2016) who define it as an "evolutionary process that leverages digital and technological capabilities to enable business models, operational processes and customer experiences to create value" (p. 22). However, Celis and Ramon (2023), conceive of it in a more holistic way, defining it as:

The process of adapting and changing the way organisations operate and interact with their customers through the use of digital technologies. This includes automating processes, implementing information systems and adopting new technologies, such as artificial intelligence and the cloud, to improve business efficiency and effectiveness. Digital transformation also includes how companies use digital technologies to create new products and services, and to interact with their customers differently (p. 2).

Digital transformation should be understood as that systemic change or transformation of processes, professional competencies and business models that makes it possible to take advantage of everything that new technologies provide, both to organisations and to all the actors involved. It seeks the use and integration of technology and data so that all members benefit and are able to adapt to any system in the organisation.

#### *Digital Transformation in Education*

Currently, the world lives in a constant technological change, where digital transformation is present in all productive sectors: industry, government, society and academia, no one escapes. In this sense, it is important to define it in order to understand how it works, particularly in the field of education.

Almaraz et al. (2017) define the digital transformation of HEIs as the process of technological and organisational transformation driven in these institutions, derived from the development of ICT. However, it is not only the application of technology; it involves all the actors that are part of HEIs, as well as their organisational structures, where they must adapt and adopt a new organisational or institutional model. For its part, the Colombian Quality Assurance System (2021) mentions that digital transformation is an integral and strategic process that contributes to an educational transition, and leads to an educational change for the development of new training scenarios.

In this sense Artuso and Guijt (2020) highlight that the need for this change or process of educational transformation is given by the continuous and accelerated technological development in which we live, linked to technological innovation, hyperconnectivity, changes in work models and the emergence of digital technologies such as the internet of things, augmented reality, virtual reality, blockchain, artificial intelligence and big data, among others.

Some authors such as Iivari et al. (2020), Bryndin (2019), Arango et al. (2018) and Díaz (2022), state that educational digital transformation focuses on the process of strategically, meaningfully and systemically incorporating digital technology in all areas of education, from classrooms to educational management. This integration seeks to improve and enrich the experience of both teaching and learning processes, as well as the optimisation of administrative and management processes in education. Consequently, as part of the context of digital transformation in education, technology becomes an indispensable tool that allows teachers, students, parents and administrators to access a wide variety of digital resources and services.

According to studies by Romero et al. (2023), Viñoles et al. (2023), Valdiviezo et al. (2022) and López et al. (2022), the digital transformation in HEI academic programmes contemplates some aspects in which they coincide: a) personalised learning, b) access to information and resources, c) collaboration and communication, d) assessment and feedback, e) teacher professional development, and d) efficient school administration.

Personalised learning. According to Parody and Isequilla (2022) and Guaña (2023), personalised learning takes into account the characteristics, needs, potential, perceptions and previous knowledge of students; it is therefore proposed as an education focused on inclusive teaching, where students are the main actors in the teaching-learning process. It presents a change in pedagogy, i.e. it modifies the way in which education is delivered, promoting student-centred approaches, active learning and online collaboration.



Access to Information and Resources. According to [Salgado \(2023\)](#) and [Sánchez et al. \(2019\)](#) information and communication technologies (ICT) have become a key part of the teaching and learning processes in HEIs. As a result, it has led to greater interaction between students and teachers, through more flexible and personalised learning environments, while improving accessibility and inclusion. In this sense, the digitisation of educational materials and access to online information allow for greater availability and updating of resources. Students have access to e-books, digital libraries and repositories, specialised databases, as well as multimedia resources to enrich and strengthen their learning.

Collaboration and Communication. Digital tools facilitate real-time communication between students, teachers and parents. [López et al. \(2022\)](#) point out that they have transformed education, enabling more fluid and enriching communication, regardless of the physical space where students and teachers are located. Hence, online collaboration platforms, discussion forums, videoconferences, as well as social networks enable a more fluid and enriching interaction.

Assessment and feedback. The use of technology allows for the development or application of various ways of assessing student performance ([Cabero & Palacios, 2021](#)), whether through online tests, interactive questionnaires or progress monitoring systems, to name a few.

Consequently, teachers can provide immediate feedback to students, helping to facilitate their learning. Where evaluation and impact measurement focuses on the need for new metrics and assessment methods to measure the impact of digital transformation on student learning and performance.

Teacher Professional Development. The digital transformation benefits teachers with the training and updating processes in which they must be immersed. Therefore, they can access online courses, communities of practice and professional development resources to improve their digital and pedagogical competences ([Higuera & Rivera, 2022](#)).

It is important to note that digital transformation in education is not simply about replacing paper and pencil with electronic devices. Technology can strengthen and improve educational processes, foster creativity, critical thinking and collaboration, and prepare students to face the challenges of the digital world. Consequently, institutional leadership and teacher training are essential to effectively guide and support digital transformation in HEIs.

Efficient school management. Digital transformation also affects the modernisation of administrative and management processes in educational institutions ([Castro, 2023](#)). The use of school management systems, online enrolment platforms and data analysis contribute to improving efficiency, effectiveness and final decision-making. In addition, the need to develop digital skills and promote equity in access to technology. At the same time, it provides opportunities for the personalisation of learning, as well as improving academic efficiency.

Each of these areas where ICTs have become key tools in each one, allows us to understand how a permanent and systemic change has been developed, which has contributed to a digital transformation in HEIs, particularly in each of the actors (students, teachers, administrative staff and parents) that are part of the university community.

### Recent studies

[Leal and Redon \(2022\)](#) developed a study on the impact of digital transformation on quality management systems in service sector companies in the city of Cúcuta, with the purpose of evaluating the impact of digital transformation on quality management systems, with a qualitative approach.

The findings show that the companies developed digitalisation and transformation processes, but basic ones; where as a result of the pandemic, they helped to promote digital transformation in the city.

While [Renán et al. \(2021\)](#) focused on digital transformation in the new normal for higher education, where they state that as a result of COVID-19 HEIs have had to rely on technological platforms to continue their educational activities, where digital transformation not only refers to the online courses implemented, but to being able to define an education model that adapts to current needs in favour of the academic quality of the educational programmes offered.

The [EDUCAUSE Horizon Report \(2022\)](#) analyses educational trends in the world, divided into 4 sections: Trends, showing the most relevant lines to be considered in the future (social, technological, economic, environmental and political); Key technologies and practices, which have a significant impact on teaching and learning processes; Scenarios, next 10 years; Implications. Therefore, it highlights the aspects that will accompany these changes: Emerging technologies (disruptive technologies such as artificial intelligence, learning analytics and learning tools); Hybrid learning (hybrid learning models, face-to-face and virtual); Data and analytics (data collection and analysis for decision-making); Post-pandemic changes (impact of the pandemic on educational habits and how they will affect the future of education); Foresight: (foresight of key technologies and practices that will transform higher education in the short term). Based on the above, it enables HEIs to prepare themselves with more tools and more knowledge, but mainly less resistance to technological change.

[García et al. \(2022\)](#) conducted a study to identify the actions and mechanisms that an HEI should consider for its digital transformation. Through a systematic review, based on the PRISMA model from the use of different criteria. The findings show that HEIs should be aware of the degree of digital maturity of students, teachers and the community itself, as well as the state of their infrastructure. The authors also emphasise that HEIs should develop strategic plans to improve the application of digital technology.

[López et al. \(2022\)](#) mention that HEIs must respond to the emerging demands of society. In this sense, their research focused on exploring how digital transformation processes are carried out, based on the perceptions of the members of the educational community. Based on a longitudinal, case study design, the results identified the aspects that contribute to the digital transformation process, such as equipment, teachers and students. In addition to the need for a digital culture as a factor for change, the authors conclude that a greater digital culture accompanied by a cultural transformation model favours educational change.

In the study Towards a digital transformation of the education sector by [Cruz et al. \(2022\)](#), the opportunities and challenges of incorporating technologies as part of the health emergency by COVID-19, appropriation of learning and new pedagogical skills for the future and orderly integration of technologies, as well as the use of available digital resources, are set out. On the one hand, the autonomous performance of students is highlighted. On the other hand, it shows the deep digital and pedagogical divide due to the unequal distribution of resources. The findings of the study highlight that emergency virtualisation enriched the educational process through better communication between students, teachers and institutions. However, the incorporation of ICTs was uneven; digital and pedagogical gaps are evident. It also highlights the need for training and updating of teachers' digital competences for virtual or hybrid scenarios. [UNESCO \(2023\)](#) is developing strategies to address the challenges and opportunities of ICT in education, focusing on an inclusive, rights-based digital transformation of education. In this regard, and in addition to these actions, the UNESCO International Institute for Higher Education in Latin America and the Caribbean (IESALC) is carrying out studies focused particularly on: Digital competences (training of all actors involved to help strengthen them (teachers, students, researchers), construction of instruments to measure the digital maturity of universities); Hybridisation (support to HEIs in the implementation of hybrid models and strategic plans for the improvement of their educational programmes, studies on virtual mobility); Artificial Intelligence (development of manuals regarding the impact of AI on education as well as user guides for AI).

The [Inter-American Development Bank \(IDB\) \(2020\)](#) states that only those HEIs "capable of anticipating the new times will be able to maintain a position of relevance" (p. 49) in this developed technological world, where the use and exploitation of ICT will make it possible to face the challenges of higher education. 49) in this developing technological world, where the use and exploitation of ICT will make it possible to face the challenges of higher education, highlighting what HEIs should already be incorporating as part of their development plans: adaptive and competence-based learning platforms, education analytics, digital assessment, AI applications, conversational user interfaces, smart campuses, enabling technologies for research enhancement. Implementing them as part of their processes of:

Student recruitment, student experience and satisfaction with teaching-learning processes, experience and performance of researchers in knowledge generation, the administrative relationship with the university, enhancing the campus experience, establishing personalised training programmes for professional re-qualification, platforms for employability enhancement (p. 50).

The above provides a basis for understanding the digital transformation of education, particularly in higher education, highlighting aspects such as its conceptualisation, characterisation, didactic and pedagogical approaches, assessment, leadership, teacher professional development, opportunities and challenges.

## Methodology

The purpose of this study is to analyse and understand how higher education institutions are currently addressing digital transformation. The guiding research questions are: *In what ways are HEIs undertaking digital transformation in both their academic programmes and academic-administrative processes, what are the effective strategies and practices that HEIs have implemented for digital transformation, what are the challenges and opportunities linked to the adoption of digital technologies in HEIs, and what are the challenges and opportunities that are linked to the adoption of digital technologies in HEIs?*

Therefore, a strategic approach is applied, under systems thinking ([Senge, 2012](#)) that allows us to explore as a whole its conception, initiatives, challenges and opportunities related to the adoption of digital technologies in this constantly evolving academic environment. By its nature, the research focuses on the qualitative paradigm, highlighting the characteristics of the educational phenomenon ([Hernández-Sampieri, 2018](#)). This was carried out through a systematic review, based on an exhaustive search of scientific literature, as well as an analysis of research and articles with diverse perspectives and updated information to strengthen the study.

The systematic review as a methodological approach, in accordance with the [Cochrane Handbook \(2011\)](#) and *Preferred Reporting Items for Systematic Reviews and Meta-Analyses*, allow recent information to be identified, based on specific criteria, in order to subsequently carry out an analysis of each one of them. It also considers the search for answers to research questions in correlation with the phenomenon under study. According to [Hernández et al. \(2018\)](#) the design of systematic reviews "highlights the use of certain steps in the analysis of data and is based on the procedure of [Strauss and Corbin \(2007\)](#)" (p. 473).

On the one hand, an exhaustive search and analysis of primary sources is carried out, obtaining different perspectives to strengthen the study, taking into account that the purpose is to analyse and understand how higher education institutions are currently dealing with digital transformation. On the other hand, the questions guiding the systematic review of the literature are *In what ways are HEIs undertaking digital transformation in both their academic programmes and their academic-administrative processes, what are the effective strategies and practices that HEIs have implemented for digital transformation, what are the challenges and opportunities linked to the adoption of digital technologies in HEIs, and what are the challenges and opportunities that are linked to the adoption of digital technologies in HEIs?*

For this purpose, a search was carried out in different databases specialised in technology, education and social sciences, such as *ERIC*, *Scopus*, *Web of Science*, *Science Direct*, *Proquest*, *Redalyc*, *Scielo*, *Dialnet*, y *Google Scholar*. Consequently, the scientific literature was reviewed, as well as references of studies related to the topic in order to obtain additional and complementary information.

Thus, the search strategy considered key terms related to digital transformation, educational digital transformation, ICT use in HEIs, such as "information and communication technologies", "higher education", "learning", "virtual platforms", "pedagogical innovation", among others. Filters were used to limit the search to publications in scientific journals, in English or Spanish, in the last 5 years due to the nature of the topic.

#### *Procedure*

In order to achieve the purpose and answer the research questions, activities were carried out in the order specified:

1. Identification of key words and the selection of databases according to the subject matter.
2. Inclusion and exclusion criteria for the studies were defined.
3. The period of validity of the sources was determined, from 2018 to 2023.
4. A research protocol was defined for the search of research, dissertations and relevant articles applying the Cochrane Handbook of Systematic Reviews of Interventions, translated by the [Iberoamerican Cochrane Centre \(2011\)](#).
5. A comprehensive search for primary studies on Digital Transformation in Higher Education Institutions was conducted.
6. Around 100 articles were reviewed, of which 50 were selected for full-text review, in databases such as Web of Science, Science Direct, Google Scholar, Proquest, Redalyc, Scielo, Dialnet, among others.
7. Following a detailed review, only 15 articles were selected for inclusion in this article.
8. The selected articles cover different topics related to ICT in higher education, digital transformation, digital educational transformation, including the impact of ICT on learning, educational quality and pedagogical innovation, as well as the implementation of virtual platforms and e-learning programmes. Various methodologies were used in the studies, such as surveys, interviews, documentary analysis, case studies, among others.
9. Instruments designed by the authors were defined based on templates from the [Cochrane Handbook \(2011\)](#): Checklists for Assessing and Selecting Sources, Matrix for Organising Information, Description Matrix for Assessing and Selecting Primary Sources, Summary Content Sheets, Checklist for Filtering Experts.

#### **Results**

The findings presented below are aligned to the research questions.

*How are HEIs implementing digital transformation both in their academic programmes and in their academic-administrative processes?*

The results highlight that digital transformation has contributed significantly to the improvement of the quality of higher education academic programmes. There has been a clear improvement in the student learning experience, which has become more interactive and personalised, focusing on quality of teaching and learning, student satisfaction, classroom engagement, digital skills enhancement, faculty perceptions, learning outcomes, process quality and user satisfaction, however it has not been inclusive for all stakeholders in the institution.

*What are the effective strategies and practices that HEIs have implemented for their DL?*



Strategies for successful implementation of digital transformation were identified, including effective teacher training, strategic alignment of technology with educational goals, as well as the promotion of interdisciplinary communication and collaboration.

*What are the challenges and opportunities linked to the adoption of digital technologies in HEIs?*

The results show the need to address the ethical and privacy challenges that accompany digital transformation. Concerns about the collection and use of student data are evident in the studies, and solutions such as transparent privacy policies as well as the promotion of ethics in educational research are proposed.

Significant variability in the adoption of digital transformation in different geographical regions and institutional contexts was also detected. This finding emphasises the importance of tailoring digital transformation strategies to the local needs and characteristics of each institution. Digital transformation has had a positive impact on student participation and engagement in the educational process. Strategies such as the use of interactive platforms and gamification approaches are shown to be effective in fostering greater student participation and deeper engagement with the content.

The findings reflect a clearer picture of how digital transformation has influenced higher education, highlighting both its benefits and challenges. Furthermore, it underlines the importance of adapting digital transformation strategies to address contextual and geographical differences, while prioritising the enhancement of students' educational experience.

## Discussion

This study focused on distinguishing, analysing and understanding how HEIs are realising digital transformation in both their academic programmes and their academic-administrative processes. Therefore, first, the need to tailor digital transformation strategies to meet the unique needs of each institution is identified. Although successful strategies were identified, it is clear that effective implementation requires flexibility and adjustment to the individual circumstances of each university.

This is confirmed by [Romero et al. \(2023\)](#) and [Viñoles et al. \(2023\)](#), who argue that digital transformation in HEI academic programmes should consider strategies focused on personalised learning, learning communities, collaboration and communication, learning assessment, and teacher professional competences, through digital inclusion as part of the whole system. In such a way that digital transformation strategies are adapted to the specific needs and characteristics of each institution, as well as to its context.

Second. Findings related to challenges and opportunities lead to the implementation of clearer policies and the creation of ethics committees to oversee the collection and use of student and teacher data due to the risks currently being taken. As [Galan-Muros & Bosen \(2023\)](#) argue, there are ethical and privacy concerns regarding data collection, as well as the use of artificial intelligence; hence these are crucial issues for higher education to address.

Furthermore, the [Ibero-American Business Council \(2021\)](#) emphasises the importance of:

The transversality of coherent public policies and the training of human capital skills. Not only must new generations be educated for the future, but current workers must also undergo a process of reconversion to make efficient use of connectivity (p. 78).

Thus, the regulations to be defined should facilitate the processes of digital transformation of education in institutions and not hinder it. Universities should also adapt their digital transformation strategies according to geographical and contextual differences, recognising that what works in one place may not be effective in another. This is in line with [Salgado \(2023\)](#) and [Sánchez et al. \(2019\)](#), where ICT are indispensable tools in teaching and learning processes for academic programmes. This allows for greater interaction between students and teachers, through virtual learning environments and learning communities, which are more flexible and personalised, favouring accessibility and inclusion.

Therefore, it is evident that HEIs are unaware of the degree of digital maturity of their stakeholders (students, teachers and administrators) as well as the current state of their infrastructure. Hence, as mentioned by Salgado (2023) and Sánchez et al. (2019), even when ICT have favoured accessibility and inclusion. On the one hand, it is necessary to carry out evaluations focused on the impact that educational materials and access to online information have on students' learning processes. On the other hand, whether the infrastructure available to the academic programme is sufficient to actually carry out actions that contribute to the permanent and systematic digital transformation that is currently required.

Furthermore, the studies reveal that most HEIs do not have strategic plans to improve the use of digital technology, both at methodological and instrumental level, thus facilitating digital transformation at the level of infrastructure, digital competences of both teachers and students, favouring the digital inclusion of the entire system, which as mentioned by García et al. (2022) the benefit lies in improving educational quality, as well as in the application of digital technology.

For all of the above reasons, it should be noted that the digital transformation of education, through the use of emerging technologies, seeks the digital wellbeing of higher education students. In this way, it reduces the gaps in the different digital ecosystems that HEIs are experiencing within themselves. Considering that we are in a process of permanent and systematic educational digital construction, where all the actors involved must make it their own, take ownership of it.

## Conclusions

The digital transformation has had a positive impact on the quality of teaching and learning in higher education institutions. Greater interaction and personalisation of learning has been observed, which has contributed to an improved student experience. Effective measurement of this impact involves assessing qualitative indicators, such as student satisfaction, classroom engagement and digital skills enhancement, rather than relying solely on traditional quantitative metrics.

Several successful strategies and best practices for implementing emerging technologies in higher education have been identified. These include effective faculty training, strategic alignment of technology with learning objectives, and promotion of interdisciplinary collaboration. These strategies are critical to ensure effective and successful implementation.

Challenges are significant concerns in the process of digital transformation in higher education. These include the collection and use of student data, as well as the protection of student privacy. Appropriate solutions involve implementing transparent privacy policies, promoting ethics in educational research and adopting effective data security measures.

The adoption of digital transformation varies significantly in different geographical regions and institutional contexts. Contextual factors, such as the size of the institution, geographical location and available resources, have a substantial impact on how universities approach digital transformation. Strategies must be adaptable and consider the specific needs of each context. In short, it is essential for HEIs to have strategic plans focused on the digital transformation of their academic programmes, which has a direct impact on their educational quality and favours the digital inclusion of the whole system.

## Implications of the study

The findings of the study on digital transformation in higher education institutions have important implications for educational institutions. These can guide strategic and operational decision making in managing digital transformation, such as:

1. *Strategy development.* Formulation of more robust digital transformation strategies tailored to the specific needs and characteristics of the institution. HEIs should identify best practices and strategies that fit their context.
2. *Teacher training.* Effective strategy, where HEIs should prioritise the training and professional development of teaching staff to ensure successful implementation of technology in the classroom.

3. Ethics and privacy. Challenges and opportunities for HEIs should lead to the implementation of clearer policies and the creation of ethics committees to oversee the collection and use of student and teacher data.
4. *Adaptation to contexts.* HEIs should adapt their digital transformation strategies according to geographical and cultural differences.
5. *Investment in technology.* HEIs should pay special attention to making decisions on the technological investment required for their academic programmes. Where they adopt emerging technologies that are effective in improving the quality of education.
6. *Continuous measurement and evaluation.* Effective measurement of the impact of digital transformation should lead to an emphasis on continuous data collection and analysis to assess progress and make strategic adjustments.
7. *Strategic partnerships.* HEIs should enter into strategic partnerships with technology companies or other educational institutions to access additional resources and expertise in the field of digital transformation.
8. *Evaluation of results.* HEIs should focus on the assessment of student learning outcomes, using specific metrics related to the impact of digital transformation on academic achievement.
9. *Organisational change management.* Digital transformation requires significant changes in the institution's culture and practices (processes, technologies, people).

In summary, the implications of this study on digital transformation in higher education can help HEIs to make informed decisions, adopt effective strategies, as well as improve the quality of teaching and learning through technology. These implications can guide the future direction of the institution in an ever-changing educational environment.

### Recommendations for future studies

Based on the needs, experiences, and limitations of this study, research is recommended focusing on: Key technologies for educational digital transformation, Integration of Technology in the educational process, Pedagogical innovation and teaching models, Teacher professional development in the digital context, Design of an educational digital transformation plan, Long-term impact of digital transformation on the quality of teaching and learning, Effectiveness of digital transformation strategies in diverse educational contexts, to name a few. This will help to complement and deepen the knowledge of this constantly evolving field and validate the findings obtained in the literature review. It also emphasises the need for more specific research that explores the particularities of each higher education institution.

### Declarations

#### Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

#### Authors' Contribution

The contribution of each researcher in each of the points developed in this research, was defined based on:

*Rivera-Gutiérrez, Erika:* Development of the study centred on the subject being addressed, defining the problem statement, context of the study, purpose, review of scientific literature, methodological design, implementation, results and discussion.

*Higuera-Zimbrón, Alejandro:* Review of scientific literature, implementation of the methodological design and discussion.

*Argüello, Georgina:* Data collection and analysis.

#### Availability of data and materials

The data for this research are available according to the sources consulted.

## Article

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**Abbreviations**

IDB. Inter-American Development Bank.

HEI. Institutions of Higher Education.

IESALC. Higher Education in Latin America and the Caribbean

OECD. Development Centre of the Organisation for Economic Co-operation and Development.

SMACiT. Social, Mobile, Analytics, Cloud Computing & Internet of Things.

TD. Digital Transformation

ICT. Information and Communication Technologies.

UNESCO. United Nations Educational, Scientific and Cultural Organisation.

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