Digital Education in Universities:

A Comprehensive Implementation Guideline

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Tecnológico de Monterrey

Institute for the Future of Education

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Preface

At the dawn of the 21st Century, the world stands at a fundamental crossroad, where the evolution of technology has woven its presence into every aspect of our existence. Education, the backbone of society, has plunged into a journey of unprecedented transformation: the Digital Education (DE) paradigm.

Its importance is undeniable in an increasingly interconnected and technologically advanced world. It is no longer enough for students to obtain static knowledge; now they have to master dynamic skills that enable them to navigate, understand, and leverage the vast digital resources that define our era.

Education, on its own, transcends the physical frontiers of classrooms, breaking down the barriers of space and time. It makes learning accessible anytime and anywhere, democratizing information and providing opportunities to those who might otherwise be marginalized. This transformation revolutionizes not only the way we teach and learn, but also how we interact with knowledge itself, cultivating critical and creative thinking.

Ultimately, the importance of Digital Education lies in its ability to empower present and future generations to thrive in a world shaped by technology. By embracing this educational revolution, we open the doors for innovation, creativity, and human progress. However, only through a collective commitment and an inclusive vision we can take full advantage of its transformative potential.

These pages explore various aspects, challenges, and possibilities this educational model presents today. It's a journey towards the understanding of how the fusion between education and technology can shape a brighter and more equitable future for all.

This kind of reports are of utmost importance because they come at a turning point, that calls institutions to embrace Digital Education as a fundamental pillar of modern society in a global context, particularly in Latin America.

We are at the threshold of a new educational era, and the decisions we make today will determine the course of history. The question is not whether we should embrace Digital Education, but how we can do it in a fair, inclusive, and effective way for the benefit of all humankind.

Michael J.L. Fung, Executive Director of the
Institute for the Future of Education (IFE)

Foreword

Throughout history, in addition to changing industries and people's lives, technology has transformed the way we teach and learn. However, now more than ever, the question arises: which path should higher education institutions take?

Not only did education change after the pandemic, but also how people perceived it. Prejudices against remote education were eliminated and tech-nology became appreciated as a timely solution in an area that has been heavily influenced by tradition. Digital Education is a reality that is becom-ing an important part of universities across the globe, although for many of them, it is still an unknown or distant territory.

This report aims to submit nine recommendations on Digital Education in the 21st Century, providing a useful tour through the history, definitions, expert remarks, besides success stories in higher education. It's intended to serve as a practical guide for universities that are seeking to enter into this educational model and to those that have had previous experience.

This wouldn't be possible without the participation of people from different entities, including academics from universities around the world and their strategic partners. This report proves that the future of education, while going hand in hand with technology, has human collaboration as its cornerstone, since the latter will finally provide the quality and necessary answers to the unknown of posterity.

These collaborations were based on interviews in which different specialists shared their expertise, which helped nurture the contents of this report, portraying an educational landscape in constant update. These interventions are of value for both their colleagues and the members of the education of the future.

José Escamilla de los Santos, Associate Director
of the Institute for the Future of Education (IFE)

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Introduction

"Digital Education, broadly defined, is the integration in use of virtual and on-line technologies from some moderate level all the way up to full delivery," that's how Paul LeBlanc, President of Southern New Hampshire University (SNHU), describes the main topic of this report.

Also, he adds that the world has changed, and DE promises to keep prospering. This is a tangible improvement, because only a little more than twenty years ago, in the year 2000, less than 7% of the world's population had access to internet; while currently this figure exceeds 50%[1]; a situation that has favored access to information and its day-to-day use.

Technology, in particular digital technology, has made an impact in all aspects, in all industries and life in general. Educational institutions must recognize the fact that their students will need digital technologies to integrate themselves into the workforce of the future. Thereby, they have to form people with skills in the use, understanding, and application of new technologies.

Thus DE, implemented in higher education institutions (HEI), ensures strategies that generate processes in which students not only know, but also use and understand technological tools and are trained on the competencies that will be demanded from them in any global context.

Despite everything, this type of transformation tends to be accompanied by different difficulties, either because they represent a disruption to the educational tradition, or because there is a lack of preparation at the time of defining educational offers, or because the faculty lacks training, among

1 World Economic Forum. (2020, November 18) *Here's how technology has changed the world since 2000.* https://www.weforum.org/agenda/2020/11/heres-how-technology-has-changed-and-changed-us-over-the-past-20-years/

other factors. In addition to the different obstacles inherent to the implementation of this kind of models, context takes an important role because it is a key factor that can help or impair the implementation, by setting the limits to DE's application. That is why the different reports on digital maturity of higher education in Latin America are a precedent that serves as a basis for road already traveled and the road still waiting to be traveled.[2]

An example of these reports is the one published by the Inter-American Development Bank, whose text "Digital Transformation in Higher Education in Latin America and the Caribbean" (2021) presents the results of a study on the future vision of universities due to the impact of the COVID-19 pandemic.

On the other side, during the 20th Assembly of the Network of Latin American and Caribbean Private University Associations (REALCUP), in Panama, 139 people from different institutions answered a survey in order to outline the current context on the importance of Digital Education and the transformation of HEIs.[3]

Geographical Distribution of the University — N= 139

Single Campus	49%
Between 2 and 5 Campuses	40%
6 to 10 Campuses	10%
11 to 20 Campuses	3%
More than 20 Campuses	6%

Fewer Campuses ↓ **More Campuses**

Person Who Answered the Survey — N= 139

Rector	13%
Academic Vice-Rector or similar role	12%
Dean	5%
Person in charge of educational technology or systems	9%
Teacher	36%
Director of department	14%
Other	11%

0%

2 HolonIQ. (2021). *Transformación digital en la educación superior en América Latina y el Caribe*. Banco Interamericano de Desarrollo. http://dx.doi.org/10.18235/0003829

3 Rincón-Flores, E.G.; Portales-Derbez, L.E. & Martínez-Cardiel, L. (2023). *Transformación Digital en el marco de la Red de Asociaciones Latinoamericanas y Caribeñas de Universidades Privadas 2023 (REALCUP)*. Institute for the Future of Education.

This method was used to collect information on the level of adoption and maturity of different dimensions and aspects associated with Digital Transformation in the educational models of private universities in Latin America. 55% of the participants in the study correspond to personnel from high educational ranks, such as rectors, deans, department heads, among others, and 47% are teachers and specialists. 80% of the participants work at universities with one to five campuses, while the rest have six or more.

It is interesting to observe that according to the survey answered by the members of REALCUP, 65% of the surveyed people consider that the digital maturity of their institutions is at an intermediate level. In spite of the facilities provided by these technologies, the difficulties that some institutions faced when incorporating these practices into their programs are highlighted. Thereof, this report may be of interest for these and other HEIs, as it includes the opinion and experience of specialists that work directly with issues related to digital transformation.

Level of Technological Maturity

N= 86

100%

19%   Advanced

65%   Intermediate

16%   Basic

0%
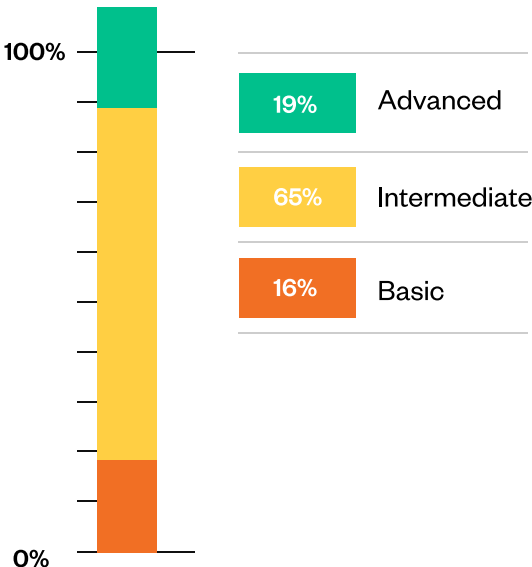
Furthermore, this report covers the terminology, use, and application of Digital Education (DE). Led by experts in different areas, the nine recommendations that are presented hereunder are a practical guide for the implementation of a new model in HEIs.

What is
Digital Education?

The use of digital technologies and tools in education is known as Digital Education,[4] which is defined by the Tecnológico de Monterrey's model as "a whole educational ecosystem that allows to enrich learning experiences" integrating innovative pedagogies with the use of digital media and technologies.[5]

Natividad Cabrera, expert in Educational Quality Assessment at the Universitat Oberta de Catalunya (UOC), points out that this type of education can be framed in all those educational propositions that go beyond the instruction and the creation of content. They are learning opportunities that enable the transformation of people through the development of their competencies, by means of the flexibility and personalization provided by technologies. Also, they facilitate measuring, monitoring, and interaction, where technology and human knowledge supplement each other to provide students with transcendental education.

4   Alenezi, M., Wardat, S. & Akour, M. (2023). The Need of Integrating Digital Education in Higher Education: Challenges and Opportunities. *Sustainability* (2071-1050), 15(6), 4782. https://doi.org/10.3390/su15064782

5   Tecnológico de Monterrey. (2022). *Educación Digital.* Educación digital | Educación Digital | Tecnológico de Monterrey. https://edtec.tec.mx/es/transformacion-de-la-educacion-digital/educacion-digital

According to the "OECD Digital Education Outlook 2021", the use of Digital Education is not a synonym of remote education, but serves as a reinforcement of what happens in the classroom (referring to a physical space), to promote a more adaptive and interactive learning.[6] The concept covers all those technology-based learning experiences that a person lives along their student life. Currently, it is one of the options with the greatest future, growth, and impact for the new generations, who are becoming familiar with technology from a very early age and mostly use it to interact and socialize with others.

6   OECD. (2021). *OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*. OECD Publishing. https://doi.org/10.1787/589b283f-en

a. Examples of Digital Education

There are a variety of formats that educational institutions can choose from in order to deliver high-quality Digital Education. The following examples show how DE can be implemented to select the modality that best suits the needs and objectives set by institutions.[7]

■ Face-to-face enriched with technology:

It refers to the physical place where technology tools are involved and add value to students' classes. Some of these tools are:

- Virtual and augmented reality
- Personalized learning
- 3D printing
- Metaverse
- Digital white boards
- Storage platforms
    - Google Drive
    - Dropbox
- Design programs, programming, etc.
- Adobe
- AutoCAD
- Java

- Educational desktop or mobile applications
    - Menti
    - Kahoot
    - Miró
- Educational platforms
- Canva
- Google Classroom
- Moodle

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7 Tecnológico de Monterrey. (n.d.). Aprendizaje enriquecido con tecnología. https://edtec.tec.mx/es/experiencia-de-aprendizaje-en-modalidades-digitales/aprendizaje-enriquecido-con-tecnologia

iStock.com/RoJDesign

■ Hybrid:

The combination of both face-to-face classes as well as in a digital environment. This modality can integrate contents, activities, or sessions in real-time through web conferences on a defined schedule.

■ Remote:

This modality doesn't require a physical classroom for the interaction between teachers and students, but uses technology as an essential mean. The resources used are delivered through a fully digital environment, which gives the student, to some extent a degree of personalization, since this mode offers them the timeless environment and freedom to exercise their own learning path.

There are different types of remote education:

- **Online:** This educational model promotes students' self-learning skills, by offering all the educational content needed to study a subject on a platform, where they have the possibility to access the information at any moment. All this is done considering the courses' schedule and the support and follow-up of a teacher, with the possibility of having live videoconferences to complement their learning.

- **MFD (flexible and digital model):** Students, regardless of where they are physically located, have the possibility of taking courses and interacting through videoconferences in real time. They count with the necessary material which is digitized and uploaded to a platform and have the constant support of a teacher throughout the program.

- **MOOC:** The massive open online courses are short-term sessions taught by a professor via videoconferencing, which are open to a limited audience. It can have a digital environment where discussion forums, activities and exams are included.

- **Self-directed:** Students have the freedom to self-manage their time for learning, with the only restriction of having an established deadline to hand in their assignments at the end of the course. Sometimes, the student can seek the advice of a tutor, through the digital media.

Adapted from EdTec.[8]

Technology is an additive of great value for educational institutions, giving a more flexible, adaptable, and accessible learning experience to their students. With the aim of improving the quality of education, it's fundamental for universities to define their objectives as organizations in order to choose the modalities that fit these goals.

Gene Hayes, Senior Vice President of Western Governors University, explains that Digital Education can be seen in different ways, since, on

8 EdTec. (n.d.). Aprendizaje enriquecido con tecnología. Tecnológico de Monterrey. https://edtec.tec.mx/es/experiencia-de-aprendizaje-en-modalidades-digitales/aprendizaje-enriquecido-con-tecnologia

the one hand, education is one entity and the modality used is another, depending on a wide variety of people and institutions.

Concepts such as the ones presented before (online education, remote education, or digital education) change with the passage of time. Previously, remote education was education by mail, although at the time there was also tele-education, satellite education, among others. Each model will be different both in quality, as well as its application; however, this type of education shatters traditional paradigms, causing a natural disruption in the system.

In Mexico, there are different myths regarding education, starting with the face-to-face model, automatically considered being better and more effective, to the belief that all distance educational models are focused solely on gaining com-mercial advantage, which is totally unfair. The quality depends on the institution and what the student is looking for. It is worth mentioning that companies don't have any bias towards diplomas issued by this type of institutions.

The pandemic helped to break away from the myth that distance or online education would never form part of institutions with very high reputation. Before that, few schools had made the decision to venture into this kind of topics, but now it's a way to be innovative, says Gene Hayes.

Thus, as the world changes, so does the way we learn and teach, and learning today has to be characterized by easy access and availability. This is why Digital Education, besides improving learning with technology, enables new educational possibilities for students.[9]

9 Alenezi, M., Wardat, S. & Akour, M. (2023). The Need of Integrating Digital Education in Higher Education: Challenges and Opportunities. *Sustainability* (2071-1050), 15(6), 4782. https://doi.org/10.3390/su15064782

What is Digital Education?

Nine recommendations about Digital Education in the 21st Century for Universities

The following set of recommendations has the intention of outlining a guide for anyone who wishes to create Digital Education strategies for their educational institutions. Each suggestion reflects enriching insights from specialists within a particular area, who have faced and overcome multiple challenges, and they were willing to share their best practices.

1. Why or What For?

The changes in higher education due to the pandemic turned Digital Education into a billion-dollar sector. Although the way in which teachers and students had to endure this period was chaotic due to the lack of training, it was possible to change the landscape of what digitization had to offer.[10] This unlocked a new landscape for education, by helping educators facilitate knowledge acquisition for their students as well as supporting them to learn quicker by integrating intelligent technologies that benefit customized learning, in addition to other service-oriented approaches for trainees.[11]

10   Humpl, S. & Andersen, T. (2022). *The Future of Digital and Online Learning in Higher Education; Publications Office of the European Union. Reflection Paper Series (Vol 4)*. DG for Education, Youth, Sport and Culture.

11   OECD. (2021). *OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*. OECD Publishing. https://doi.org/10.1787/589b283f-en

Digital Learning Incorporation within Universities' Educational Models

Beatriz Palacios, Director of Educational Innovation and Learning at Tecnológico de Monterrey, states that Digital Education has to be an initiative that is part of an institution's strategy. The approaches to its application may vary; which is why, criteria should be established for the University to decide the role that educational models based on the use of technology play in their institutional strategy. It's also relevant to identify the moments and situations on students' academic journey in which DE would be considered valuable for the entire university community, because it's an experience that can enrich all stakeholders.

Although, since the pandemic, the use of Digital Education was enhanced, and it should now be included as an important solution in educational models at all levels. It's a gamble that has been present for many years. Meanwhile, traditional education has evolved in its outreach, and the concept of future education implies the inclusion of experiences where technology promotes teaching-learning process.

Impact of Digital Technologies Within Universities	N= 82
Increases access and reach of the educational offers.	86%
Improves the development of students' digital competencies.	86%
Improves the quality of teaching and learning.	81%
Adoption and implementation of emergent didactic strategies.	78%
Improves the organization and administration of an institution.	77%
Enablement and acceleration of research processes.	67%
Promotes collaborations with other institutions at international level.	65%
Replacement or expansion of international mobility offering thanks to virtual mobility.	63%
Collaboration with productive/industrial sector.	58%
Collaboration with other institutions at a national level.	58%

According to the information collected from the REALCUP survey, where respondents could choose more than one option, 86% of the participating universities felt that digital educational technologies increase access and the scope of the educational offers and that, at the same time, are beneficial students' digital competencies development; these being the main reasons for integrating technologies into their curricula. In third place, and not far behind, 81% believe that the quality of teaching and learning increases. While in this sample these were the most popular options, there is no doubt that educational institutions have a positive perception of the favorable impact that digital technologies have within their community.

"The education of the Future must be framed by the best of face-to-face education, enriched with the best practices where technology adds value to the teaching-learning process."

– Beatriz Palacios, Director of Educational Innovation and Digital Learning at Tecnológico de Monterrey.

Beatriz Palacios also states that for a clear institutional strategy for DE's integration, it's essential to establish specific definitions of the modalities that may be used and how they can be mixed with other approaches. She describes technology as an enabler, not an end. Hence, the strategy has to identify in which manner students will live their educational trajectory, assuming the diverse scenarios that they may experience and preparing solutions for those who have little access to infrastructure now, but will need to have access later, asynchronously.

A key aspect to consider is the solution's design creating environments where technology can be one or the other, but based on students' different contexts because creating solutions without understand-

ing that there are different realities is impossible. For example, spaces can be created within educational institutions where individual students who don't have the required resources can have access to what they need. Beatriz Palacios mentions that in this scenario some universities create centers to connect, experience virtual reality, or have access to simulators directly.

However, there are various technologies that can be used in education today. They are easy to identify by radars and are able to go hand-in-hand with current trends. Some include leading-edge technologies such as: immersive worlds, artificial intelligence (AI), machine learning, effective computing, or accessibility. There are several topics that are essential for educational institutions to have in mind.

A radar shows all the options of existing tools, but don't include the solutions adapted to each case; so in order to determine how to integrate them, certain steps must be taken. One of the main steps is to understand the areas of opportunity for the institution and what is

going to be solved with technology, because choosing the correct path it's important agreeing on a common achievement. On various occasions the answers can be provided by technologies that are not even cutting-edge. A basic example is that during the pandemic, many institutions managed to solve their problems through educational videos. However, some noticed that they didn't have the infrastructure to manage the storage of said videos. Nevertheless, as it has been mentioned, access is not equal. Some students didn't have adequate bandwidth capaci-

ty, access to services, or computer equipment. Likewise, there were neither training sessions nor tools for teachers to create content to enrich their remote classes.

Therefore, it's essential to search for technologies that contribute to enhance the educational model and build the right instruments for different situations. Most of the tools require a "what for?", as well as a management and integration model. You have to know them, but above all, you must understand them and approach them properly, says Beatriz Palacios.

b. Benefits of Tecnology as an Enabler

Technology is essential for every institution nowadays. It is introduced due to the great benefits that it provides to every member of the school community. Either used to improve quality, accessibility, or economy, technology helps students access education in different ways while assisting them to hone their talents. There are different opportunities and positive aspects stemming from the im-

plementation of Digital Education. Some of the advantages that help to acknowledge technology as an enabler are described hereunder.

While it's important that educational institutions integrate DE into their strategies, it's also important to clarify that face-to-face modalities don't compete with digital modalities and vice versa. Both complement each other by add-

ing value to students' academic journey, and each one is used to achieve different goals.

DE develops universities and prepares them for the current context. It does not only benefit teachers and collaborators who learn how to use these technologies, but also makes them more competitive in their profession, Beatriz Palacios explains. By incorporating Digital Education, teachers familiarize themselves with the infrastructures that simplify their teaching processes through the use of technology.

Inclusion of digital opportunities allows institutions to build a pedagogy, which is enabled through technologies applied within the classroom, enhancing the user's experience, explains Maribell Reyes, Director of Digital Education at Tecnológico de Monterrey. Given the integration between theory and practice, classrooms' digitalization allows students to obtain profound and long-lasting life experiences, as well as connecting with their sensory senses while they learn. Today, as human

activity is reduced in computing, the implementation of DE develops strategies that go beyond abstract exposure to computers and connect students to life itself.

Norma Lara, Director of Dissemination and Content in Educational Innovation and Digital Learning at Tecnológico de Monterrey, assures that another benefit is the aspect of searching for information. It paves the way to analyzing, by comparing different sources, where students are able to discern the value of data, fostering critical thinking and interpersonal skills.

The value that Digital Education brings isn't only experienced through a person's school life, but it also enriches their competencies in the professional field. The knowledge on the use of these technologies can be transferred to give them a different use in the classroom, which will boost the business or discipline in which the graduate will engage, providing them with a series of skills that will be used in their professional careers.

Likewise, DE gives the flexibility to think of different solutions for processes, describes Norma Lara. Today educational institutions are developing professionals who have additional competencies and receive multiplied value by applying them.

By implementing DE classroom barriers disappear and frontiers no longer exist. On one side, in a classroom enriched with technology it's possible for students to be transported to a different place, or to take their classes in any part of the world; besides having the opportunity to coexist and learn from teachers and class colleagues who are in different parts of the planet. In this way, asynchronous exchange is facilitated, allowing teachers to be in contact with leading experts in different branches.

By having a space where teachers can leave relevant content on a given subject for a group, repetitive processes can be eliminated, and thus they can concentrate on the preparation and quality of their classes.[12] From the students' perspective, having all these resources available through their devices at any time of the day boosts their autonomy by having to manage their time and taking control of their own learning process.

It's worth mentioning that while the deployment of Digital Education can be a great investment, in the long run the profitability of institutions increases by reducing the expenses of not having to rely on a physical space, books, and other resources. It helps students eliminate relocation costs, travel expenses, and some other materials; besides offering a more flexible environment where they can balance their time in a way that suits them best, with the goal of fulfilling their educational and personal duties.

12 Servín, A. (2023). Conoce 4 beneficios de incorporar herramientas digitales en las aulas. *El Economista*. https://www.eleconomista.com.mx/los-especiales/Conoce-4-beneficios-de-incorporar-herramientas-digitales-en-las-aulas-20230426-0145.html

"Online education gives them the convenience to be a student when it makes the best sense for them to be a student."

– Paul LeBlanc, President of the Southern New Hampshire University (SNHU).

Modern times demand efficiency, flexibility, innovative experiences, developing competencies in the use of technologies, attraction, and connection with experts, opening up to institutional collaboration in a more optimal way, offering internationalization opportunities, improving learning results, access to other markets, and inclusion. These are the elements required to navigate the current world that are provided by educational technologies to train future generations.

DE allows the adaptation to different learning styles and delivers experiences that support them. It's an opportunity to open new markets, but also for existing markets, by giving them more opportunities to meet their personal needs. Namely, it contributes by enriching the trajectory of certain student profiles or by strengthening contents with digital teachings.

Advantages of DE

Improves teaching and learning: Benefits educational development and high-technology skills.

Return on investment in higher education: Entrepreneurial and innovation skills become essential to promote the creation of jobs in research and development areas.

At any place and time: Students have access to learning materials at any time and place.

Reduces inequalities: Favors access to quality education for rural and underserved communities.

From Alenezi, Wardat and Akour (2023).[13]

13   Alenezi, M., Wardat, S. & Akour, M. (2023). The Need of Integrating Digital Education in Higher Education: Challenges and Opportunities. *Sustainability* (2071-1050), 15(6), 4782. https://doi.org/10.3390/su15064782

Regarding the attraction of external experiences, Beatriz Palacios suggests that an institution betting on Digital Education foresees a future of multiversity. Increasingly, universities will have to establish strategic alliances to provide a more connected education, because it's easier to collaborate and exchange knowledge when it's done through digital environments. For example, it's advantageous to have international teachers and collaborative educational projects with other universities worldwide, where three or four different institutions are involved.

"We'll probably be evolving from university to multiversity based on various 'multiplied efforts': by multi-stages, because today we are used to studying for four years at a university before graduating, and even though this trend will continue, you will be able to enter and go out from different stages at any time, because you will return for updates on artificial intelligence, or be retrained in the green economy, which will be necessary in all industries." [14]

– David Garza, Rector and Executive President of Tecnológico de Monterrey.

iStock.com/Intpro

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14 De la Fuente, D. (2023, September 4). El reto: ser una multiversidad. *El Norte.* https://www.elnorte.com/el-reto-ser-una-multiversidad/ar2669121

For more than 30 years, Tecnológico de Monterrey has aimed to innovate and create educational experiences based on technology.[15] In 1987 the first steps were taken, when the institution added the satellite network as a solution for communication and interconnection among its campuses. Later, in 1989 it launched its distance education project, after making the connection between Tec and the University of Texas Medical School at San Antonio a year earlier. Hereinabove efforts did not only represent the first time that the Internet was accessed from Mexico, but they also set a precedent for its innovative trajectory.

While three decades ago the context didn't allow for the consistent use of technology to be feasible, the efforts of its remote programs accelerated the introduction of education supported by these resources.[16] Today, technology is an essential part of every aspect and that is why the university has focused on continuously redesigning its educational model.

Despite these transformations, Tecnológico de Monterrey has based its strategy on digital modalities that consider various aspects such as: institutional vision, teaching-learning process, markets, innovation, and efficiencies.[17] Furthermore, it has focused its digital educational offer and the reasons for its implementation on the benefits that its students receive. With these programs, students will[18]:

• Enhance their learning and complement their face-to-face experiences.

• Enrich their teaching-learning process, offering added value to their academic experience.

15   Palacios, E. (2023). 30 años de Educación a distancia y digital en el Tecnológico de Monterrey. *Editorial Digital Tecnológico de Monterrey.* https://repositorio.tec.mx/bitstream/handle/11285/650179/I038_final.pdf?sequence=5&isAllowed=y

16   Ibidem.

17   Vicerrectoría de Innovación Educativa y Normatividad Académica. (2022). La educación digital en el Tecnológico de Monterrey. https://issuu.com/innovacion-educativa/docs/estrategia-de-la-educacion-digital

18   Ibidem.

• Promote learning and flexibility personalization.

• Promote high-value international experiences.

• Create strategic alliances with the industry.

• Develop disciplinary, cross functional, and digital competencies.

• Ensure practices that incorporate educational innovation.

Norma Lara states that the lessons obtained from the pandemic led to rethinking the future of educational programs. One of these reflections was that Digital Education enabled and attracted innovations; so the strategy for the previous year and upcoming years will be to apply DE by definition during their scholarly trajectory. In this manner, students will have different types of digital experiences based on their study plans.

"For our students, challenge based learning, together with training partners is extremely valuable. They feel that learning from experience and solving challenges on real contexts motivate them and prepare them for real life. The Tec21 Model has strengthened our capacity to prepare our students for future challenges that we still don't know today. We have learnt that educational innovation has to be a permanent process."

– Juan Pablo Murra, Rector of Professional and Graduate Studies of Tecnológico de Monterrey.

Likewise, Beatriz Palacios argues that the institution is in the perfect stage to define the best way to use Digital Education, to further enhance its value proposal because it's the backbone of the educational model. This is precisely because the university has an experienced past, and today's context demands the incorporation of these practices to take greater advantage of the use of technology in education.

Technologies improve the teaching-learning processes by defining why it's useful to implement them.

By planning and inserting them appropriately, it's possible to increase motivation, participation, and development of competencies that upgrade students' learning results. Similarly, DE enables teachers to speed-up and refine the process of their class preparations and materials. If the institutional vision and strategies fostering the enrichment of the best practices are focused in these tools, the institution will be on the right track towards transformation and growth.
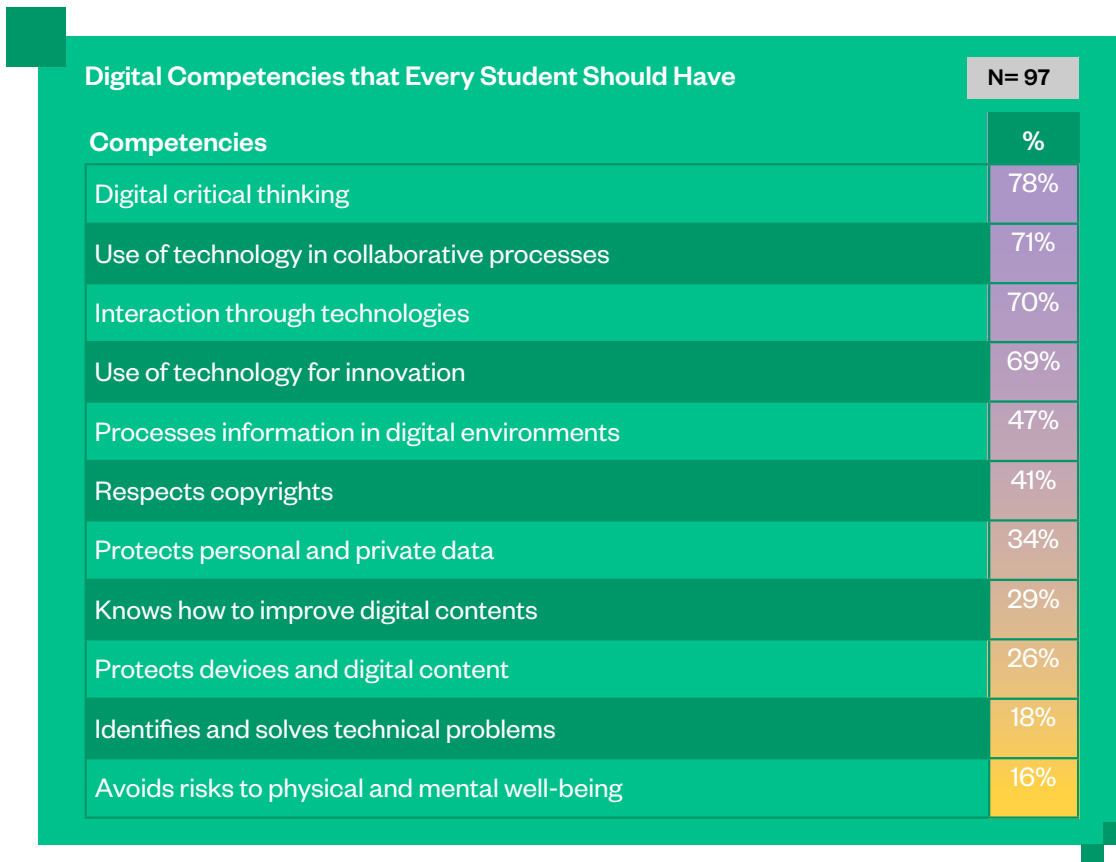
2. Definition Process
for Digital Offers

While the world moves forward in the technology environment, institutions must follow its pace to increase the education quality that they provide; without forgetting the protagonists: their students. HEIs must offer the best skills and capabilities, so their students are able to face the new needs that will arise in their professional environment and in the world.

Still, it's not enough to be aware of new trends, because adequate strategies need to be thought in order to synchronize their objectives and students' profiles, so that the integration of the digital sphere has a reason to be. This incorporation has to be an exclusive design that includes memorable experiences aiming to achieve specific goals and excellent academic performance; as well as teaching students about digital competencies needed to be professionals who will embrace emerging technologies, says Myriam Villarreal, Director of Pedagogical Design and Architecture at Tecnológico de Monterrey.

Digital Competencies that Every Student Should Have	N= 97
Competencies	**%**
Digital critical thinking	78%
Use of technology in collaborative processes	71%
Interaction through technologies	70%
Use of technology for innovation	69%
Processes information in digital environments	47%
Respects copyrights	41%
Protects personal and private data	34%
Knows how to improve digital contents	29%
Protects devices and digital content	26%
Identifies and solves technical problems	18%
Avoids risks to physical and mental well-being	16%

The results of the survey conducted through REALCUP highlight the main digital competencies that experts consider as the most important ones for their students. In these multiple option answers, 78% believe that digital critical thinking is essential for the development of their students, so they can correctly discern the information provid-

ed by different digital components. Also, 70% estimate that the use of technology for interacting, collaborating and innovating are skills that their students should have acquired by the time they graduate.

Technology skills cannot be omitted in any university program; so,

defining the necessary goals for students to develop such competencies is essential, and this can be done through the digitization of classrooms and the integration of technology tools.

a. Remote Programs

Remote education is an efficient alternative for students who have difficulties in attending face-to-face classes or specific courses on a given subject, due to a class's schedule or location.[19] Remote education first started through radio or television, but now it is provided almost exclusively through the Internet.

Due to COVID-19's global pandemic, institutions were forced to advance when digitalizing their classrooms, in order to continue educating their students despite adversity. While it was the most widely used modality at the time, this fast transition wasn't simple for all educational organizations, because many of them had to prepare initiatives from scratch in

order to confront this great challenge.

Nevertheless, in the case of Tec de Monterrey it was possible to apply this modality easily due to their previous experience with the implementation of technologies in their programs. For example, during the contingency it was impossible for students to physically attend factories or laboratories, so virtual programs were created where they could carry out their internship practices, such as taking measurements or changing settings on digital machines. Thanks to virtual simulators, students had the opportunity to visit these spaces at any time of the day, as well as operate machines without restrictions while learning from their mis-

19 Enciclopedia Humanidades. (n.d.). Educación a distancia. https://humanidades.com/educacion-a-distancia/

takes and without damaging actual industry processes. Otherwise, in a real factory, students need to follow a specific schedule and their access to machines is limited.

Now is the right time for educational institutions to carefully and intentionally plan the implementation of these technologies within their curricula, without being taken by surprise, as it happened during the pandemic that shook the world in 2020; besides making the best out of the lessons learnt and the benefits of remote education.

iStook.com/seb_ra

b. Tips for the Implementation of Digital Education in an Institution:

Paul LeBlanc says that a quality organization is based on three pillars, which must be excellent: operations, product, and people; the education sector is no exception. However, one of these elements must stand out from the rest: people.

Many universities will spend all their efforts in the product, which would manifest itself in such institutions by talking non-stop about the greatness of their academic programs or the awards they have won. However, the true aspect where all the energy has to be focused on is the students, through profound knowledge about the new generations and the central point on getting the best-trained staff to provide them with the best tools once they graduate.

"But the key, and my point in that illustration, is that you really have to understand what your students need from you, and then you build from there. So that was really critical for us in the beginning. And then when we realized what our students needed, we could take those lenses and apply it to what we were doing."

– Paul LeBlanc, President of Southern New Hampshire University (SNHU).

Taking into account the above, already knowing the needs of the students as well as their mission, vision, objectives, etc., universities can begin to look for the best digital opportunities to integrate them into their existing or new programs.

On the other side, Maribell Reyes, who works at the Vice Rector's Office for Educational Innovation and Academic Regulations at Tecnológico de Monterrey, describes that this area is dedicated to defining the Digital Education strategy for the institution in the upcoming years. For this reason, she proposes some step-by-step tips to execute a successful Digital Education plan:

1 Define why DE should be incorporated in the institution. The objective and strategy for integrating DE into the school's current policies must be clear.

2 Know what wants to be achieved through the integration of DE. For example, in Tecnológico de Monterrey it has been defined that DE aims to enrich students' experience throughout their development in the institution.

3 Specify human and material resources required DE implementation. From a human resources viewpoint, it refers to the people who will teach the use of technologies and other related knowledge. "Materials" refers to the resources needed, such as physical facilities, furniture, software, hardware, etcetera.

4 This change also entails a transformation in terms of teaching, so personnel prepared for these modalities must be available. Likewise, it is important to have a team supporting teachers; both by providing teaching advisors, who would support them with didactic strategies, as well as experts in the technological area.

5 Align all entities. Faculty, schools and technology areas have to be involved to ensure that everyone is guided by the same goal and they work together to meet the institution's objectives. Constant monitoring and change management campaigns will be necessary so these transformations don't disorient the university's community.

6 Define the direction and steps required to accomplish the targets. Prioritize where to start and begin developing everything that is necessary to reach the final goal.

C. Inclusiveness as an Essential Component for the Quality Enhancement of DE

Educational inclusiveness is consolidated under the premise of using specific strategies that favor the participation of students in the teaching-learning process, furnishing students with the help they need to achieve their academic success.[20] Beyond uniformity, this process consists in teaching, regardless of students' differences, using technology to facilitate high-quality education.

Axel Rivas, expert in policies, innovation, and educational justice, explains[21] that educational systems with the highest quality have the capacity of promoting social integration, regardless of existing differences. Also, he points out that the teaching staff is a rebalancing factor and an element that provides equity; since teachers are agents that establish educational justice through diversity management in their different projects.

Digital components allow learning to be ever-present in different times and spaces; for example, they give continuity even during unwanted situations such as diseases or conflicts.[22] Digital components also foster scaling up and replicating the best teaching practices, with mentoring and support for teachers.

Likewise, DE accelerates educational models, through personalized learning and the development of competencies in their students, based on the detection of individual needs. It's an opportunity to open new markets and grant more possibilities for the existing audiences to be served in terms of their personal needs.

The use of technology in education isn't easy for everyone, since it requires more effort to guarantee connectivity in different regions of the world.[23] By reducing the digital gap, the range of opportunities

20   Cabrero, J. (2015). Inclusión digital – inclusión educativa. *Sinergia, revista semestral.* https://core.ac.uk/download/pdf/51403436.pdf

21   ProFuturo. (2018). 1. Inclusión social desde la educación digital. *Retos: educación, inclusión y sociedad digital.* https://profuturo.education/wp-content/uploads/2020/06/Retos-1-PF.pdf

22   Ibidem.

23   Nassif, C. (2022). ¿Por qué la inclusión digital es crucial para el futuro de la educación? *IFT.* https://www.ift.org.mx/transformacion-digital/blog/por-que-la-inclusion-digital-es-crucial-para-el-futuro-de-la-educacion

broadens, allowing greater capacity to provide accessibility.

A great number of people equals an unlimited number of possibilities, in terms of the new ways of thinking, collaborating, socializing, and, above all, learning. DE is a powerful ally that gives the possibility to stop homogenizing teaching, adapting to each student's learning pace regardless of their differences and, therefore, increasing access to education.

d. Case: Tecnológico de Monterrey

Maribell Reyes mentions that Tecnológico de Monterrey adds Digital Education within its curricula throughout students' careers in an intentional, systematic, and conscious manner; including didactic strategies enabled by technology to generate high value for them.

In higher education, the aim is to incorporate digital modalities in their programs and allow students to attend them digitally based on their relevance; because the design of digital modalities add high value to their learning.

Some examples of technologies implemented within the classroom in Tecnológico de Monterrey are:

■ Adaptive learning: A learning strategy where courses are designed so that each student can have their own learning route. On the other side, teachers have access to a series of analytics where the progress and areas of opportunity of each student can be observed, as to work more efficiently in a group or individually in specific areas that need to be strengthened. On the other hand, it's a tool where teachers can evaluate themselves and decide which strategies worked well and which ones need to be changed.

■ ChatGPT: It's used inside the classrooms not only as a tool to search for information, but also for students to make a critical analysis where they differentiate true from false information, and compare their findings with other

sources, solidifying their media literacy skills.

■ At Tec's Dentistry career, students have virtual reality glasses and dummies on which they can practice. This way, by the time they care for real patients, they would have already practiced multiple times and be prepared to treat them without having hurt others.

In this university it isn't expect that students count with digital literacy competencies since their enrollment. Through the use of technologies, Tec contributes to the students' competencies development throughout their studies.

■ For example, through the digital gateway of the library's institution, students are constantly encouraged to search for information as well as analyzing it and differentiating between valid and invalid sources.

Tecnológico de Monterrey seeks to ensure that its students learn quickly and in the best way possible; where they are able to transfer what they learn to different aspects of their daily lives; in addition to enriching their knowledge and experiences through modern technology.

e. Case of Universidad de los Andes (UNIANDES)

Universidad de los Andes (UNIANDES) has more than 25 years working on topics of educational innovation with technology. Today, the institution is developing a transformation project with an emphasis on digital transformation issues, asserts Luz Adriana Osorio, Director of the Center for Innovation in Technology and Education (*Conéctate*) of Universidad de los Andes.

She is also the Director of the Innovation and Technology Research Group of UNIANDES and teacher of the School of Education, and comments that at the beginning of this century, the university's work was quite centered on how to enhance in-person experiences with technology. Because of this, the institutional project Virtual Learning Environments was created to support face-to-face experiences. Thus, in a deliberate and conscious manner, their objective is to explore how technologies can contribute to what happens inside the classroom. This practice is currently applied to the university's pedagogical models.

In order to incorporate technology to the curricula, teachers were asked to reflect on their practice, share what they did in class and build on other ways of designing the course, with the goal of experimenting and, subsequently, evaluate the classroom. At a later time, in 2013, *Conéctate* was born as an institutional bet. An interdisciplinary team integrates the center, which includes educators, engineers, evaluators, directors, producers, and animators, among others. In 2015, an alliance with *Coursera* was created to produce massive open online courses, because the university had already begun offering postgraduate courses in hybrid modalities.

At the end of 2019, Coursera invited UNIANDES to be the first institution outside the United States of America to design 100% virtual master's degrees. The topics included were: software engineering, artificial intelligence, and data analytics, as well as engineering management. Under this premise,

during the pandemic it was necessary to resort to remote teaching, where institutional strategies were designed to bring teachers closer to virtual education.

Even though the institution returned to the on-site undergraduate format when going back to the new normality, today it has blended and virtual graduate programs are available as a strategic institutional offer. It also continues to create MOOCs and specialized courses in Coursera; as well as innovating its continuous educational offers, designing micro and macro credentials, along with training paths in virtual, hybrid, and technology-enriched in-person modalities.

Verónica Suárez, Head of the digital university belonging to the Executive Management of Digital Transformation at Universidad de los Andes, says that their digital offer has been designed in a modular way, with the goal of expanding their market. Students from these programs have profiles with skills that prepare them to face the changing labor market. These ef-forts consist of generating a positive impact on learners that maybe didn't have access to the university or weren't prepared to start a full master's degree program.

Students are provided with environments for the construction and creation of knowledge and establishing cultural exchange with other people, which contribute to the teaching-learning process. Also, DE generates new ways to learn novel skills or refurbish certain competencies to switch to other roles within their current company. This design favors the demonstration of such skills with real evidence that employers can verify. This student-focused methodology is based on activities and real assessments that prepare them for direct professional contexts, by means of projects, cases, and real-life situations.

Luz Adriana Osorio explains that, as Raquel Bernal Salazar (the University's rector) mentioned, students have now changed. There are important demographic modifications and the need to train throughout life and around diverse

learning trajectories and life projects raise the challenge of truly disruptive and different educational models. Thus, their institutional dream is to respond in a broader and more flexible manner, with a wider offer that is compatible with their students.

"In contexts of so many technological possibilities, the university has to recover its missionary role. Human flourishing, creativity, critical thinking, and creating skills in the classrooms to develop ethical and integral professionals capable of properly programming all of these technological tools, are all cross-functional human competencies that are urgent."

– Luz Adriana Osorio, Director of the Center for Innovation in Technology and Education (Conéctate) at Universidad de los Andes.
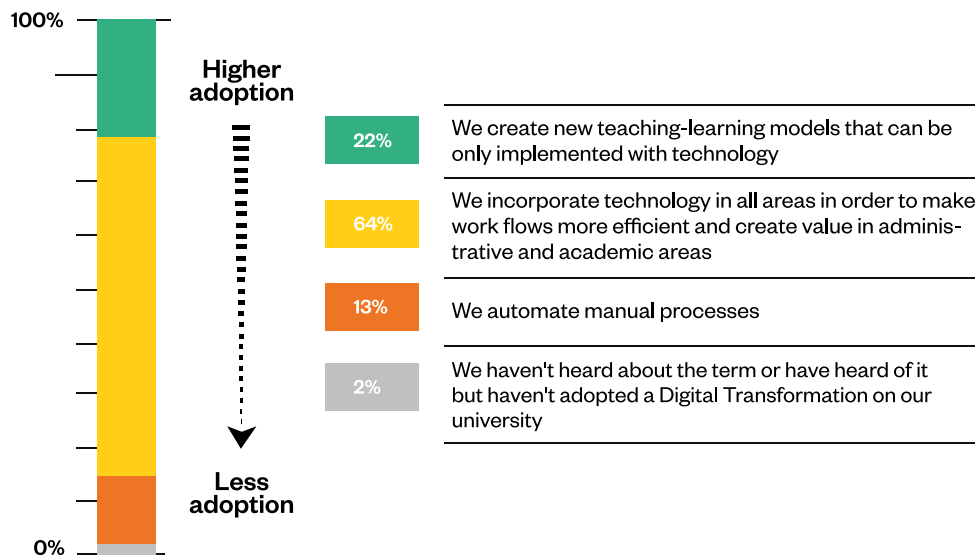
3. Digital Learning Incorporation within Universities' Educational Models

More and more universities are digitizing their classrooms, and as technologies are being gradually implemented, adoption is becoming more common.

100%

Higher adoption

22%	We create new teaching-learning models that can be only implemented with technology
64%	We incorporate technology in all areas in order to make work flows more efficient and create value in administrative and academic areas
13%	We automate manual processes
2%	We haven't heard about the term or have heard of it but haven't adopted a Digital Transformation on our university

Less adoption

0%

According to the study conducted by REALCUP, 98% of the respondents consider that their university is under a digital transformation process. However, every university is at a different level. For example 13%, use technology to automate manual procedures; 64% employ it to make the workflow easier and improve administrative and academic areas' quality; and 22% of universities create new teaching models that can only be implemented with technology.

"Incorporating Digital Education in a traditional model involves promoting it from a strategic view of integral transformation. It's important to have in mind the learning objectives and pedagogical intention of utilizing technology. Technology shouldn't be used for the sake of using it, but its purpose should be clearly defined. We should ask ourselves if it's a matter of coverage, reach, quality, relevance, personalization, or equity, while determining the best use of technology based on the educational intent."

- Juan Pablo Murra, Rector of Professional and Postgraduate Studies at Tecnológico de Monterrey.

University Strategic Positioning

According to Beatriz Palacios, there are four criteria to consider when analyzing the situation and ensuring the correct deployment of Digital Education. These stages are a fundamental part of any educational institution trying to integrate DE in a timely manner or seeking to mobilize it within their organization.

1

First, it's essential to bet towards the future and analyze the context around education. All the areas that are part of people's lives are increasingly impacted by technology. Any institution, regardless of their educational level, from basic, middle, or higher education, needs a defined and clear strategy of where to go. For this, it's necessary to understand the environment, be aware of what is happening in the world and to observe other universities' practices. On another side, it also implies analyzing the type of institution they want to be, where they want to grow and what their weak points are so they can focus their actions on them for the following years. From there, institutional approaches start to be built; thus, consolidating step one.

2

Then, it's important to create structures and processes to ensure that the DE strategy established in the first step is enabled. So, the second stage is identifying which areas should be involved and which ones will have to evolve to reach the strategy's objective. It should also be questioned how to start preparing teachers and support areas; as well as defining the type of physical spatial infrastructure or technology resources that the institution should possess.

3

The third stage works in parallel with stage two and consists of starting to create particular projects where the strategy is deployed, as well as observing and assessing if the plan is on the right track. Likewise, the type of courses, programs, groups of teachers, or student profiles to be impacted should be defined. It's essential to follow this process in stages and to constantly observe its development.

4

The fourth step is being mindful of society's demands, including the way in which teachers, students, parents, or legal guardians —in the case of basic or higher education— are experiencing the institution's Digital Education strategy. For example, many HEIs had a less-than adequate DE model during the pandemic. Moreover, being able to measure how students, their families, and teachers are undergoing this situation, should be established as a basic element; because in the end, if something isn't correctly adopted, people tend to reject or be resistant against it.

Different groups of stakeholders need to understand the strategy for them to start seeing the benefits and make suggestions for improvement, so adjustments or organizational changes can be made. It's essential to be able to create transformations hand-in-hand with the institution's change management team and their audiences, in order to appropriately take advantage of the Digital Education strategy.

A DE strategy that is integrated into the university's definition, has a mission and an educational model that add value to the institutional life. In the future, if they want to evolve as educational institutions, it's vital to create a strategy that goes together with the reason of their existence, to impact future education at all academic levels.

b. Problems and Challenges When Digitizing an Educational Institution

Despite the significant advances and knowledge that Digital Education provides through the use of software, different modalities, and other technologies, there are still some challenges that may hinder its implementation in some institutions. It won't be easy to identify and overcome them, and a strategy must be structured to address them to achieve a successful application.

Natividad Cabrera explains that one of the biggest obstacles starts with people themselves, and their resistance to change. This is a very common human problem that occurs when doing something differently from what they were used to. This is difficult for both people who are driving the change and for students, in particular, because on both sides there are personal and cultural barriers, additionally to a great variety of different mental models.

It's worth mentioning that while the pandemic forced the acceleration of classroom digitization, it wasn't easy for many institutions. It is important to consider the organizations' short-term response capacity to react against this kind of crises, and even for medium or long-term situations. However, while establishing such action plans, institutions fail to communicate internally properly, or the institution itself fails to envision the long-term goals they had set for themselves.

Another challenge when incorporating artificial intelligence instruments would be the financial situation.[24] Covering hardware and software costs with enough capacity to hold resources such as facial recognition or natural language processing tools is complex for school systems with a limited budget for technology incorporation. Likewise, management of personal data and consent to use it represent other constraints.[25] Privacy is a significant right to consider before and during the implementation of AI.

24   Singh, R. (2023). Advantages and Disadvantages of Artificial Intelligence in Education. https://techbaji. com/education/advantages-disadvantages-artificial-intelligence-education/

25   Miao, F., Holmes, W., Ronghuai, H., & Zhang, H. (2021). AI and education: guidance for policy-makers. *UNESCO.* https://unesdoc.unesco.org/ark:/48223/pf0000376709

Even though the tendency of being receptive to the inclusion of DE is a must, it should be considered that this trend will not be enough to close the educational inequity gap between people with high and low incomes. Many universities won't count with the same budgets to have the most advanced technologies, and some of them won't be able to even pay for the basic installation of computers, technology tools, or training for teachers. While there are benefits in terms of costs and accessibility; it should also be considered that Digital Education won't guarantee their education's quality.

While technologies foster cognitive skills such as information leverage and visual literacy skills, strategies to counteract the negative outcomes of digitization should also be considered, including diminished imaginative capacity, reduction of mental efforts while using a visual medium and a decrease in attention towards verbal information.[26]

Technology facilitates and allows visualization of elements that might otherwise be difficult for teachers to instruct or for students to comprehend; despite this, it's important to highlight that the educational process goes beyond cognitive and academic components.[27] While digitization moves at gigantic steps, central elements for the integrated development of students have been slowly neglected: values, attitudes, emotional intelligence, among others; this is because some institutions or instructors place all the responsibility of teaching on technologies, without providing "human" guidance.

Computers and similar devices, by nature, foster speed, precision, efficiency, and communication between human beings and machines. This idea considers these systems as undeniable authorities that have the omnipotent truth. In contrast, unlike the real world, these software-generated scenarios are structured

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26 Trahtemberg, L. (2000). El impacto previsible de las nuevas tecnologías en la enseñanza y la organización escolar. *Revista Iberoamericana de Educación. TIC en la educación. 24.* https://rieoei.org/historico/documentos/rie24a02.htm

27 Ibidem.

and predictable. It should also be taken into account that it's unknown to us who designed these tools, as well as the values, criteria, and priorities that they selected when operating these instruments[28]; therefore, such systematic operations may include biases that might discriminate some users.[29]

Machines could be a threat if the limitations and effects that they have in people aren't recognized. Questioning progress with an active rather than passive attitude towards technology is useful in order to use it as a benefit and enabler.[30] The risks of creating conformist and compulsive software postures must be discerned, understanding the importance of balancing impulses and instant gratifications like the ones created by technological resources.

Also, reading from a screen makes people read slower and generates higher fatigue than doing so from printed texts. Students' reading comprehension when reading from a screen is lower in terms of assimilation and memory compared to reading from a printed sources; because users tend to continue navigating away without finishing reading a text.[31]

For teachers, instructing in a virtual manner is very different from traditional teaching, as the effort has to be greater in order to guide online discussions and constantly encourage students.[32] This modality requires teachers to continuously monitor and give feedback, being facilitators of their students' different learning styles. Therefore, they spend much more time with each student than what they would usually spend in a conventional classroom, since they need to sign in several times a day and make a dedicated and thorough review of each student's submitted work. The previous work is done in addition to the training period required to obtain the essential skills required to manage these courses.

28 Ibidem.

29 Ibidem.

30 Trahtemberg, L. (2000). El impacto previsible de las nuevas tecnologías en la enseñanza y la organización escolar. *Revista Iberoamericana de Educación. TIC en la educación. 24.* https://rieoei.org/historico/documentos/rie24a02.htm

31 Ibidem.

32 Ibidem.

Luz Adriana Osorio and Verónica Suárez highlight that teachers are the driving force behind transformation. Teachers who have inner motivation to innovate in class have an authentic interest and disposition to deal with new adversities. However, when incorporating new methodologies or pedagogies to change their modality into a virtual course, acceptance becomes more complex.

Strengthening the technological infrastructure to keep it up to date and at a good level is a challenge. Continuous support and accompainment require different actions from on-site offers, content updates, and training. Stronger impact has been sought with 100% virtual programs, where not only is the teacher responsible, but also a group of tutors who accompany the students. This modality would facilitate following up on emotional issues, highlighting their importance.

Today, without the pandemic, there are still many obstacles that higher education level has to overcome. Luz Adriana Osorio and Verónica Suárez suggest that there is a need to attract students to university experiences, stay relevant, diversity, and different learning paces and various tastes and motivations can also create moments of crisis. Still, the new normality involves uncertainty. People wish for mobility and flexibility, and thinking about the curriculum in a flexible way is difficult. By selecting courses there is an option for the creation of learning routes to provide personalization and autonomous decision-making.

Main Challenges Associated with a Digital Transformation Implementation

N= 116

Challenge	%
The national context makes the adoption of technology and the process of change centered in the Digital Transformation difficult	67%
The culture existing within the university doesn't encourage an agile and flexible operation that favors Digital Transformation	31%
There aren't enough financial resources to implement and adopt Digital Transformation	29%
There isn't the necessary collaboration between the different areas for Digital Transformation	28%
The human and institutional conditions aren't in place to conduct pilots that validate emerging technologies and their impact on the teaching-learning process	28%
The physical infrastructure isn't enough for the use of educational technologies on the teaching-learning process	27%
There aren't people with enough skills and knowledge to carry out the processes of Digital Transformation	27%
There aren't technological platforms and software needed to improve the teaching-learning process	20%

The cultural differences of institutions, as well as their contexts, also prove to be impediments for the adoption of digital transformation. The data collected by REAL CUP shows that more than half of the universities find it difficult to implement educational technologies due to the national context in which they are located. 67% have an internal culture that doesn't have a favorable environment to encourage digital transformation, and 71% don't have enough financial resources to integrate such tools within their programs.

Educational institutions should bear in mind that, sadly, despite all the benefits that Digital Education provides, there are also challenges that they will have to face. It's a matter of taking into account these adversities, especially those that the university's community identifies most with, as to design a solid

strategy to prevail over them and; still, new problems will continue to emerge and plans will constantly have to be re-designed to combat them. Constant re-evaluation and renovation will be the best tools to conquer challenges while benefiting students.

Case: Western Governors University

In 1997, 19 governors met at what was called Western Governors' Association with the intention of changing the course of higher education in the United States of America. The idea was to implement an innovative model that could help their states to be more competitive by developing the workforce of the future, in order to meet the demand for labor. This coalition was unprecedented, as there was active participation between Democratic Governor Roy Romer and Republican Governor Mike Leavitt; the first one wanted practical training, while the second desired to extend the coverage of higher education to reach rural areas. Therefore, it was decided that a model based on competencies should be created in a 100% online modality. This is how WGU was founded, and after 26 years it continues to be a resounding success, with more than 166 thousand students and 350 thousand graduates. One of its main achievements consists of a flexible model that is entirely focused on their students, making concrete actions without thinking on how the institution's reputation or finances would be benefitted; but rather on how it would directly serve their students.

In this way, by having a student-centered approach, the university's academic offer is decided, taking into account those practical knowledge areas that have higher demands and are most likely to provide the best return of investment. For example, instead of having 80 careers, only those that have a high demand are offered, with enough market to directly benefit learners. Each one of

them is updated constantly as well as adding new technologies and theories. Michael O. Levitt School of Health was also founded with a scholarship granted by the U.S. Health Department, adding careers like nursing, which have high demand and allow students from rural, low-income, or ethnic minority communities to have access to these programs. In addition to these schools, the School of Education and the College of IT were also established.

The university is limited to these four areas, in order to ensure that students get a job once they graduate. Western Governors University has around 70 programs and, in words of Gene Hayes, the university has a simple vision: "We change lives for the better by creating pathways to opportunity." Furthermore, all employees are fully aware of the vision, mission, and key results, which shouldn't be seen as results but rather as goals, which are three: reintegration of the students, personalized completion in a timely manner, as well as equitable access and achievements.

This way, in a few words, the whole institution is focused on students;

mission and vision are oriented towards their benefit and they open their doors to all learners and not only to the elite.

Individually, a Senior Vice President, who is focused on the academic and operational aspects, leads the four schools that form the WGU, working hand-in-hand with the Vice President of Accreditation, where all schools are regulated vigorously. Also, the quality of education becomes everybody's business at the university, and the competency-based model measures specific learning, instead of measuring time and collective learning.

This allows students to get a bachelor's degree at WGU in approximately two years and four months, in light of the necessity to demonstrate and prove that their students learned, no matter how long it takes, allowing them to advance faster, as well as helping them to take advantage of the opportunity to learn things they haven't mastered yet. It's a better return on the investment of their time and credentials, resulting in lower costs in addition to shorter graduation times. All of this is possible

with the help of an unconventional team, unlike the traditional model, where teachers are the only ones responsible of the course.

WGU has curricula developers, in charge of creating their programs, class instructors, people who impart the subjects, mentors who give constant and personalized support to each student and, lastly, evaluators, who validate students' performance evidence and provide feedback. At the same time, each one of them has a department that measures the required performance, quality, and training, allowing them to work on everything that is important for the course.

With the emergence of new technologies such as AI; WGU is constantly considering the correct ways to use them to benefit their students. Therefore, while the intention is to place students at the center and promote their career paths with better opportunities is the main target, educational institutions would be on the right track to incorporate new learning methodologies efficiently.

4. Implementation and Quality Assurance Follow-up

In the educational field, quality refers to the capacity of transforming students, in a way that will positively impact society once they graduate. Far beyond the process of elaboration or implementation of an educational program, it's necessary to think about students in relation with the modern learning environment and to harmonize human components with current technologies.

In the creation of digital programs, it should be considered that contents by themselves won't guarantee high-quality education, but their design is of great relevance, considering regular updating as a key point: content's obsolescence is a risk factor.[33]

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33 García-Peñalvo, F. J. (2020). Modelo de referencia para la enseñanza no presencial en universidades presenciales. *Campus Virtuales*, 9, 41-54. http://uajournals.com/ojs/index.php/campusvirtuales/article/view/625

a. Design Criteria (Course Structure, Incorporation of Resources, Alignment, and Innovation in Teaching Processes)

Myriam Villarreal asserts that Digital Education is a value proposition for students from newer generations with multitasking profiles, who require flexible and innovative programs. Thus, as soon as other generations enroll to universities and their characteristics change, it's important that the institutions' curricula remain under constant observation, evaluation, adaptation, and updating; for the purpose of meeting society's and labor market's needs, according to these new profiles.

It's worth mentioning that, while there is an infinite number of very advanced and interesting technological trends, it's essential to innovate with good judgement and responsibility, taking into account when it is relevant to use them in class and the way in which they complement students' learning. It isn't the same to have an on-site program and just transfer it to a digital format, rather than to plan a well-structured particular design to give a flexible and dynamic twist to the ludic activities that take place in the classroom.

Regarding the above, it's imperative that a course's digitization contributes positively to its subject. Therefore, it's possible to build on an existing program with new technological tools due to the following aspects:

1

By means of enabling virtual spaces or laboratories, which are frequently used nowadays. Many resources can be employed to change something very practical into a life experience through simulated environments or virtual spaces.

Combining face-to-face and digital, hybrid, or mixed education. These models are the right solution for those courses or programs that have conceptual issues that can be managed using technology, such as: discussions, content, analysis, and others.

On the other hand, when dealing with the practical parts of an education program, it's more convenient to physically attend environments such as internships in companies and laboratories. However, students could have used and practiced with digital modalities prior to their internships; this way, they are already prepared to deal with real-life situations with previous experience (degrees such as medicine or dentistry, for example).

iStock.com/gorodenkoff

b. Ensuring Quality on Students' Digital Education and Improvement on their Learning Improvement

The cycle starts with designing, training, implementing, and, finally, evaluating; details that need rectification are adjusted again in the first stage, starting once more from step one: design. Myriam Villarreal describes each one of the steps that are necessary to carry out a quality process, seeking to ensure the best learning experience and optimal results for students:

■ 1. Design:

The process starts with the design of the program or course itself. There is a team in charge of, firstly, designing with quality. Certain standards, guidelines, and criteria must be met to deliver a good educational program.

From the first moment, this team should work hand in hand with teachers to prepare and design the programs' experiences. This work is thoughtful, analytical, and thorough, and the program's contents are created: what will be seen in each session, what comes before and what comes after, materials, tools, software, evaluation plans, accessibility, and inclusion, etcetera.

In order to enrich the course, many universities provide assisting teams, such as instructional designers, web programmers, and graphic designers, who focus on developing graphical and visual resources that support programs and courses.

■ 2. Training:

After assembling the design with all its structures, activities, schedule, and evaluations, training follows. It's here where tutors and teachers step in, setting their already defined plans into practice on a more solid base. Occasionally, teachers also need to be instructed on the course, because one teacher will be responsible for designing the program and selecting the corresponding tools, while the rest of the facilitators have to be trained so they can teach the same subject to different groups.

Once designed, it's essential that from the first moment students enter into their course, they are able to access all the instructions they need to complete the course and obtain a passing grade on said digital platform. Students should expect all digital courses to have the same elements that will facilitate their assimilation of the contents and their digital experience.

3. Implementation:

To maintain the quality throughout the course, constant and attentive accompaniment is required to meet teachers' and students' needs.

It's during the first sessions that the teacher informs the group about the methodologies that they will use and how to use them, as well as how they will be guided and will receive additional resources through digital platforms to complement the lessons' comprehension. Likewise, teachers are able to offer additional resources if learners desire to gain more insights about a given trend or tool.

In many institutions there are particular coordinators that constant-

ly track students' and teacher's performance; ensuring that the course is being conducted as designed. By documenting the adjustments and modifications, the course can be further refined for the following semester.
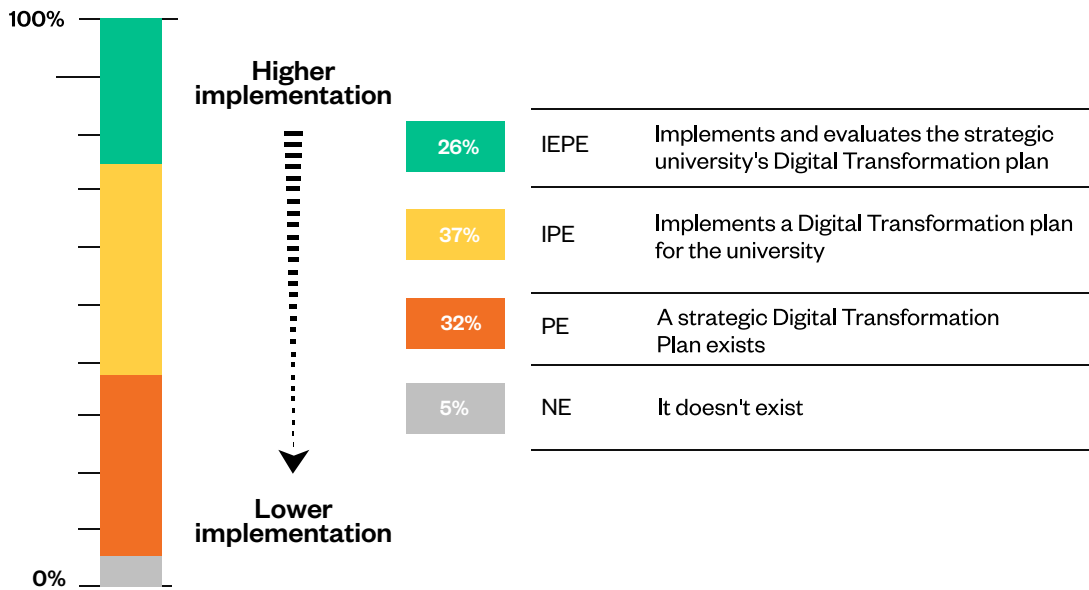
4. Evaluation:

It's an essential part of the Digital Education implementation process. It's at this point where the program's success is assessed, along with the needed rectifications for the continuous improvement of institutional programs. This can be done through surveys that are applied at the end of the course with the participation of students.

Evaluation, despite being a key element for the collection of relevant information in order to improve educational processes, is not implemented in some institutions to measure their impact. According to the survey done by REALCUP, the sampling showed that 57% of the universities have the task of including evaluation strategies into their educational innovation efforts. However, 43% of the institutions recognized that they don't actually do it.

Universities' Strategic Digital Transformation Plan Status

100%

Higher implementation

26%	IEPE	Implements and evaluates the strategic university's Digital Transformation plan
37%	IPE	Implements a Digital Transformation plan for the university
32%	PE	A strategic Digital Transformation Plan exists
5%	NE	It doesn't exist

Lower implementation

0%

From the group of experts that have strategies to measure the impact of educational innovation within their institutions, 95% of the participants have designed a digital transformation strategic plan; out of which 37% execute the plan, while only 26% evaluate it.

In order to guarantee a high-quality Digital Education, evaluation is essential to make the necessary modifications to comply with the objectives established in the design stage, as well as meet the established quality goals. In this way, the proper functioning of the work plan is sustained.

C. Accompaniment

Technology is merely a means, not an end. While delivering new and efficient ways to perform different processes, the responsibility to educate shouldn't be left to technology solely. A human accompaniment is needed in all university levels, walking in with students, teachers, and collaborators so as not to leave relational work behind.

"You can't transform someone's life if they don't feel like they matter to you."

– Paul LeBlanc, President of Southern New Hampshire University (SNHU).

Moreover, regarding school digitization, continuous education and training are essential for the university community, because everything changes very quickly and, thus, quick adaptation is needed. Even the most experienced student or teacher shouldn't neglect their own digital literacy, and must constantly update their digital skills.

If the entire university community does not become digitally literate, it will be impossible to follow the institution's technology proposition, delaying its digitization. So everybody in the institution's community should be part of these proposi-

tions, instead of just knowing how to handle them; everyone should also use them critically, ethically, and analytically. In this way, they would be able to see for themselves the need to move forward, by implementing and acquiring knowledge about other ways in which they can instruct and learn.

■ I. For Students

According to Myriam Villarreal, the way to ensure quality for students is to give them the right introduction since day one, so they learn the definition of what Digital Education is, which must be aligned

to the institution and courses' objectives; as well as with students' expectations from the program. Still, some students may not even understand what DE is. They may even have a different idea from the school's definition and may not be satisfied with what they receive. Clarity and good communication should be provided since the beginning, in order to avoid misunderstandings and walk together towards the same goals.

In addition to the objectives' clarity, students should also receive information about the tools, software, etcetera, they will be using through the course; besides showing their usage benefits. It's important to make them understand that the reason for employing a given methodology or technology will be for the sake of their experience and not merely for novelty.

Traditionally, students' accompainment was left to teachers alone; and while in the new virtual teaching propositions this has not changed, today they don't always accompany students directly. Natividad Cabrera points out that through Digital Education, today's teachers are capable of designing accompaniment elements for students which help, motivate, or lead students to make decisions during their courses. As a result, information and materials are within their reach at any moment of the day and they are able to decide when it's proper to use them; leaving teachers with more time to strengthen their planning strategies and quality of their courses.

■ II. For Teachers

First of all, teachers, besides being prepared with their knowledge and experiences, need to be constantly trained by the institution to learn the strategies, methodologies, and pedagogical trends that will be used along with the tools, software, and technologies, since it's impossible for them to instruct them correctly if they don't count with the support of an expert team. Beyond the institution's technological tools policy usage, teachers must be willing to train and venture to try new things that they wouldn't do in traditionally; this grants value to their classes, and could be able to improve their on-site classes.
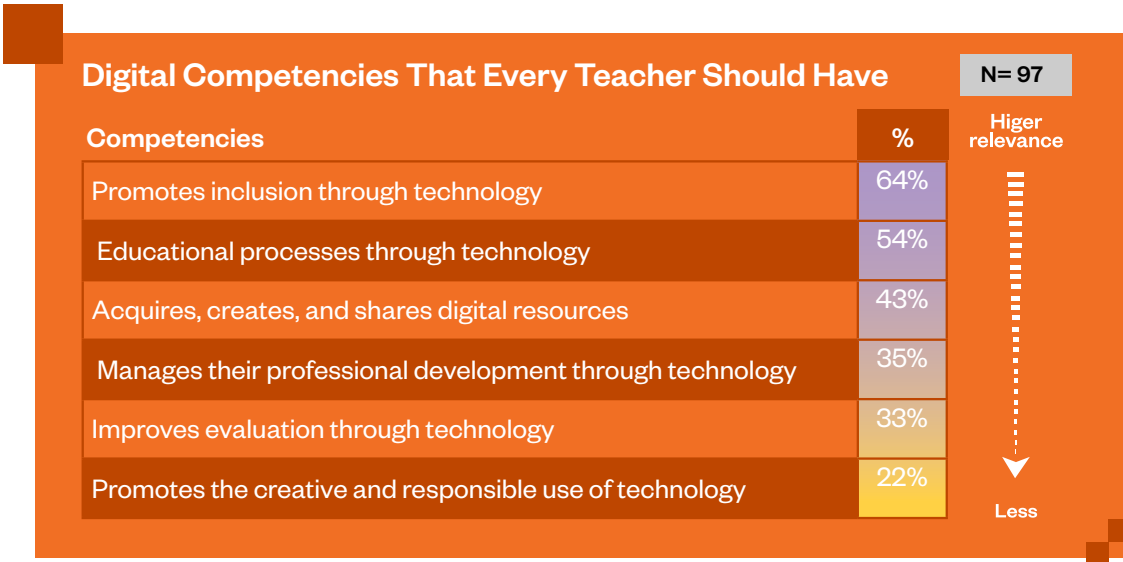
Use of Different Technological Resources by Teachers in their Pedagogical Strategies

13%	Always
76%	Often
10%	Almost never
1%	Never

100%

0%
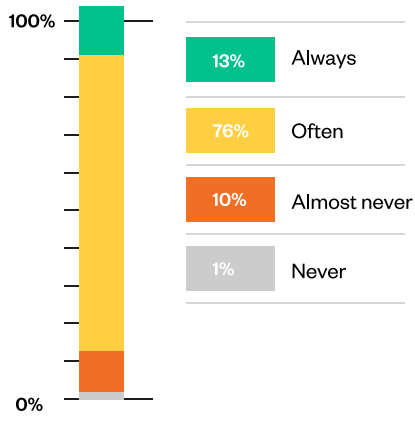
In this regard, participants from REALCUP's survey affirm that 89% of teachers always or almost always use different technology resources when strategizing their pedagogical plans.

The survey done by REAL-CUP indicates the most relevant digital competencies for teachers. In the most

Digital Competencies That Every Teacher Should Have   N= 97

Competencies	%	Higer relevance
Promotes inclusion through technology	64%	
Educational processes through technology	54%	
Acquires, creates, and shares digital resources	43%	
Manages their professional development through technology	35%	
Improves evaluation through technology	33%	
Promotes the creative and responsible use of technology	22%	Less

popular result, with 64%, experts believe that technology is a means by which teachers can promote inclusion. Then, 54% stated that teachers should have the skills to manage their educational processes, which is a practice that benefits them greatly, as it's more transparent and efficient. In an age revolving around the digital uni-

verse, 43% of the respondents believe that teachers should be able to acquire, create, and share digital resources.

Nowadays, technology competencies shouldn't be absent from teachers' professional careers; therefore, in addition to equipping themselves with studies and

trainings offered by the institution, they have to be willing to innovate themselves constantly, in order to improve the students' learning experiences.

Another important aspect was very present during the pandemic, and should also be instructed to teachers nowadays: the socio-emotional connection between them and their students, as to enhance their integration and results. It's recommended that during the first few sessions students carry out engaging activities that motivate them, to create a strong commitment with the subject. This way, students won't be alone and will know that their teacher is backing up these digital platforms and tools, to whom they can resort with enough confidence at any time during the course without hesitation.

Within the technological environment, which is the base, teaching responsibilities shouldn't be left to teachers solely. They should have a backup team to help them manage and fix those aspects that are purely technological, such as system failures or solving questions, so instructors can feel accompanied at all times, in such a way that they can encourage the use of technology in their classes.

◾ III. For the Institutional Community

For any institution, what happens beyond class delivery and evaluations are also important with a view to ensure the quality of education, affirms Myriam Villarreal. All those support services that guarantee the university community's comfort and ease to carry out its activities should be considered; making sure that everything in school works properly. This entails digital services, academic services, care, tracking, and integrity, as well as talent attraction, admission, and enrollment.

Paul LeBlanc points out that the student community has different needs, and they mainly seek convenience; and so, community problems must be solved as quickly as possible, in order for them to continue with their intricate schedules. The time to carry out processes

should be as fast as possible and with the best customer service.

A quality institution must take care of these support services from end to end: from the moment a student is attracted and enrolls into a digital program, until graduation; and even during their professional career. A good service should be considered for all the stages in a person's academic life.

d. Case: Tecnológico de Monterrey

In Tecnológico de Monterrey's case, the Instructional Design team in the Educational Innovation and Digital Learning division is dedicated to the creation of digital courses from high school to postgraduates, so that these programs are imbued with strategy, new trends, and innovation.

Likewise, besides building these methodologies, it's also in charge of promoting constant educational updates both within itself as well as outside their area (other teams and especially among teachers), as to be at the forefront of new pedagogical and technological trends. It's through journals, papers, and their participation in numerous events that Tec de Monterrey is able to share their findings with the institution's community.

A great instrument that measures classes' quality is the ECOA (Students' Opinion Survey - Encuesta de Opinión de Alumnos) survey; which is a tool that provides feedback regarding teaching practices to improve them. It consists of a digital survey addressed to students, where, anonymously, they have the opportunity to send their opinion and comments about the teachers and the programs they are studying. This is done to evaluate and take into consideration the results, which are then sent to the instructional design team, for the purpose of making the corresponding adjustments for the following school year.

Occasionally, for those new digital programs, they are supervised during the semester, to ensure consistent progress along the way, especially when new technology tools are implemented. Specific actions are taken in case issues show up throughout the course. Through those actions, the Instructional Design Team in charge of accompanying teachers can help them to adjust details so that the program can be set back on track.

In Tecnológico de Monterrey it's

believed and guaranteed that quality comes from the instructional design first; therefore, the Design Team also joins forces with expert organizations such as *Quality Matters,* an international body dedicated to advising educational institutions on Digital Education and innovation.

"If I have a Digital Education product that has to come out; whether it's a course, or a program; I have to plan, design, and develop it before putting it into action. From the design stage I have to ensure quality in order to be successful; I have to integrate innovation to end up with a high-quality product, an attractive product that will allow having a memorable experience that will enrich the student's academic journey."

– Myriam Villarreal, Director of Pedagogical Design and Architecture at Tecnológico de Monterrey.

e. Case: Universitat Oberta de Catalunya (UOC)

Universitat Oberta de Catalunya (UOC) was the first university that offered virtual programs in Europe in 1995. They decided to venture into the digital world in spite of the great distrust that existed in this medium, since it was just emerging. Neither organizations nor people were prepared to even consider that this option would be a beneficial way to boost education in the near future.

Natividad Cabrera points out that the UOC's digitization since the 90's has been possible thanks to the clear conception of the goal they wanted to reach: visualization. On the other side, this wasn't an easy task, due to the large number of capabilities and resources gaps, not to mention the distrust and lack of social acceptance that existed regarding this technology.

From this unambiguous and structured overview, the university has been able to work and evolve to reach their goals, as well as adjusting to the rules and needs of an ever-changing world.

■ I. How does UOC Ensures Educational Quality?

Initially, from the first digital courses proposed by the UOC, trust became the most essential element, and two parallel strategies have been followed to obtain the approval of university communities.

The first one is to constantly seek recognition from the immediate university system: the Catalan, Spanish, and European systems. Like this, UOC participates in all possible existing processes to obtain homologation and accreditation as an institution, following the same procedures as the rest of the universities in the Catalan and Spanish systems.

Before teaching their classes, the university complies with all the regular accreditation processes promoted by the Catalan and Spanish quality agencies, and based on that, teachers also have to be constantly trained in an effort to comply with such agencies.

It's worth mentioning that this wasn't very easy at the beginning of the implementation of Digital Education in the university, because processes weren't thought for virtual teaching yet. As a result, UOC had to negotiate and explain to these agencies the benefits and lessons learned from virtual education, in order to obtain their understanding and acknowledgment with the final goal of obtaining their accreditations. However, nowadays, and due to the pandemic, this understanding has become easier and it's is even more common among accreditors.

Having achieved accreditation within their country and continent of origin, UOC's second strategy was to attain international recognition, to continue reaffirming their quality and gaining everyone's trust, not only in their geographic area, but in different parts of the world.

For UOC, providing a quality education consists in rigorous education delivery that builds trust in an inclusive and flexible way. Having in mind the diversity of university communities, it's possible to respond in an ethical manner to the demands of society, from decisions based on evidence and research. This reaffirms the foundational objectives of this institution, taking into account all aspects that benefit society, such as the values previously mentioned, as well as social responsibility, impact, and transformation, among others.

5. Regulations and External Accreditations

In addition to the different topics that have to be considered while making changes in HEI's educational model, it's essential to consider those that allow them to operate properly and provide the corresponding validation to be able to perform their functions officially.

Regulations

"Regulation is what aligns and directs, allows to focus efforts on a common goal, it's mainly centered on the programs' academic quality and validation"; that's how Luis Alberto López, Director of Regulations and Academic Management of Tecnológico de Monterrey, defines regulation. Besides, he distinguishes between two different types of this concept: internal and external.

Internal regulations frame everything that is allowed within academic processes. It's that framework that establishes guidelines and the basis for reaching an institution's common goals. These regulations allow the university community to walk on a valid and defined road, within an operating margin.

On the other side, external regulations refer to those established by governments or by accrediting agencies, that also maintain a structure for what they consider to be correct, in order to ensure the quality of education and keep up with global trends. It's neces-

sary to comply with government regulations, because their rules are the ones that officially validate an institution.

In Mexico, the Ministry of Public Education determines the standards or criteria that university institutions need to cover. That is in addition to internal regulations, which have other definitions and standards.

■ I. Digital Education and Regulations in Universities

Regarding DE, it is critical to establish regulatory parameters, because there is a variety of digital elements that can be administrated, applied, or executed in different ways, with their respective scopes. If an outline or definition are not established, then it's possible to lose focus on the main objectives as an institution.

As an example, during the pandemic Tec de Monterrey offered courses that, at the moment, were called hybrids: some students attended on-site classes while

simultaneously others attended remotely. This model had to have formalized regulations, even though at the end of the pandemic, the institution concluded that such courses weren't suitable for all programs.

In this case, creating regulations that dictate under which conditions and circumstances these courses can be offered, promotes the evasion of differentiated efforts and avoids losing sight of the university's objective, which is to guarantee the best experience for students, making sure that they are able to learn in optimal environments that suit their necessities best.

This is a very simple example of why regulating digital elements is so important. Regulations related to Digital Education indicate under which conditions online, synchronous, or asynchronous courses can and should be offered, as well as how to mix on-site and remote classes, according to a curriculum; as well as the needed certification criteria or credentials required by teachers, in order to offer programs with digital elements.

■ II. Considerations

As to successfully implement internal regulations in an institution, it's necessary to make a revision and identify under which models, standards, and criteria said programs can be offered. It is also important to consider which are the characteristics of the teachers who will instruct. Meaning, the trainings they should have, which certifications, which design model must be used in their training units —subjects, courses—, which evaluation models must be established and how teachers must make sure to conduct such evaluations. On one hand, there is a combination of the curriculum, teaching structures, teacher's characteristics, and very importantly, the design of evaluations.

On the other hand, regarding external regulations, it's necessary to identify trends and changes made by both the authority vested in each institution (in Mexico it will be the Ministry of Public Education), and accrediting agencies. It's up to universities to identify the standards and how it's possible to comply with

them to facilitate the issuance of documents.

III. Modifications

Regulations change constantly, so it's essential to keep policies updated according to a changing world. Institutional objectives, students and teachers' characteristics, as well as the topics to teach, also evolve all the time.

A key element in a regulatory process is the way it's being adjusted and constantly modified. The incorporation of digital elements involves performing a new revision and updating the regulations related to such elements. If the appropriate adjustments aren't made, it's possible to fall into the obsolescence of certain policies: each one of them must have a reason to exist that is, applicable to the current educational context.

IV. Regulation of Digital Education

Regarding DE, regulation in Mexico faces a significant problem: authorities haven't defined yet the digital element that educational models should have. Until now, the national legislation enacted three schemes: school-based (a 100% face-to-face study program), non-school-based (a completely remote program) and mixed (a program that integrates a combination of both schemes).

With the arrival of artificial intelligence, it is up to authorities to identify where trends are heading and review their regulations. However, they have centered their work on complementary education and professional competencies. Furthermore, rather than relating AI to digital areas, it has been related to the way in which an academic program should generate professional competencies in order to receive certain accreditations or credentials, without including them or linking them to digital elements.

V. Recommendations for Digital Education Regulations

Regulations need the following modifications when incorporating Digital Education in an institution:

1. Consequences of non-ethical behaviors.

2. Structure of educational plans.

3. Evaluation models.

4. Alternative student competencies, both internal and external.

5. Criteria for subject accreditation and graduation.

In this regard, it's essential to listen to teachers and collaborators and identify the processes that they consider effective, since there are outdated regulations that only hinder their students' work and processes.

In Tecnológico de Monterrey, the Academic Senate is where proposals to modify the educational regulations are presented. This body governs all teaching and learning processes. These proposals can come from teachers, rectories, campus directors, etcetera, so it's up to the academic community in general to be constantly aware and identify which articles or regulatory elements are obsolete and the way they could evolve.

Finally, it's important to consider the regulations related to dangerous or illegal conducts, to clearly establish the possible causes and consequences of unethical behaviors. Plagiarism, purchasing assignments, impersonating someone else to submit exams or tasks, among others, are some examples. These circumstances must be typified in these regulations, along with their possible consequences, which can range from a warning to expulsion. Institutions must be prepared to identify potential misuses of technology for academic benefit. Besides, in the case of artificial intelligence, it is important to settle the rules for its correct use and defining parameters.

b. Accreditations

While it's impossible to choose external regulatory standards established by the government, it's possible to select the type of accreditations that the institution can have, since each accrediting agency establishes their own standards in order to comply with their quality criteria. In this aspect, the levels of demand vary from agency to agency.

Valeria Cantú, Director of Educational Effectiveness at Tecnológico de Monterrey, states that accreditation agencies have the objective of sustaining the academic quality of the institution, school, faculty, or program. They establish their criteria, and with other evaluators analyze if the institution complies with the minimum requirements to guarantee academic quality. This is a recurrent evaluation that promotes continuous improvement, therefore, it occurs constantly and not only during the accreditation period. This is why an evaluation culture is necessary, since an improvement cycle must be carried out assiduously.

In the institutional aspect, Tecnológico de Monterrey is accredited by two bodies: FIMPES, in Mexico, which is the federation that oversees private universities in the country, from which Juan Pablo Murra, Rector of the same institution, is currently Chairman of the Board.

Likewise, Tecnológico de Monterrey is also certified by SACSCOC (Southern Association of Colleges and Schools Commission on Colleges), an accreditor in southern United States; being the first international university to be acknowledged by this association. This grants the institution the recognition of the U.S. Department of Education, that is to say, it has the academic quality levels that U.S.A. demands.

iStock.com/Intpro

I. Importance and Advantages

Today more than ever, it's important for HEIs to have the necessary accreditations, given that these types of processes provide students with the needed security and confidence that they are receiving a quality education; especially after the pandemic, since education was one of the most affected industries.[34]

Likewise, depending on the type of accreditation, the benefits that students receive thanks to this can transcend frontiers; for example, SACSCOC accreditation allows that, upon graduation, a professional or graduate student doesn't have to revalidate their studies in the United States, since the degree issued by Tec de Monterrey has the certification that validates it.

On the other side, being recognized by different accrediting agencies will also facilitate searching and applying for different funds or grants for a university.

It's important to mention, that at least in Mexico, accreditors aren't differentiating between different educational models and have only incorporated exclusive standards to their existing accreditations.

II. Types of Accreditations

There are two main types of accreditations: the institutional and career or program accreditation. Likewise, there are also those institutions that only support entities based on their geographical region or line of business.

Institutional accreditation is, as the name indicates, applicable to an entire institution. Similarly, it reveals that each entity belonging to a university contributes to the achievement of the university's objectives. Having this backup doesn't guarantee that all the programs have the same level of quality. On the other side, a **career or program accreditation** only endorses a program, a department, or an entity within an institution.[35]

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34 Instituciones de Educación Superior Acreditan Planes de Estudios. (2023, May 15). *El Economista*. https://www.eleconomista.com.mx/empresas/Instituciones-de-Educacion-Superior-acreditan-planes-de-estudios-20230515-0066.html

35 Homeland Security. (n.d.). *The Basics of School Accreditation*. Study in the States. https://studyinthestates.dhs.gov/schools/apply/the-basics-of-school-accreditation

Tips for accreditation:

1. Recognize the type of accreditation that will be most favorable to the institution.

2. Know the criteria requested by the accrediting institution.

3. Determine whether the university institution meets the criteria.

4. Before proceeding, assess whether the cost-benefit is adequate for the university.

5. To establish the team in charge of the accreditation strategies.

Finally, the most important factor when seeking institutional support for each educational entity is strategic planning: considering the pros and cons of each accreditation, as well as the time and budget to be invested.

6. Technological and Service Infrastructure

Digital technology or digitization permeates over everything. However, the implementation of such an educational model requires considering both physical and digital infrastructures; since, besides being necessary for its execution, it's usually one of the aspects that applicants take into consideration at the time of enrollment, becoming a basic element for the attraction and retainment of students.

a. Technological Infrastructure

García-Peñalvo ensures that when implementing a completely virtual educational strategy, it's necessary to have a technological infrastructure that covers at least three aspects: management and governance (attached to the project portfolio), physical infrastructure (fulfilling the needs of connectivity, servers, storage spaces, among others) and logical infrastructure (defining the technological ecosystem, maximizing interoperability and software evolution, as well as the user's experience).[36]

One of the first steps, as Carles Abarca, Vice President of Digital Transformation at Tecnológico de Monterrey, suggests, is to have what is known as a technical configuration authority. There is a team in charge of making decisions that alter the technological stack. For example, if there is new software, it's necessary to work on the renovation of a group of servers or to upgrade the storage's capacity. This type of expert committee assesses the alternatives and makes decisions based on various parameters, such as safety, operational efficiency, and technology's lifecycle.

This aspect becomes essential, because it is important to recognize that it's not always optimal to acquire the latest technologies; and this is a way to prevent it. These parameters should be accounted for by the technical configuration authority. However, it is also important to contemplate the finance team's opinion as well as their flexibility regarding these topics.

Furthermore, it is necessary to clarify that all frameworks are important, but perhaps the most critical in terms of availability is connectivity. Any situation that puts connectivity at risk is immediately perceived, for the reason that it reaches a large number of users, students, and collaborators. Connectivity is the circulatory system of an institution and it can't just fail.

36   García-Peñalvo, F. J. (2020). Modelo de referencia para la enseñanza no presencial en universidades presenciales. *Campus Virtuales*, 9, 41-54. http://uajournals.com/ojs/index.php/campusvirtuales/article/view/625

In this regard, the type of cloud in a university is of vital importance. However, many cloud services are similar and it's possible to lean towards those with more affordable prices or those with a more service that offers different functionalities; when in fact the determining factors are the target sector and it's purpose of use.

Types of Cloud Computing	
Public Cloud	Used by a single institution with private data.
Private Cloud	Shared among different organizations with a supplier administrating the software.
Hybrid Cloud	A combination of a public and private cloud.

Adapted from Carles Abarca and OCI.[37]

Types of Cloud Computing Services	
Software as a service, **SaaS**	The service provider allows the use of applications through the Internet. There are different packages depending on the sector.
Platform as a service, **PaaS**	Clients have access to the tools required to create their own applications. The provider is responsible for security.
Infrastructure as a service, **IaaS**	Clients use the infrastructure and are in charge of the software's development and security.

Adapted from Carles Abarca and OCI.[38]

37 Oracle Cloud Infrastructure. (n.d). *¿Qué significa "Cloud Computing"?* https://www.oracle.com/mx/cloud/what-is-cloud-computing/#:~:text=a%20las%20empresas-,Tipos%20de%20Cloud%20Computing,un%20nivel%20de%20seguridad%20diferente.

38 Idem.

Also, infrastructure must be maintained continuously. It has an impact on every circumstance, and issues are anticipated based on regular troubleshooting, using agreed renewal cycles; meaning that the equipment, even if it doesn't fail, is replaced when it reaches the end of its useful life cycle. The best way to guarantee service continuity is by checking systems through a combination of different pieces of equipment with centralized monitoring systems that allow users to take local action if a problem arises.

Measuring the outcomes of using technology enables the improvement of the service's quality. Consistent monitoring is given to effectively prove that technology actually has a positive impact on users.

b. Considerations of Technological Infrastructure and Services

According to Nohemí Vilchis, Digital Education has unlocked new landscapes and has optimized different processes within the classroom; however, its use can lead to the violation of user's personal information if it isn't properly executed.[39]

She also highlights that, as part of the services offered by HEIs, students aren't involved in the decision-making process of platforms and technologies, so it's impossible for students to refuse using them. It's important to establish visible privacy politics that are part of the terms and conditions of the educational resource, as it's institutions' responsability to ensure the correct use of their students' personal data.

Abarca de Haro also points out that, within digital skills learning, it's possible to distinguish three levels:

1

The basic digital relationship skills that are necessary to function in today's society. It's necessary to acquire certain digital competencies and knowledge, even if it's just on a basic level.

2

The knowledge that applies to roles that manage digital technology. In order to prepare these specialists, it is vital to include a different level of training in educational programs.

3

The knowledge of researchers, developers, and creators of technological innovation, who are driving the real revolution of artificial intelligence in the world.

39   Vilchis, N. (2022, September 23). Does Educational Technology Disregard Students' Digital Rights? *Observatory IFE* https://observatory.tec.mx/edu-news/edtech-digital-rights/

However, in terms of digital inclusion, two gaps are concerning: first, the knowledge gap, which is the easiest to close, caused by the distance between learner and subject. However, the most concerning gap is the financial barrier: referring to people that have no access to economic resources, who represent a very high percentage of the population.

In terms of infrastructure, the most important conditions are high-quality connectivity and in particular, the applications and means of access, relating to tablets, mobile devices, or computers. It's up to institutions to prepare students for a world that doesn't exist yet, and to begin anticipating how the labor market will behave and determine which capabilities will be needed. Not everybody requires to be an expert in artificial intelligence, but it's important to understand what it's useful for, and in which situations of their professional career they will have to resort to this type of technology.

c. Case: Tecnológico de Monterrey

Tecnológico de Monterrey has created the "Techvolution" initiative, which has the intention of making digital service and attention experiences much more intuitive and effective to the university community. It's objective is to provide users with self-management, self-learning, and agile solutions with added value to meet any of their needs.[40] The initiative consists of five pillars[41]:

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40 Treviño, R. (2022, January 17). Techvolution: la visión digital y de servicio del Tec de Monterrey. *Conecta.* https://conecta.tec.mx/es/noticias/nacional/institucion/techvolution-la-vision-digital-y-de-servicio-del-tec-de-monterrey

41 Ibidem.

1 Institutional Architecture: It refers to a map of available technologies offered by the institution, where the services ecosystem is aligned on comprehensive platforms such as Hubspot or Service Desk.

2 Infrastructure: Its intention is to renovate virtual and physical technological facilities where the university's target audiences can learn to operate with the help of, for example, the institution's data center.

3 Cybersecurity: The protection of digital assets, based on a preventive culture and the use of tools that protect a university's digital information.

4 Construction of digital experiences: The whole community's experiences are taken into consideration, with more than 200 initiatives that support their needs. This includes the work cells that develop and evaluate the users' journey, to improve, for instance, the enrollment process or creating school schedules almost automatically.

5 Tech Savvy: Includes technology development programs, courses, certifications, and diploma courses that lead the community into the digital era equipped with strengthened skills.

Techvolution has eight lines of digital products at a national level, and based on them all of Tecnológico de Monterrey's campuses consume digital products from most of the services offered by this initiative. Work cells were created with process leaders from different areas to focus on the diverse audiences of the university and their needs, in order to produce improvement plans for them.

Likewise, a great part of the operational work done by the university is in the cloud, ensuring greater resiliency that evolves rapidly and contributes to an agile operation.

7. Financing

Higher education institutions do not only need to make major investments to create and/or expand the required infrastructure for the implementation of DE, but also being mindful of updating teaching staff's knowledge and providing them with consistent training.[42]

42   Humpl, S. & Andersen, T. (2022). *The Future of Digital and Online Learning in Higher Education; Publications Office of the European Union. Reflection Paper Series (Vol 4).* DG for Education, Youth, Sport and Culture.

a. Financial Planning Process

Incorporating everything related to the university with finances depends very much on the context, and in particular there are moments when it's imperative to make decisions. Adriana Wong, Director of Income and Financial Services for Students, and former Director of Administration and Finance of the Rectory of Operations, says that under an ideal premise, financial topics must be taken into account at the same time that an idea is being conceived or at the strategic planning stage.

When the accompaniment starts from the project's first stages, it occurs behind the scenes, so it's possible to share thoughts about the primary ideas and talk over the initial big numbers. This way, the project can be dimensioned and redirected if necessary.

Even so, as there are more urgent moments for the presentation of relevant information and decision-making, a business case with numbers is vital to accompany the process. The case is taken to the responsible area's team, where the project is discussed and grounded. The institution may have the best possible estimates with margins of error, when there is enough time. However, when every second counts, the project's timeline should be requested and, in some way, adjusted in order to reach the corresponding objective.

Renato Ramírez, Director of Analytical and Business Intelligence at Tecnológico de Monterrey and former Director of Administration and Finance for the Rector's Office, explains that the financial planning process depends on the definition of the institution's strategy and type of DE. If Digital Education is visualized like a piece that goes inside a teaching unit, it requires certain elements such as remote interaction with students in an online class or educational programs that are similar to a full graduate degree. There are also other models such as bootcamps or MOOC. It depends on the magnitude of the effort to be undertaken and the size of the challenge which will

determine how far in advance it's necessary to plan and assess what is feasible to do.

In general, any Digital Education model is clear when it's a 100% digital offer and a determined cost is established, says Adriana Wong. When it's a combination, the price differs. On the other side, pricing should avoid the perception that this second modality is of lower quality, as this isn't the case.

Adriana Wong identifies a challenge related to the tools. Sometimes it becomes complex to manage different delivery modalities with systems that, although they have robust functionalities, have certain financial limitations.

The Total Cost of Ownership, TCO, corresponds to a comprehensive technological information valuation and other costs, across business boundaries over time. The measure designed by Gartner, the information technology research consulting firm in the late 1970s, includes hardware and software acquisition, management, and support, communications, end-user expenses and opportunity costs regarding downtime, training, and other productivity losses.

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Ownership costs provide a frame of reference for making different decision paths. Stipulating them guarantees the operation of the institution during its life cycle. There are various elements to consider, such as: personnel costs, hardware and software capital costs, maintenance and support, specialized consulting, supplies, travel, stationery, etc. It involves administration, technology, and infrastructural services.

Educational institutions must build a comprehensive financial strategy to ensure the viability and coherence of their performance and activities. The advantages of carrying it out may include establishing priorities and managing operations based on knowledge of the financial environment. Additionally, a financial strategy helps calculate the necessary future resources and assess the collaboration opportunities for new teaching-learning methodologies. Another relevant benefit is that it helps mitigate financial risks by reducing potential damages based on solid data.

Some of the good practices that Renato Ramírez proposes are: first, planning should involve considering all the effects that a decision causes. It's important to correctly understand the planning and management cycle, as quantification is the finance area's responsibility; however, it has to be accepted by an operational area that may not have the same knowledge.

Occasionally, planning may lack elements to be considered or may include some that will not be implemented, and there will also be areas where resources are underestimated whereas in others the opposite happens. However, one method is to place everything in a central fund, helping to mitigate the impact of those who are very optimistic and want to execute everything in the same year, and also those who tend to be very conservative and think they will run out of resources. Financial experts have to be there for these different areas and be able to gauge these kinds of situations.

For example, when an educational institution has multiple campuses, finances take on additional complexity. To make a cost allocation at that level implies that sometimes there won't be enough variables to make an estimate, and the best option is to have a central fund (pool). Finally, in this manner the fund can be executed.

Adriana Wong assures that the key for this process's success is the genuine involvement of decision-makers and their sponsors. Eventually, leadership teams, even if they have high aspirations, are required to set a limit to that fund. It's important to learn to prioritize and identify what is most desirable and what can be sacrificed, as many ideas can emerge. Having a decision-making team fully involved and aligned, with explicit guidelines as the project progresses, is an efficient way to avoid having endless discussions.

Renato Ramírez says that a satisfactory practice is to have a financial figure supporting the decision maker, by allowing the leader to feel empowered and not constrained, so that they take into consideration and understand the relevance of the proposed economic model. Within financial teams there are autonomous groups capable of acting as the decision makers' counterparts, which also contributes to work on proposals that make sense, turning the process into a virtuous cycle.

It's key for project leaders to be present not only during planning, but also in the implementation process. If something isn't working in this process, their responsibility is to warn and redirect, always accompanied and informed, Adriana Wong adds. She also mentions that another important aspect of the project's success is to count on clear KPIs (key performance indicators) in order to advance. Such indicators have to be quantitative to measure the process. The role of finance is central to enabling them and triggering alerts.

b. Importance of the Business Case

Adriana Wong asserts that it's crucial that the business case does not only include the building process, but also have forecasts reflecting where the resources will be coming from and the benefits obtained during the operational stage. A business should be solid, with premises that can really be achieved. In the case of a Digital Education project, the business case has to be able to support the required transformation with its own resources.

Another one of Wong's recommendations is to save up assets by establishing first the funds that correspond to these types of transformation processes. Normally, it's complicated for the design processes to be self-financing, so funds for these projects have to be prepared beforehand. When the moment arrives, these financial resources are assigned to a specific plan. The problem can arise when funds run out; and that's why the business case is so important, because this type of situations are already considered within the operation's short and medium-term financial plans, as to avoid inconveniences.

Likewise, Renato Ramírez provides guidance on sustainability and on the use of resources as an investment and not as an expense. This varies according to the nature of the chosen digital innovation, but can be divided in two ways: spending on the current educational model, in which the models pay for it and generates revenue; and doing something else that it is not the current model, but comes out of the same funds, with the expectation that there will be a return on that investment, thus making it sustainable.

Despite the volatility of current challenges, such as competition, economic instability and the declining enrollment rates, among others, a strategic plan helps institutions to fulfill their mission and vision. Regardless of the challenges, a clear budget structure drives a robust and entrenched decision-making framework, as the system supports several financial decision paths.

C. Case: Tecnológico de Monterrey

In Tecnológico de Monterrey the Digital Education component has been in charge of the institution's central vision, Renato Ramírez highlights. He also explains that there are initiatives that have been favorable for Tec's small-medium size campuses, because they have the possibility of attending a higher demand in their locality. One example is the gathering of groups of approximately 35 people distributed throughout the country to become regularized in the educational program. Digital Education, as the pandemic evidenced, facilitated teachers to achieve academic credentials they didn't have, in order to get the accreditation from the Southern Association of Colleges and Schools (SACS).

On another hand, Renato Ramírez describes that David Garza, Rector and Executive President of Tecnológico de Monterrey, alludes in his presentations that rather than debating whether university education should be delivered face-to-face or digitally, it should be anticipated that it will be multimodal.

"Tec de Monterrey's campuses will remain physical, but will be combined with online, hybrid, immersive, Metaverse modalities. However, we will no longer need those strange glasses that are worn today, but simple ones where anyone can see my hyper-realistic avatar, as I am seeing you now, without scrolling.[43]"

– David Garza, Rector and Executive President
of Tecnológico de Monterrey.

43 De la Fuente, D. (2023, September 4). El reto: ser una multiversidad. *El Norte.* https://www.elnorte.com/el-reto-ser-una-multiversidad/ar2669121

When planning for these projects, Renato Ramírez shared that there are changes that have echoed through time, and many of them haven't had numbers assigned to them because of the complexity of cost estimates; for instance, the cost of enrollment in the new model. The planning carried out for Tec21's educational model was created in advance; attention and efforts heavily focused on the academic area, where the radical change was to be made.

Many times the emergence and progress of new models happen in the context of past systems, and to continue, all the details contributing to their viability and long life must be reviewed. Planning financial aspects, even if such planning is not as accurate, due to the new models' novelty, provides an outline for making important decisions and dealing with unforeseen events.

8. Educational Technologies

Technology applied in education has been defined by the incorporation of new tools that support learning and optimize teaching processes. The field of educational technology has been growing significantly through recent years since the appearance of the newest technological advances; however, this is an approach that has been around for a longer time.

a. History of EdTechs

Educational technology, also known as EdTech corresponds to those tools or resources used in a given sector,[44] in this case, the educational one. In general, they tend to be associated with digital instruments or the Internet, however, this is a growing field. There are those who affirm that the incorporation of ringing bells to indicate an important time at school is an educational technology,[45] as well as pencils or the arrival of blackboards.[46]

Some stories date back to 1998 with "Wikis", web pages that can be edited by anyone, converting the Internet into a collaborative tool.[47] Later, e-learning arrived (1999), with electronic learning programs that laid the foundations for the approaches of the next decade.[48] Then we had:[49] learning objects (2000), e-learning standards (2001), Open Educational Resources (OER) (2002), blogs (2003), Learning Management Systems (LMS) (2004), videos (2005), Web 2.0 (2006), virtual worlds (2007), e-portfolios (2008), Twitter, and other social networks (2009).

In 2010, connectivity arrived in education to pave the way for massive open online courses (MOOC), after the emergence of Personal Learning Environments (PLE) (2011), MOOCs (2012), open textbooks (2013), learning analytics (2014), digital badges (2015), the return of Artificial Intelligence (IA) (2016), Blockchain (2017), and Virtual and Augmented Reality (VR/AR) (2018).[50]

After the pandemic, by contemplating the landscape and influ-

44   Delgado, P. (2019). What Is EdTech: its Definition and Impact through the Years. *Observatory IFE.* https://observatory.tec.mx/edu-news/what-is-edtech-its-definition-and-impact-through-the-years/

45   Watters, A. (2022). The History of the School Bell. *Hack Education.* https://hackeducation.com/2022/01/30/bell

46   Hollenbach, K. (n.d.). Educational Technology Through The Years. https://www.sutori.com/en/story/educational-technology-through-the-years--8om1eLgfS5rVceffJ4RFqSxK

47   Weller, M. (2018). Twenty Years of Edtech. *EDUCAUSE Review* 53, 4. https://er.educause.edu/articles/2018/7/twenty-years-of-edtech
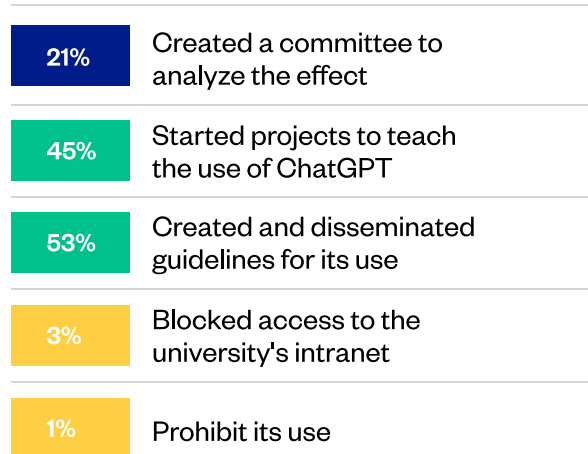
48   Ibidem.

49   Ibidem.

50   Ibidem.

ence of generative artificial intelligence like ChatGPT, diverse hypotheses have been established regarding the trends that will mark the future in the educational technology field. There is a more frequent adoption of hybrid modalities or blended learning, the incorporation of micro-learning with short capsules of educational content, as well as the use of instruments and platforms that guide the development of skills in students and trainees throughout life.[51]

Universities' Response or Reaction to ChatGPT's Arrival to the Academic Context

N= 86

21%	Created a committee to analyze the effect
45%	Started projects to teach the use of ChatGPT
53%	Created and disseminated guidelines for its use
3%	Blocked access to the university's intranet
1%	Prohibit its use

Facing generative artificial intelligence technologies, particularly illustrated by ChatGPT which at the time was a milestone for this type of tools, universities had to react quickly to its academic use. REALCUP's results demonstrated that most of the institutions embraced this technology through the dissemination of guidelines for its use, and initiated projects on their usage, compared to 4% who restricted access to them.

The history of EdTechs dates back to the earliest methodologies for delivering education, but as ad-

51   Ramírez, J. (2023). The Future of EdTech: Key Trends Shaping the Landscape in 2023 and Beyond. *EdTech Digest*. https://www.edtechdigest.com/2023/09/26/the-future-of-edtech-key-trends-shaping-the-landscape-in-2023-and-beyond/

vances kept coming at an accelerated pace and various resources were established, it's necessary to receive with open arms these new tools with a view to ponder upon and rethink their purpose to promote learning in students.

b. Educational Technologies in Digital Education

Before establishing the desired educational technologies inside the classroom, it's important to define the purpose of adding certain resources. If there is a clear objective regarding what to improve or what wants to be achieved with a certain tool, it's much easier to identify the most appropriate technology to optimize learning.

Bertha Saldívar, Director of Technologies for Education of Tecnológico de Monterrey, reveals that it's also important to establish the most optimal moment for the inclusion of educational technology within the curricula.

For teachers, these instruments contribute to the detection of patterns among the students requiring reinforcement, verifying their current knowledge or level, or verifying at which stage they are, as well as their comprehension of the content in order to adapt teaching techniques. But they should also bring light on the impact of these technologies and explain their purpose to students.

The master in Information Systems Management also mentions that, on many occasions, there is no assessment of a technology's implementation outcome or which tool facilitated the course's content. It's essential to establish what is more effective, both for teachers and students.

■ I. Strategic Planning

Participating in the design of academic programs gives the possibility of suggesting what is the best technology to put into practice. The area in charge of the educational technology context must be immersed in this process, since this team is familiarized with teachers' environment and what is feasible for them.

Bertha Saldívar shares that technology must be thought along with the conception of the educational model and grow along with that design. This way, it's possible to perceive what tool has to be implemented in prominent moments of the model. A measure is to review with each school the disciplinary technologies, with the goal of establishing applications that will strengthen the lessons in each one of the teaching units of the educational institution, with their respective specifications.

Likewise, it's advisable not to think specifically on which learning management system to use, without first verifying the educational model's pillars. On this basis, the best means of operation can be selected. For example, if one of the pillars is flexibility, then a Learning Management System that connects strongly with other technologies is required, making it the ideal option. The idea is to translate concepts into technical functionalities , which is what is universities are looking for in a platform. This can be achieved by having all the information needed to design the ecosystem.

Another factor to examine is the experience of the main actors within the classroom: teachers and students. Listening to their daily experiences and being aware of their needs will help provide them with the required support and training in order for them to correctly carry out their teaching-learning processes.

Active listening aids on the detection of the ideal moment or the need to include technology. Once it's known what has to be optimized, it's necessary to issue a rubric; thus, the basic functionalities to be covered by the tool can be listed. The evaluation process is similar to a funnel analysis, where based on the availability of certain tools in the market, and assessing their maturity, it is possible to select those that comply with what a university considers as essential. Later, the team in charge acts as a user and tests products' usability.

Another way of ensuring that technology meets the stated purposes

includes carrying out an evaluation of the available technologies in the market and, subsequently, implement a pilot. This method serves as to not use technologies in vain. When counting with the authorization to conduct a pilot, there is a commitment to analyze the feasibility of using them at a general level by the institution and, therefore, their cost can also be calculated in advance through the business case.

The pilot tests must be governed by priorities according to the existing needs, in order to take care of the audience and generate a controlled environment, where both teachers and students receive constant support. The functional area in charge learns the steps required to carry out the implementation and considers a stage of change management. In this manner, there is also an adoption stage and training to explain teachers how to use this resource. Likewise, it's essential to ensure that there is operational support for all users.

Even if there are free technologies that are robust and useful, it's fundamental to be mindful of the ranking they're categorized in, get to know them in detail and examine whether personal data is being given out when using them. In addition, consideration should be given to the possibility of these tools ceasing to be free of charge and the clauses ought to be constantly reviewed, as learning continuity shouldn't be affected.

As previously mentioned, connectivity is a valuable element; therefore, it's critical to assess in advance what type of connectivity is required by educational technology tools. A clear example is presented by Bertha Saldívar at Tecnológico de Monterrey, where in order to use Zoom it's key to measure how much bandwidth is required, as well as where and how students will take the course, as to decide how to provide the optimal conditions to execute it correctly. Institutions must be aware that many people have more than two devices connected to the same network. Thus, connectivity and the necessities of Digital Education must be considered in the business case.

Another recommendation is to have a specialized area in technologies for education, preferably divided into a team dedicated to designing solutions for educational models and another group that deals with emerging technologies. An enriching practice is to have a person responsible for looking into future trends, connected with other sources of information such as forums or virtual communities that can help envision different scenarios in a clearer way. An added benefit is to create inter-institutional collaborations and look up for guidance from other experts.

■ II. Technological Literacy

Teachers have a profound impact on students. Therefore, lessons on digital culture are also part of their responsibility as instructors. In some teaching units, topics of cybersecurity and information protection are included. However, for this to happen, assertive digital skills must be strengthened in both teachers and students.

Institutions must also ensure the protection of teaching-learning data. Bertha Saldívar states that there should be a control panel prioritizing the protection of this

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information. She also adds that many decisions can be made in relation to databases, which is indispensable to ensure transformation. Institutions can collect interconnecting information, such as preferences or consumption patterns that help grant an enhanced learning experience. In addition, this resource serves to customize teaching to students' different needs, facilitating the improvement of academic performance and learning enjoyment.

Another important factor to be acknowledged when discussing educational technology resources available in the classroom, is artificial intelligence (AI), which can be incorporated in different ways. AI systems can support automatic grading, provide prompt and relevant feedback, as well as evaluate competencies and skills in a determined field of work.

Furthermore, these instruments optimize the use of resources offered by educational institutions in areas such as facilities, group size, scheduling, multimedia sharing and tools among differ-

ent campuses, etc. AI provides a more accurate understanding of students and graduates by identifying their needs; allowing institutions to provide the corresponding support at an individual or group level.

Nowadays, artificial intelligence helps accelerating the process of identifying the skills required by industries and businesses, with the purpose of closing gaps between the available university programs and the jobs required by the market. Consequently, their curricula is transformed and adapted to provide their students with the necessary skills. In general, when used correctly as an enabler, AI can provide the flexibility and agility required for educational institutions and their members to remain relevant in an ever-changing environment.

Case: Tecnológico de Monterrey

Currently, Tecnológico de Monterrey has an ecosystem of educational technologies supporting their professional model. Since the birth of Tec21, which is based on competencies to solve present and future challenges, the entire ecosystem has been prospected, but has not been implemented by phases. First, Tec started with the most urgent and elementary area: the content part, the learning platform, and assessment of skills. The rest of the components were added later on.

This model involves active participation in its design. It visualized the educational technologies that were needed, its basic pillars and the heart of Tec21 Model. The foundations included content, evaluation, and feedback; and so they served as a basis to determine the disciplinary technologies required by each school.

The most difficult component has been the analysis required to customize learning. This challenge has been present since the beginning of Tec's vision, so technology has been properly connected within the ecosystem, in order to obtain data for different purposes. In the case of educational research, it's a matter of understanding how to personalize teachers' training paths and the student's learning route, which is advancing, and wouldn't been possible if the complete plan had not been designed from the beginning.

Teachers have a comprehensive backup. They receive tips and suggestions to adapt technology to their needs and also get operational support at each campus. As basic support, there is a bot that replies from a list of questions. Furthermore, they count with support from Tec Services and the Center for Teachers' Development and Educational Innovation (in Spanish Centro de Desarrollo Docente e Innovación Educativa, CEDDIE), where a group of people from the IT area or the Vice-Presidency of Digital Transformation area, provide backup to the ecosystem of educational technologies.

Teachers are specialists in their own disciplines, so they also require training and support in the adoption of the new technologies that are to be implemented. The university has resorted to different resources such as Edutools Tec, an institutional platform that offers a space that promotes the participation of teachers by sharing educational technologies that make resources available to the rest of their peers. This instrument has a catalogue of assessed technology tools, the visualization of each school's software portfolio and the direct experiences of teachers when using different applications.

Therefore, educational technologies implemented with a defined purpose and aligned to the educational model's pillars are useful, enriching resources for students and teachers. While serving as solutions that optimize certain processes and dissolve distance limits, they also improve the learning experience of students under different circumstances. Thus, assigning specific people to look after the students' needs and the effective implementation with a long-term perspective becomes a crucial aspect.

9. Organizational Culture and Target Audience Education

Communication inside an organization is key for the development and dissemination of the processes that different areas execute. It allows its members' efficient evolution and performance of their respective roles. However, there are internal and external audiences within the institution who should be included when designing strategies that can transform the university's culture.

a. Educating our Audiences

Many simple modifications and good practices exist that, together with technology implementations, add value to a program; asserts Norma Lara, Director of Dissemination and Content in Educational Innovation and Digital Learning at Tecnológico de Monterrey. From the pedagogical conceptualization, initial solutions can be developed. The key is to ask questions, starting from the vision; what do we want to change with the support of Digital Education?

Once the actions are defined, it's very important to share the institution's mission and vision, to have an organic deployment of these messages. The strategies should be communicated by transparently transmitting what is being done; why, for what purpose, and to whom the information is directed.

Norma Lara details that each university should determine their goals according to the modality they offer or based on the modification or innovation they are expecting to implement. From

this starting point, organizational changes can be prepared.

As to disseminate these variations, it's necessary to define the effects that are implied and what will be modified in the university's culture that will have a direct impact on people. At the same time, it's essential to mobilize top management and leaders, since everything starts with them. Establishing a wide-range management plan allows, on one side, to determine communication strategies and key messages to be transmitted and, on the other side, to continuously reinforce and share the benefits that the modifications to the educational model will bring.

Institutional communication should be perceived as a process, not only as an event.[52] A communication plan includes key messages announcing the requirements of the adjustments to be made. These are varied, and involve efforts that must contain a structure, in such a way that everyone inside the organization can understand why;

52 Prosci. (n.d.). Cinco recomendaciones para una mejor comunicación sobre el cambio. https://www.prosci.com/es/blog/5-recomendaciones-para-comunicar-mejor-sobre-el-cambio-0

so that later detailed descriptions of the solutions and technical aspects of the alterations can be issued. Different types of media are required to repeat and reinforce key communication throughout the campaign or project.

According to REALCUP's survey, most of the participating educational institutions said that they use social media, e-mail, and web

pages as communication channels with students, teachers, and the university community. Another way they share relevant information is through phone contact and instant messaging apps (WhatsApp, Telegram, Messenger, among others).

Information must be reaffirmed since message recipients may not actively listen or deeply understand and be concerned about their personal implications. It's advisable to communicate several times throughout the day, from five to seven messages,[53] with the purpose of developing the desired understanding.

With the purpose of transmitting important messages between members of an educational institution, different audiences should be identified. There are several actors in this field who will become target audiences to whom the essential information will be communicated. Norma Lara says that it's necessary to take into account that none of these initiatives could be deployed without teachers' involvement.

Channels to Establish a Digital Communication with Students, Teachers and University Community.

N= 116

	Students	Teachers	Community
Social media	83%	62%	80%
E-mail	79%	91%	57%
Instant messaging apps (WhatsApp, Telegram, Messenger, etc.)	71%	64%	47%
Blogs	38%	35%	37%
Discussion forums	57%	52%	22%
Web pages	79%	75%	84%
Videos in YouTube channels	65%	59%	59%
Phone contact	73%	70%	53%

53 Ibidem.

The main target audiences are teachers and students because, at the end, they are the main parties that will be impacted by the changes or the information received. Teachers need such data for their work, and therefore there are fundamental agents that accompany them as first contacts during this process. Likewise, parents play a crucial role as target audience or as key allies.

Some of the other secondary roles, but not less important, are training partners, who participate in the definition of certain projects with the students and employers' support. Graduates also have the task of keeping stakeholders well informed, particularly in teaching-learning topics. Other audiences that assist the institution and the schools within, are leaders, directors of departments, deans, as well as associated deans and deans from other universities.

Change can be difficult for the university community, not only out of ignorance, but also out of habit.

If the goal, path, and vision of the dream to be achieved are understandable and explicit, resistance to implement said changes can be reduced.

Norma Lara assures that key messages must be adapted to the needs of target audiences. Informing just for the sake of doing so or saturating with information are not always the best strategies. As these changes are made, it's necessary to prioritize the nature of the innovations to be implemented, which could be related to the organization, processes, the culture of the roles themselves, and their reach. They can cover aspects as simple as access to library materials, however, the users' environment should be understood based on a deep analysis of their behaviors in terms of preferences, their learning styles and digital capacities they have or should have.

b. Organizational Change

According to Norma Lara, the most agile steps to start the change within educational institutions are:

1

Establish a framework for the main actions to be carried out and the key messages to be transmitted to different audiences.

2

Identify and communicate the modification factors; it's of most importance to prepare people for these changes, leading them into a stage of awareness. The aim is to inform and bring visibility into the direction of the institutional culture and, at the same time, create expectations as to what is to be achieved. Occasionally teachers can be resistant to change, although most of them recognize that the generation of students they serve isn't the same as five or ten years ago, since they have different native competencies.

3

Define the main audiences and pioneer groups that will trigger and multiply the changes by adopting them. In this stage it's essential to get closer to these people and listen to them, even generating other options to stimulate the cultural change.

4

When determining the actions required to achieve this change, there must be motivation and empowerment to transform different schemes, in addition to providing support for such change, with enablers promoting the deployment of new initiatives. Like this, a perfect scenario for incentivizing a spirit of support for the organization will be created. For example, faculty may be granted recognition or compensation in academic vitality, while students may be shown access to better platforms or more effective assessment tools.

A complication that may arise when promoting change is that people, far from experiencing the need for updating, can feel forced to apply new technologies. As human beings, there is always the fear of technology replacing people's daily work. However, channeling the messages correctly and showing the potential for innovation as an ally will foster a paradigm shift related to resilience.

It's indispensable to be agile and firm in terms of cultural change and communication. With Digital Education issues, progress can be relative to specific cases. There are teachers who manage virtual and augmented reality, while for others it's an achievement to look at the camera while giving classes. Regardless of the situation, timely communication facilitates progress.

C. Case: Pontificia Universidad Católica del Perú (PUCP)

Regarding education, it is important to say that the pandemic brought a great lesson. As an institution, PUCP was able to massively implement virtualization strategies that hadn't been possible to test due to some teachers' reluctance. The pandemic, by itself, helped to eliminate prejudices surrounding Digital Education; in particular the idea that virtual careers lacked quality. Therefore, once the pandemic was over, new audiences and disciplines that had not been considered before were included.

Claudia Zapata, head of the Academic Affairs Department of the Pontificia Universidad Católica del Perú (PUCP), says that the institution has years of experience in digitizing different programs, but the pandemic managed to push digitization even further. DE has permitted PUCP to expand their postgraduate programs, leading to the virtualization of many courses; which tend to be more complicated in bachelors' programs, due to the level of professionalization required by undergraduate modules.

This approach leads to openness, not only with universities of the same country, but also with different regions as well as the world, given to the fact that the offering expands. It also promotes a more sustainable global environment by addressing some of the problems in big cities, such as traffic and pollution caused by massive displacement. Additionally, the topic of well-being and time mismanagement is added, avoiding unnecessary displacements that can also be harmful for mental health.

One of the main problems of including Digital Education in the educational model of the university is teachers' training, which reflects a palpable inequality. On the other hand, the regulations that exist in Peru are very strict, emphasizing on-site programs (maximum 20% virtual), blended (30 to 70% virtual), or virtual (maximum 20% on-site), which limits the way in which the courses are offered, as well as students' freedom to choose their own schedules. In addition to these problems, there is the issue of technology and equipment.

The importance of establishing the mission and vision of the university lies in the fact that it marks the way in which actions can be directed towards the achievement of the university's goals. Thus, everything that is carried out within the university must be aligned with the pursued objectives. If there isn't a common mission, it's difficult to advance as a community, including the university's educational model. These three points must guide the institution's direction, although it isn't enough to specify the mission and vision: they must be defined and conveyed.

Regarding the transmission of information, it isn't enough to post it on a website, print it out, or send send it through e-mail; it is also necessary to invite the community to take part on these efforts. The university community must participate and build the path towards the mission and vision. An effective communication should never be unidirectional; both positive and negative comments of the people who are part of the institution should be respected, and the spaces for the interaction required to form the idea of community must be valued in order to jointly build the key messages that consolidate the organizational culture.

As an important step, it should be considered who the target audience is and, above all, acknowledge that the amount of information to be communicated can't be the same as 10 or 20 years ago. Currently, regardless of age, the issue of immediacy and speed have changed the amount of information that people are willing to receive. It becomes essential to learn how to administer information and to examine by which means it's more convenient to send informative messages.

Nowadays, PUCP tries to make use of digital tools to reach new audiences at an international level. Peru's geography makes it difficult for people to move around, so getting closer to provinces has always been a complicated issue; nevertheless, Digital Education and the virtual world have helped to amplify the country's education access and as well as its decentralization, even if it's just by a small amount.

One way to prepare the university's audience for the integration to Digital Education, is precisely establishing the way in which educational programs are carried out, as well as communicating the manner in which the quality of education is ensured; something that isn't a complicated issue for PUCP, since it is positioned as one Peru's best universities.

On another side, Claudia Zapata highlights Digital Education's role as a research enabler within the institution, due to a more favorable access to education, together with the enhanced communication among different researchers around the world. Likewise, she says that accreditation mechanisms help ensure a program's quality, as well as continuous improvement and consistency with the level of education that the institution offers.

Identifying institutions' target audiences and providing pertinent changes and updates, according to their profiles and particular needs, can mobilize these transformation processes in a productive way. A change management plan has to be devised hand-in-hand with triggering communication actions that take care of the essence and structure of the key messages that will lead to this transformation.

Vision Towards the Future

The future of education has been outlined in recent years with different approaches that institutions have set in motion, paying attention to certain scopes. One example has been the solutions or activities based on developing emotional and social intelligence; learning to support the resolution of global issues and the development of competencies for the labor market.[54] Likewise, universities have been urged to see the importance of the teacher's role as an agent of change in education, requiring consistent update of their knowledge in order to succeed.

In a constant reinvention environment, it's important to identify obstacles and future outlooks, because it's necessary to con-template them to deliver learning through Digital Education.

The advantages are many, either by making use of AI to personalize learning or by improving a faculty's performance; however, there are also certain risks related to teachers' competencies, changes in the evaluation processes, as well as work overload and the impossibility of disconnection. Thereof, it becomes urgent to create changes in teachers' education by promoting mutual collaboration. Educational institutions are responsible of providing the ultimate conditions that lead to an adequate performance of the teaching and learning process.[55]

"But in a knowledge economy where AI is now more powerful than we are, then we got to rethink what matters."

– Paul LeBlanc, President of Southern New Hampshire University (SNHU).

54   Fundación Telefónica. (2022). Las siete claves de la educación (digital) del futuro. https://www.fundaciontelefonica.com/noticias/siete-claves-para-repensar-el-futuro-de-la-educacion/
55   Frolova, E. V., Rogach, O. V. & Ryabova, T. M. (2020). Digitalization of Education in Modern Scientific Discourse: New Trends and Risks Analysis. *European Journal of Contemporary Education*, 9(2), 313-336. https://doi.org/10.13187/ejced.2020.2.313

Some universities include centers or counselor support for wellness, viewing it as a secondary issue. Paul LeBlanc also mentions that, in a world of AI where knowledge isn't what's most important, it's essential to recognize that the ontological issues of self, wellbeing and community are crucial. They shouldn't be separated into primary and secondary elements, but must be set side by side, as inte-grated parts of a whole.

In the presence of these and new resources, the prevailing challenges are very similar. The aim is still to enable teachers, students, and collaborators to be more productive and optimize their operational tasks, dedicating more time to what is substantial. It is also important to keep working in order to combat the ethical risks of AI and to prevent frauds in the evaluation process. As mentioned before, it's essential to understand the usefulness of artificial intelligence in various situations of graduates' professional lives.

Likewise, with the rise of generative artificial intelligence influencing a broad range of fields, it will be imperative to maintain a focus on Neuromorphic Computing.[56] This concept is strengthened by the design of hardware and software models that emulate the human brain, both for the purpose of creating cognition machines as well as for the acquisition of information, just like a brain does.

"I think this is where AI is really powerful for us because we can actually deepen humanity if we get it right."

– Paul LeBlanc, President of Southern New Hampshire University (SNHU).

Educational institutions willing to evolve and innovate in the future, need to reflect and contemplate all scenarios, including other disciplines, that affect the education and knowledge industries. Having their purposes clearly defined would provide a consolidated path. However, in order to make modifications within a world with changing needs, flexibility will make them resilient and exemplary.

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56   Escuela Internacional Online de Neurociencia Empresarial. (n.d.). Computación Neuromórfica, imitando al cerebro. https://www.escoeuniversitas.com/computacion-neuromorfica-imitando-al-cerebro/

Conclusion

Nowadays, the line between day-to-day activities and digitization is becoming increasingly blurred, and it's even disappearing. Paul LeBlanc sustains that it is becoming more common not to make distinctions between carrying out an activity physically, and performing the same activity digitally, because digitization has been normalized nowadays: now we are always connected.

Newer generations don't buy online or through applications, now they just buy. Journalism is not called digital journalism, but it encompasses a series of activities that weren't previously done, such as creating podcasts, editing videos, or publishing on social media. The same applies to education, where, as time goes by, technologies have been gradually incorporated to such an extent that the younger generational cohorts are naturally used to them.

While much of our lives has been compressed into a single device, which may be comfortable and convenient for many, now it's the time to rethink the proper integration of such technologies into our lives to enrich them. There are activities that digitization won't be able to replace, so it's essential to give a well-defined purpose to the technological tools that we include into the educational environment and be aware of not neglecting the areas that require human attention.

"People often think about scaling as something you do through technology. And what you try to do is kind of minimize the amount of humans, right?, because humans are expensive, they're messy, they're hard to scale, they can only do so much work, etc. We flip that approach, and we say, what are the most important human interactions? Let's hold that ground sacred. We're not automating or applying technology to the most important human interactions, but then let's automate and use technology to scale the hell out of everything else. So everyone here has to learn the technology tools."

– Paul LeBlanc, President of Southern New Hampshire University (SNHU).

It isn't enough to have the latest technology to become the best university. You can never replace the support, empathy, guidance, and warmth of a human being, so prioritizing technologies won't make everything else run smoothly.

The institutional community must walk hand in hand with educational digi-tization in order to reach its established objectives, both academic and hu-man, and thus moving forward towards an outstanding future, where grad-uates can distinguish the separation that exists between their unique skills and the benefits and facilities stemming from the use of new technologies.

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