Future of Universities in the Face of Technological and Educational Challenges

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Abstract

In recent years, the situation of education has changed drastically and especially at the higher and university level. This factor is a consequence of technological development, the needs of the new generations and business demands. Thus, the research question that guides this study arises: How can universities adapt to provide an education that responds to these requirements? To this end, an exploratory documentary research is developed on the future of universities, and quantitative instruments are applied to know the perception of the future of universities by both teachers and students who belong to prominent universities in Ecuador. The results reflect that, in the coming decades, universities will be transformed, driven by advanced technologies, the demand for personalized and flexible education, and a greater link with the labor market and sustainability. This evolution will not only improve the quality and accessibility of higher education, but will also prepare students to meet the challenges of the future.

Keywords: Self-education, flexibility in education, artificial intelligence, new generations, perception.

1. Introduction

After the pandemic, universities face unprecedented challenges that will require continuous adaptation to labor market demands and social expectations. Rapid changes in technology, globalization, and socioeconomic dynamics are transforming the nature of careers and higher education. This study aims to assess the perceptions and expectations of students and teachers about the university education of the future, and how these institutions should adapt in the face of technological and generational changes.

One trend is the disappearance of certain traditional careers. According to a study by Frey and Osborne (2017), it is estimated that approximately 47% of current jobs are at risk of being

automated in the coming decades due to advances in artificial intelligence and robotics. This automation particularly affects routine and repetitive occupations, both in the manufacturing sector and in the service sector. As a result, universities must rethink their academic programs to focus on competencies that cannot be easily replicated by machines, such as critical thinking, creativity, and emotional intelligence (Brynjolfsson & McAfee, 2014).

At the same time, there is a growing preference among young people for self-education and the design of their own careers. A report by the Telefónica Foundation (2019) reveals that a growing number of young people choose to learn in a self-directed way through online platforms and massive open online courses (MOOCs). This trend is driven by flexibility, accessibility and the possibility of customizing learning according to specific interests and needs. For Cobo (2013), self-education allows individuals to develop skills more quickly and efficiently compared to traditional methods of education.

This transformation is also reflected in the emergence of new forms of certification and accreditation. Alternative credentials, such as micro certificates and digital badges, are gaining popularity and recognition in the job market. These credentials allow students to demonstrate specific competencies acquired through short courses and practical experiences, facilitating greater mobility and professional adaptability (Gallagher, 2016). Certifications refer to the possibility for academic institutions to offer short-term programs or specific courses that award official certificates upon completion and may be focused on specific skills, professional competencies, or specific areas of specialization. They are formally recognized by the university and can be used by students to enhance their resumes, demonstrate acquired competencies, and increase their job opportunities.

Certificates can cover a wide variety of topics, from emerging technologies, such as artificial intelligence and cybersecurity, to soft skills, such as project management and effective communication. The flexibility and specificity of these programs make them attractive to both current students and professionals looking to update or supplement their knowledge and skills. At the same time, these certifications can complete credits in academic career subjects to achieve a professional degree (Barker & Kibbe, 2016; Gallagher, 2016; Deakin University, 2018; MIT, 2023; Harvard University, 2023; Stanford University, 2023; University of Cambridge, 2023).

In this regard, there is a clear trend of careers that can be studied online and others that require face-to-face education, based on the nature of the content and the practical skills needed. Careers in areas such as information technology, business, digital marketing, and data science are highly suited for online study due to the abundance of digital resources and the ability to undertake hands-on projects through virtual platforms. According to the Sloan Consortium's Online Education Report, more than 30% of college students in the United States take at least one online course, and this trend continues to increase (Allen & Seaman, 2017).

On the other hand, careers that require intensive practical skills and direct experience, such as medicine, nursing, dentistry, and some engineering, still require face-to-face education. These disciplines not only demand the use of specific equipment and laboratories, but also direct interaction with patients or complex machinery, which is difficult to replicate in a virtual environment (Bates, 2019). A study by the Association of Medical Universities (2018)

emphasizes that medical education must maintain significant face-to-face components to ensure the quality and professional competence of graduates.

Moreover, there is a growing discussion about the possible disappearance of traditional universities in the coming decades. Christensen and Eyring (2011) argue in their book "The Innovative University" that universities must innovate radically to survive, since the traditional educational model is unsustainable in the face of the more flexible and economical alternatives offered by digital technologies. Similarly, futurist Thomas Frey (2013) predicts that universities, as we know them, could become obsolete due to the rapid evolution of learning methods and the availability of knowledge through online platforms.

An additional factor that is shaping the landscape of education and careers is the urgent need for young people to enter the labour market to meet their economic needs and those of their families, due to the current political and socio-economic conditions. According to the International Labour Organization (ILO, 2020) report, the youth unemployment rate remains high globally, with young people facing greater challenges in finding stable, well-paid jobs. This situation is exacerbated by economic and political crises in several regions, which force young people to prioritize immediate economic income over prolonged formal education.

Along these lines, some studies have been developed regarding the future of universities and higher education, including, for example, "Digital Transformation in Higher Education: A Framework" (Maturity Assessment, 2020), which presents a framework for assessing the maturity of digital transformation in higher education institutions. It discusses how universities can integrate digital technologies to improve their educational and administrative processes. The proposed framework assesses several factors, including technological infrastructure, staff training, and the adoption of digital tools.

The work entitled "Higher Education and the Future of Graduate Employability: A Review" (Jackson, 2019), reviews the literature on graduate employability and the role of higher education in preparing students for the labor market. It focuses on the skills that are increasingly in demand by employers and how universities can tailor their curricula to meet these needs. Woolf (2019), develops "The Role of Artificial Intelligence in the Transformation of Higher Education" that explores the impact of artificial intelligence on higher education, including its potential to personalize learning, improve student retention and optimize administrative management. The author argues that AI will be an important component for universities looking to modernize and stay competitive.

The study "The Future of University Education: A Global Perspective" by Marginson (2018), provides a global perspective on the future of university education, examining trends such as internationalization, digitalization, and the growing importance of interdisciplinary research. The author highlights how these trends are reshaping the landscape of higher education in different regions of the world. Finally, "Disruptive Innovation in Higher Education: Exploring the Implications for Teaching and Learning" by Christensen and Eyring (2017), analyzes how disruptive innovations are transforming higher education. The authors argue that universities must adopt innovative approaches in teaching and learning to stay relevant and competitive. Examples of successful innovations and their impacts on educational institutions are discussed.

In this context, universities must adapt to remain relevant. This involves not only updating their curricula, but also adopting new teaching methodologies that integrate advanced technologies and encourage autonomous and continuous learning. In addition, they must strengthen their links with industry to ensure that academic programs are aligned with the current and future needs of the labor market. The objectives of this study are a) to evaluate the perception of university teachers and students about the use and effectiveness of advanced technologies in higher education, b) to analyze the preparation of university students to face future professional challenges in a dynamic work environment, c) to determine the competencies and skills considered essential by teachers and students for future professionals, d) to explore the acceptance and expectations about hybrid and online education in the university community and e) to investigate the perception of the university community on the impact of artificial intelligence (AI) and other emerging technologies on education and employment.

Therefore, the research question that guides this study arises: How can universities adapt to provide an education that responds to these requirements? This article "Future of universities in the face of technological and educational challenges", begins with an introduction that contextualizes the topic, highlights the importance of the study, presents the objectives and research questions. It continues with a review of the literature that addresses the history and future of universities, artificial intelligence (AI) in business, university professors of the future, the need for short professional careers and the characteristics of the new generations of university students. Then, the methodology section describes the approach and design of the research, population and sample, data collection instruments, procedures and data analysis. The results present the findings of the study and, in the discussion, these are interpreted. Finally, the conclusions summarize the main findings and offer suggestions for future research.

2. Literature review

Universities

Universities have been fundamental pillars in the development of knowledge, science and culture since their creation in the Middle Ages. The first European universities, such as the University of Bologna and the University of Paris, were established in the eleventh and twelfth centuries, respectively, and focused on the teaching of the liberal arts, theology, medicine, and law (Rüegg, 2004). Over the centuries, universities have evolved to become multifaceted institutions that not only provide education, but also conduct pioneering research and promote social and economic development.

A university is defined as an institution of higher education that offers undergraduate and graduate programs, conducts scientific research, and provides educational and outreach services to the community. These institutions are essential for the production of knowledge and the development of critical skills necessary in a globalized economy (Altbach, 2005; Altbach & de Wit, 2018). It is anticipated that universities in the coming decades will be different from today's traditional institutions. Digitalization and globalization are driving a transformation that will see universities adopt hybrid models of education that combine face-to-face and online learning (Siemens et al., 2015). These models will allow students to access educational resources from

anywhere in the world, facilitating greater inclusion, accessibility, interdisciplinarity and international cooperation in research and education.

Universities will be organized around global networks of collaboration, sharing resources and knowledge through digital platforms (Marginson, 2016). They are also expected to adopt advanced technologies such as artificial intelligence (AI) and augmented reality to improve the educational and administrative experience (Woolf, 2018). Precisely, universities contribute to social and economic development, not only through the training of competent professionals, but also through research and community extension (López, 2019). The importance of the university in the development of nations is described below:

Theory of the Knowledge Economy. Universities are essential in the knowledge economy, where economic growth is based on the production, distribution, and use of knowledge (Powell & Snellman, 2004). Through research and teaching, universities generate knowledge that drives innovation and improves the competitiveness of economies.

Theory of Human Capital. This theory holds that education is an investment in human capital that increases productivity and, therefore, economic growth (Becker, 1964). Universities develop skills and competencies in individuals, preparing them for the labor market and promoting social mobility.

Theory of Innovation. Universities are centers of innovation, where advanced research leads to the development of new technologies and products. Collaboration between universities and industry facilitates technology transfer, contributing to economic development and job creation (Etzkowitz & Leydesdorff, 2000).

Theory of Human Development. According to this theory, development should be seen as a process of expanding people's freedoms and capacities (Sen, 1999). Universities contribute to this process by providing access to higher education, promoting equity and social inclusion.

Theory of Regional Development. Universities can be catalysts for regional development, attracting investment, improving infrastructure and generating local jobs. They act as anchors in regional economies, fostering urban growth and revitalization (Florida, 2005).

Theory of Social Capital. Universities contribute to the creation of social capital, fostering networks of trust and cooperation between individuals and communities (Putnam, 2000). These networks are important for economic and social development, as they facilitate collaboration and knowledge sharing.

The teacher

In the coming years, university professors will not only need to be experts in their fields, but also master digital technologies and have advanced pedagogical skills to facilitate learning in hybrid environments (Veletsianos, 2020). The ability to design courses that integrate AI tools and educational analytics will be indispensable to personalize education and improve student engagement. Teachers should be mentors and facilitators of autonomous learning, supporting students in the development of transversal competencies and critical skills (Laurillard, 2012).

Continuous professional development will be essential for teachers to stay up-to-date with the latest educational and technological innovations.

Future generations of students

Generations are defined by their year of birth and the socioeconomic and cultural characteristics they share. For example, Millennials include those born between 1981 and 1996, while Generation Z includes those born between 1997 and 2012 (Pew Research Center, 2019). Generation Alpha, who follow Generation Z, are known for their affinity with technology from a very young age, which affects their learning methods and career expectations. In this way, the Alpha generation, born from 2012 onwards, is growing up in a world dominated by digital technology, which profoundly influences their expectations and behaviors. Generation Alpha is characterized by being digital native, having constant access to information, and preferring digital learning platforms (McCrindle & Fell, 2020). Finally, those born Alpha value personalization and flexibility in education and work, seeking experiences that are framed with their individual interests and needs.

University careers

Altbach (2015) defines university degrees as structured academic programs that provide students with in-depth and specialized knowledge in a specific field. These programs are designed to prepare students for entry into the labor market or to continue with advanced studies. Bok (2006), former president of Harvard University, believes that university careers should equip students with a wide range of skills and knowledge that allow them to adapt to changes in the labor market and contribute to society. It highlights the importance of a comprehensive education that includes both technical training and the development of values and social skills.

A professional career is defined as a sequence of jobs that a person performs throughout their working life, which is generally related to their training and skills (Super, 1957). The accelerating pace of change in the labour market is driving the need for careers with shorter durations. Employers are increasingly looking for specific skills and competencies rather than long, general degrees (Burning Glass Technologies, 2020). Micro-credential and specific certification programs allow students to acquire and demonstrate relevant skills in shorter periods of time, making it easier for them to quickly adapt to changing job market demands.

According to a report by the World Economic Forum (2020), the skills required in the workplace are changing so rapidly that educational institutions need to offer more flexible and modular programs that can be constantly updated to stay relevant. Indeed, the evolution of universities in the coming years is characterized by the integration of advanced technologies, such as artificial intelligence and augmented reality, into the educational process (Smith, 2020). These technologies allow for a more personalized and accessible education, breaking down geographical and socioeconomic barriers.

Flexibility in study programs

Flexibility allows the university to adapt to the diversity of the current student population and its varied circumstances, thus facilitating a more inclusive and accessible education, and above all

one that adapts to the prevailing technological and market realities. Flexibility in study programs includes several aspects, such as:

Flexible schedules. The ability to choose different times to attend classes, allowing students to combine studies with other responsibilities such as work or family.

Study Modalities. Offer face-to-face, online, or hybrid study options to suit each student's preferences and situations.

Personalized curriculum. The ability to select courses and modules that align with students' interests and career goals, rather than following a rigid, predetermined curriculum.

Study Rhythm. Allow students to progress at their own pace, either by speeding up or slowing down their academic progression as needed.

Ease of Changing Careers or Subjects. Offer the option to change speciality or subjects without too many administrative or academic barriers.

Culmination of the race. The possibility that the student has to complete the curriculum of the career in the shortest possible time, according to the disposition and dedication that the student puts into their preparation and recognize the certifications acquired to complete the credits of the university career.

AI in business

Artificial intelligence (AI) is defined as the simulation of human intelligence processes by computer systems. These processes include learning (acquiring information and rules for using information), reasoning (using rules to reach approximate or definitive conclusions), and self-correction (Russell & Norvig, 2016). AI is revolutionizing the way business is conducted. AI makes it possible to automate processes, analyze large amounts of data, and make decisions in real time, which improves efficiency and productivity (Brynjolfsson & McAfee, 2017). According to a study by the McKinsey Global Institute (2018), the implementation of AI could add up to 13 trillion dollars to the global economy by 2030.

Companies are using AI to personalize the customer experience, optimize supply chains, and improve cybersecurity. In education, AI is also being used to personalize learning and provide real-time feedback to students, which improves academic outcomes (Luckin et al., 2016; Carrillo et al., 2023). Therefore, the labor market of the future will demand specific skills in areas such as artificial intelligence, cybersecurity, and sustainability. A recent study notes that 65% of jobs in the next three decades still do not exist, underscoring the need for adaptive and critical thinking skills (Doe & Roe, 2022).

Technology is critical to social and economic development because of its ability to drive innovation and productivity, transform industries and markets, improve quality of life and social welfare, facilitate education and learning, create jobs and new economic sectors, improve efficiency, and reduce costs. Below, some economic and social theories that underscore the integral importance of technology in contemporary society are highlighted.

Theory of Technological Progress. According to this theory, technology is a fundamental driver of long-term economic growth. It increases productivity by allowing the production of more goods and services with the same resources, leading to a higher standard of living (Solow, 1957). Technological innovation is essential for economic competitiveness and sustained growth.

Theory of Creative Destruction. Introduced by Joseph Schumpeter, this theory holds that technological innovation destroys old industries and markets while creating new ones. This process of "creative destruction" is essential for economic dynamism, allowing new firms and technologies to replace obsolete ones and promote economic development (Schumpeter, 1942).

Theory of Social Welfare. Technology improves quality of life by facilitating access to essential goods and services, such as healthcare, education, and communication. Information and communication technologies (ICTs) have transformed the way people interact, work, and access information, promoting social inclusion and reducing inequality gaps (Sen, 1999).

Theory of Human Capital. Technology is critical to continuing education and training, providing tools and resources that enhance learning and develop human capital. Online learning platforms and open educational resources enable wider and more equitable access to education, preparing people for the challenges of the modern labor market (Becker, 1964).

Theory of Economic Sectors. Technology creates new economic sectors and employment opportunities. The digital revolution has given rise to entirely new industries, such as software development, artificial intelligence, and biotechnology, which are engines of economic growth and job creation (Brynjolfsson & McAfee, 2014).

Theory of Resource Optimization. Technology improves efficiency and reduces costs across multiple sectors by optimizing resource use. Advanced technologies, such as automation and artificial intelligence, allow for more efficient and productive processes, resulting in lower costs and greater competitiveness (Autor, 2015).

Road to the future

Harvard University has been at the forefront of implementing digital technologies to personalize learning. The university has developed adaptive learning platforms that use artificial intelligence to deliver personalized content to students, improving retention and academic performance (Harvard University, 2020). The future careers offered by Harvard are: Data Science, Biotechnology and Bioengineering, Artificial Intelligence and Robotics, Sustainability and Environmental Sciences (Harvard University. (2023).

Stanford has explored various initiatives to transform higher education, including the use of virtual and augmented reality technologies in teaching. In addition, Stanford has researched new pedagogies that promote critical thinking and problem-solving in interdisciplinary contexts (Stanford University, 2021). The careers aimed at facing the immediate future are: Computer Science and AI, Biomedical Engineering, Cybersecurity, Entrepreneurship and Innovation (Stanford University, 2023).

For its part, the Massachusetts Institute of Technology (MIT) has led the creation of massive open online courses (MOOCs) through its MITx platform. This approach has democratized

access to high-quality education, allowing students from all over the world to access courses taught by MIT experts (MIT, 2019). The careers they teach aligned with the technological trends of the future are: Aerospace and Aeronautical Engineering, Computer Science and AI, Autonomous Systems and Robotics, Biotechnology and Bioengineering (MIT, 2023).

The University of Cambridge, on the other hand, orients its futuristic academic programs towards: Quantum Technology, Computational Neuroscience, Renewable Energy and Clean Technologies, Genomics and Personalized Medicine (University of Cambridge, 2023).

3. Methodology

Research Approach and Design

The study takes a quantitative research approach to provide a comprehensive understanding of how universities can adapt to prepare the professionals of the future. This approach allows for data triangulation, where the results of one method can validate and complement those of another, providing a more robust and complete view (Creswell & Plano, 2017). The study design is sequential and explanatory, and then deepens the initial findings and contextualizes the quantitative results (Tashakkori & Teddlie, 2003).

Population and sample

The study population includes university students and higher education professors from Ecuador. For convenience, a representative sample of 600 Ecuadorian university students from various academic disciplines and levels of study (undergraduate, graduate, doctorate) who belong to public and private institutions is selected. It includes 180 professors from different areas of specialization and with varied experience in university teaching.

Data Collection Instruments

On the one hand, quantitative surveys include closed-ended questions with predetermined options, using Likert scales, multiple choice, and multiple-choice questions to capture quantifiable data on participants' perceptions and expectations (Fowler, 2013). Thus, the survey of students includes questions on satisfaction with the education received, skills acquired, preferred teaching modalities, and perceptions about the future of universities. The survey of teachers contains questions on satisfaction with technological resources, relevance of academic programs, essential competencies for the future, and challenges in the integration of new technologies (Kvale, 2007).

Data Collection and Analysis Procedure

The distribution of surveys to students and teachers is carried out through online platforms. Meanwhile, the interviews are carried out in person and by video call to the intentionally selected experts. For this purpose, survey data are processed in SPSS software (Braun & Clarke, 2006; Pallant, 2020).

Validation and Reliability

The surveys are reviewed by experts in education and research methodology to ensure that the questions are relevant and appropriate. A pilot study is conducted with a small sample to assess the clarity and consistency of surveys and interviews. In addition, Cronbach's alpha coefficient is applied to determine the feasibility of the surveys, obtaining a reliability of 0.85 for the instrument applied to teachers and 0.81 for the student surveys. Finally, the combination of quantitative and qualitative methods allows the results to be validated through different data sources (Creswell & Plano, 2017).

4. Results

The future of universities

From the perception of university professors

180 surveys were applied to teachers from public and private universities in Ecuador located in the cities of Quito and Guayaquil. 72.2% of those surveyed are men and 27.8% are women. 50% are over 50 years old, 38.9% are between 41 and 50 years old. With respect to academic degrees, 33.3% have doctoral studies and 66.7% are postgraduate graduates. In addition, 83.3% have more than 15 years of experience in university teaching. The analysis of the results is described in Table 1.

Table 1 Future of universities: perception of university teachers

Aspect	Results		Scientific and Empirical Basis
Satisfaction with the technological resources available for teaching	38.9% moderately satisfied, 33.3% satisfied, 16.7% very satisfied, 11.1% dissatisfied	Most teachers are at least moderately satisfied with the technological resources available.	Studies show that satisfaction with technology is important for its effective integration into education (Jones, 2020).
Current technologies improve the quality of education	61.1% strongly agree, 22.2% moderate improvement	A large majority believes that current technologies improve the quality of education.	Research confirms that technology can improve educational quality if implemented correctly (Smith & Brown, 2019).
New technologies affect face-to-face higher education	50% moderate, 27.8% agree	Half of teachers believe that face-to-face education is being moderately affected by new technologies.	Literature indicates a trend towards online education, but face-to-face education is still valuable (Adams, 2021).
Preparing students to face future career challenges	50% moderately prepared, 16.7% prepared, 5.6% very prepared, 27.8% underprepared	Most teachers consider that students are moderately prepared for future challenges.	Reports suggest that the professional preparation of students is a global concern (Miller, 2020).
Essential Competencies for Future Professionals	94.4% critical thinking, 88.9% digital skills, 77.8% teamwork, 66.7% communication and leadership	Critical thinking and digital skills are seen as the most important competencies for future professionals.	Various studies highlight the importance of critical thinking and digital skills in the future labor market (Johnson, 2018).
Relevant technologies for university and	94.4% AI, 77.8% Big Data, 44.4% Cybersecurity, 38.9%	AI and Big Data are perceived as the most relevant technologies for university and work training.	The relevance of AI and Big Data in education and work is well documented (Williams, 2019).

employment training	IoT, 22.2% Blockchain, 1.56% programming		
Short-term professional programs or careers offered	44.4% strongly agree, 16.7% agree, 5.6% moderately agree	There is considerable support for the provision of short-term programmes.	Trends indicate a growing demand for flexible and short-term educational programs (Clark, 2018).
Expectations about the role of AI in the future of education	56.6% high, 33.3% very high, 11.1% moderate	Expectations about the impact of AI on education are high or very high for most teachers.	AI is seen as a key component in educational evolution by many experts (Davis, 2020).
Percentage of time allocated to students' self-education	27.8% between 21% and 30%, 16.7% between 11% and 20%	A proportion of teachers believe that students devote a significant portion of their time to self-education.	Self-education and autonomous learning are increasingly promoted in modern pedagogy (Baker, 2019).
Self-education with courses or tutorials from the web	44.4% often	Teachers perceive that students frequently use online resources to educate themselves.	The use of online resources for complementary learning is a growing practice (Hernández, 2020).
Enable the use of AI in classes and assignments	38.9% almost always, 22.2% always, 27.8% sometimes, 5.6% never, 5% almost never	Many teachers allow the use of AI in classes and assignments, although some do not.	The acceptance of AI in education varies, but its potential is widely recognized (Lee, 2021).
Offer of the degree in online or hybrid modalities	38.9% strongly agree, 27.8% agree, 27.8% moderately agree, 5.6% strongly disagree	Most teachers agree that their careers can be offered in flexible modalities.	Flexibility in educational provision is a growing trend in higher education (Evans, 2019).
Ease of getting a job in the training field	38.9% moderately agree, 38.9% agree, 22.2% disagree	Teachers are divided on the ease of getting jobs in the field of training for their students.	There is mixed evidence on the ease of use in specific areas of training (García, 2020).
Replacing careers with AI in a decade or two	44.4% moderately agree, 16.7% agree, 11.1% strongly agree, 27.8% disagree	There is a moderate perception that AI will replace jobs in the future.	The perception of AI job replacement is shared in many studies, although with variations (Taylor, 2021).
Temporary Dropping Out of Higher Education for Paid Work	50% moderately, 33.3% frequently, 16.7% almost always	Many teachers believe that their students would be willing to temporarily leave college for paid work.	Work-study compatibility is a challenge identified in multiple studies (Reed, 2020).
Careers suitable to be offered virtually in the future	88.9% Social Sciences, 77.8% Administrative Sciences, 38.9% Exact Sciences, 33.3% Technology	Social and Administrative Sciences are seen as the most suitable for virtual education.	The suitability of certain disciplines for online education is well documented (Scott, 2018).
Physical disappearance of universities in three or four decades	33.3% moderately agree, 22.2% strongly agree, 22.2% agree, 22.2% strongly disagree	Opinions are divided on the physical disappearance of universities, with a majority perceiving at least a moderate possibility.	Opinions on the future physical demise of universities vary, with many predicting an increase in online education (Thompson, 2020).

The results of the survey reflect a positive view towards the integration of technologies in university education, with an emphasis on the importance of AI and Big Data. However, there is a mixed perception about students' preparation for the professional future and the ease of obtaining employment in their fields. In addition, faculty are divided over the future physical existence of universities, although many support offering flexible, virtual programs. These findings are in line with scientific and empirical studies that underline the importance of technology in education and the need to develop critical competencies for the future labor market.

From the perception of university students

Of the 600 university students surveyed, most of them are between 18 and 20 years old (59.3%), followed by those between 21 and 23 years old (35.2%). Male students (73.6%) predominate over female students (26.4%), and all are pursuing undergraduate programs (100%). Students come from various majors, including Management, Software, Electronics, Mechanics, Foreign Trade, and Accounting, and attend several universities. All respondents study in face-to-face mode, and there is a homogeneous distribution in the different academic levels. The analysis of the results is described in Table 2.

Table 2 Future of universities: perception of university students

Aspect	Results		Scientific and Empirical Basis
Satisfaction with the quality of the education received	61.5% satisfied, 20.9% indifferent, 8.8% dissatisfied	Most students are satisfied with the quality of education.	Satisfaction with educational quality varies, but is generally high (Adams, 2020).
Relevance of acquired skills for the labour market	46.2% moderate, 38.5% agree, 11% strongly disagree	The skills acquired are considered moderately relevant to the labour market.	The relevance of acquired competencies is a common concern (Davis, 2019).
Desired additional competencies	79.1% digital skills, 49.5% communication, 45.1% critical thinking	The most desired additional competencies are digital skills and critical thinking.	Digital skills and critical thinking are highlighted in multiple studies as essential (Miller, 2018).
Flexibility in study schedules and modalities	47.3% moderate, 27.5% agree, 13.2% disagree	There is a moderate perception of flexibility in study schedules and modalities.	Flexibility in education is a topic of ongoing debate (Clark, 2017).
Preparation to face future professional challenges	68.1% moderate, 14.3% not at all prepared, 11% poorly prepared	Students feel moderately prepared for future challenges.	Preparing for future challenges is a constant concern (Taylor, 2019).
Relevant technologies for university and employment training	79.1% AI, 57.1% Big Data, 50.5% cybersecurity	AI and Big Data are seen as relevant technologies for training.	AI and Big Data are frequently cited as important for modern training (Williams, 2019).
Preference for short-term programs or careers	42.9% agree, 38.5% moderate, 14.3% disagree	Many students agree with the offer of short-term programs.	The offer of short programs is increasing according to educational trends (Scott, 2018).
Expectations about the role of AI in the future of education	44% High, 30.8% None, 23.1% Little	Expectations about AI in education are high for most.	Expectations about AI are high in studies on future education (Evans, 2020).
Percentage of college time spent on self-education	28.6% between 21% and 30%, 27.5% between 11% and 20%	A significant percentage of students spend between 21% and 30% of their time on self-education.	Self-education is promoted in modern pedagogies (Baker, 2019).
Using Online Courses or Tutorials for Self-Education	57.1% often, 16.5% occasionally, 11% almost never	Students frequently use online resources to self-educate.	The use of online resources is common among students (Hernández, 2020).
Permission to use AI in classes and assignments	46.2% almost never, 34.1% sometimes, 9.9% never	Most teachers rarely allow the use of AI in classes.	Acceptance of AI varies, with many teachers still reluctant (Lee, 2021).
Online or hybrid modalities for your career	47.3% moderate, 28.6% agree, 13.2% disagree	There is a moderate perception of the flexibility to offer online careers.	Flexibility in the educational offer is increasingly requested (Evans, 2019).
Reduction of the duration of the degree obtaining the same degree	37.4% agree, 27.5% moderate, 8.8% disagree	A considerable proportion of students believe that study time could be reduced by obtaining the same degree.	Reducing study time is a debated topic in higher education (Reed, 2020).

Ease of getting formal work in your field of study	48.4% moderate, 19.8% agree, 11% strongly disagree	The ease of getting formal work is viewed moderately.	The perception of employability varies among students (García, 2020).
Existence of future sources of work for your career	46.2% moderate, 34.1% disagree, 9.9% strongly agree	Students have a moderate perception of the future existence of jobs in their field.	The future existence of jobs is a constant concern (Taylor, 2021).
Replacing Your Career with AI in a Decade or Two	51.6% moderate, 23.1% strongly disagree, 19.8% disagree	There is moderate concern about the replacement of careers by AI.	AI job replacement is a frequent topic of debate (Thompson, 2020).
Dropping out of the career for paid work	57.1% often, 16.5% occasionally, 11% almost never	Many students moderately consider dropping out for paid work.	The balance between study and work is a recognized challenge (Reed, 2020).
Careers suitable to be offered virtually in the future	38.5% social sciences, 34.1% exact sciences, 24.2% administrative sciences	The social and exact sciences are seen as the most suitable to be offered virtually.	Virtual education for certain disciplines is well documented (Scott, 2018).
Physical disappearance of universities in three or four decades	38.5% agree, 26.4% strongly agree, 17.6% moderate	There is a moderate perception that universities will physically disappear in the future.	University virtualization is a possibility explored in several studies (Thompson, 2020).

The results reflect that for the student population, satisfaction with the quality of education is high, although there are concerns about the relevance of the skills acquired for the labor market. Students value digital skills and critical thinking, and consider AI and Big Data as key technologies for their future training. There is a demand for greater flexibility in studies and a positive perception about the integration of online modalities. Although students feel moderately prepared for the future, there are concerns about employability and the impact of AI on their careers. The possibility of reducing the duration of careers and the virtualization of universities are also prominent issues.

Satisfaction and Perception of Educational Quality

Both groups, teachers and students, show a general satisfaction with the resources and the quality of education received. While 38.9% of teachers are moderately satisfied with the technological resources available and 33.3% satisfied, students reflect a similar perception with 61.5% satisfied with the quality of education and 20.9% indifferent. These perceptions are in line with studies that underscore the importance of technology in improving educational satisfaction if properly implemented (Smith & Brown, 2019).

Relevance of Acquired Competencies

Regarding the relevance of the skills acquired, 46.2% of students consider that these are moderately relevant for the labor market, compared to the concern of teachers about the preparation of students for future challenges, where 50% indicate that students are moderately prepared. Both groups seem to agree that, although useful skills are being acquired, there is a gap in total alignment with the demands of the labor market, a point supported by studies on students' professional readiness (Miller, 2020).

Universities will play an important role in promoting sustainability and social responsibility. Research and education on climate change, renewable energy, and sustainable development will be integrated into curricula, preparing students to address the environmental and social

challenges of the twenty-first century (Lozano et al., 2015). Universities will also lead initiatives to reduce their ecological footprint, becoming models of sustainability (Filho et al., 2018).

Competencies and Technologies Considered Essential

Teachers and students agree on the importance of certain skills and technologies. Teachers highlight critical thinking (94.4%) and digital skills (88.9%) as essential, while students also consider digital skills (79.1%) and critical thinking (45.1%) among the most important. In addition, both groups identify AI and Big Data as important technologies for future training, with 94.4% of teachers and 79.1% of students highlighting AI. These coincidences reflect an alignment in the perception of key competencies and technologies for the future, as confirmed by various studies that emphasize these skills for the labor market (Johnson, 2018; Williams, 2019).

The future of universities will be profoundly marked by the integration of advanced technologies. Artificial intelligence (AI), machine learning, augmented reality (AR), and virtual reality (VR) are revolutionizing higher education. Recent studies indicate that AI will not only transform teaching methods, but also personalize learning to meet the individual needs of students (Luckin et al., 2016). AR and VR will enable immersive learning experiences that will enhance understanding of complex concepts in fields such as medicine and engineering (Papanastasiou et al., 2018).

Flexibility in Education

The need for flexibility in education is also a shared concern. 47.3% of students consider flexibility in their study programs moderate, while 38.9% of teachers strongly agree that their careers should be offered in more flexible modalities. This finding is in line with current trends that indicate a growing demand for flexible educational programs that are adaptable to the changing needs of students (Evans, 2019).

The demand for flexibility in education will continue to grow. Online education and hybrid modalities will become the norm, allowing students to access programs from anywhere and at any time (Allen & Seaman, 2017). This flexibility will not only increase accessibility for students who are unable to attend face-to-face classes due to work or personal commitments, but will also encourage lifelong learning (Pappano, 2012).

Impact and Role of AI in Education

Expectations about the role of AI in the future of education are high in both groups. 56.6% of teachers have high expectations about the impact of AI, compared to 44% of students who also have high expectations about their role. However, it is interesting to note that students show a concern about the replacement of their careers by AI in the future, with 51.6% considering this possibility as moderate, which is a reflection of the concerns expressed in several studies about the impact of automation and AI on employment (Taylor, 2021).

The globalization of higher education will continue. Universities will expand their international networks, fostering global collaborations and partnerships that will enrich the educational experience and promote joint research (Knight, 2015). Exchange programs and international

online courses will allow students to gain a global perspective and develop intercultural competencies (Altbach & Knight, 2007).

Preparing for the Professional Future

In terms of preparation for the professional future, there is a notable difference: while 50% of teachers believe that students are moderately prepared, students are more critical, with 68.1% feeling only moderately prepared and 14.3% not at all prepared. This difference in perception may be due to a deeper understanding of the demands of the labor market by students or to a more rigorous self-evaluation. Previous studies have shown that students often feel less prepared than their instructors perceive (Garcia, 2020).

The personalization of learning will be a predominant trend. Adaptive education systems will use data to create personalized learning experiences, adjusting content and pace to the student's abilities and preferences (Johnson et al., 2018). This personalization will be facilitated by big data analysis and advanced algorithms that will identify each student's strengths and weaknesses, providing targeted resources and support to maximize their potential (Siemens & Long, 2011).

Modalities of Study and Self-Education

Finally, the modality of study and the use of online resources for self-education are areas where significant use is observed. 57.1% of students frequently use online courses or tutorials to reinforce their knowledge, which reflects a trend towards autonomous learning promoted in modern pedagogies (Baker, 2019). Teachers also allow the use of AI in classes and assignments, although less frequently, reflecting a caution in the adoption of new technologies in the classroom (Lee, 2021).

The connection between university education and the labor market will be strengthened. Universities will collaborate closely with industry to develop programs that respond to changing labor market demands, ensuring that graduates possess the skills and competencies necessary to succeed in their careers (World Economic Forum, 2018). Training in soft skills, such as critical thinking, creativity, and collaboration, will be as important as technical training (Deming, 2017).

Concordances and Discrepancies between the Surveys and the Literature Review of the Article

Concordances

Importance of Technology in Education: Both the survey results and the literature review highlight the relevance of advanced technologies in higher education. Teachers and students agree that technologies such as AI and Big Data are essential for future university and professional training. The literature review also underscores that AI and other emerging technologies are transforming higher education, improving the personalization of learning, and optimizing educational management.

Key Competencies: The results of the surveys and the literature reviewed coincide in the identification of essential competencies for future professionals. Both teachers and students mention critical thinking and digital skills as relevant. The literature review reinforces this notion by highlighting that skills that cannot be easily replicated by machines, such as critical thinking, creativity and emotional intelligence, will become increasingly important in the labour market.

Flexibility and Study Modalities: Both sources recognize the growing demand for flexible study modalities and short-term programs. Surveys indicate that both teachers and students support the provision of flexible, short-term programmes, while the literature review highlights the importance of flexibility in education to adapt to the changing needs of students and the labour market.

Preparedness for Future Challenges: Survey results show that both teachers and students feel that preparedness for future challenges is moderate, reflecting a shared concern. The literature review also addresses this concern, suggesting that universities should focus their programs on competencies that better prepare students for an ever-changing work environment.

Discrepancies

Perception of Educational Quality: Surveys indicate an overall satisfaction with the quality of education, but the literature review suggests a need for continuous improvement to stay relevant in a changing environment. This difference may be due to students' critical self-evaluation compared to teachers' perceptions of their own educational effectiveness.

Impact of AI on Employment: While students show moderate concern about replacing their careers with AI, the literature review emphasizes that many occupations are at risk of being automated due to advances in AI and robotics. This discrepancy may reflect a greater awareness of long-term risks among researchers compared to students' immediate perception.

Self-education and Use of Online Resources: Students report high use of online resources for self-education, while teachers are more cautious about allowing the use of AI in the classroom. The literature review, however, supports self-education and the use of online resources as effective tools for continuous learning and personalization of learning.

5. Conclusions

To answer the question: How can universities adapt to provide an education that responds to these requirements?, it is concluded that, in the coming decades, universities will be transformed, driven by advanced technologies, the demand for personalized and flexible education, and a greater link with the labor market and sustainability. This evolution will not only improve the quality and accessibility of higher education, but will also prepare students to meet the challenges of the future.

Universities that embrace these trends and overcome the associated challenges will be well-positioned to lead in the era of digital and global education. In addition, it is expected that, for example, careers in social sciences, administrative sciences and exact sciences will be totally virtual, while careers such as medicine and technical engineering careers will tend to be hybrid (virtual and face-to-face). Therefore, universities will become laboratory centers and their teaching service will be based on virtuality.

Despite the opportunities, the integration of advanced technologies and globalization pose challenges. Data privacy and security will be central concerns, and universities will need to implement robust policies to protect student information. In addition, equity in access to

education and the digital divide will be critical issues that will require innovative solutions to ensure that all students have equal opportunities.

A comparison between survey results and literature review reveals a general agreement on the importance of technology and critical competencies for the future of university education. However, they also highlight some discrepancies in perceptions about educational quality and the impact of AI on employment, underscoring the need for ongoing studies and adaptations in educational programs to address these concerns.

It is proposed to conduct a study on the Impact of Artificial Intelligence on Education, to further investigate how the integration of AI into the curriculum affects students' skills and competencies, and their perception of the relevance of their education in the labor market. Additionally, it is necessary to evaluate the effectiveness of online and hybrid study modalities in terms of learning outcomes, student satisfaction, and employability, comparing them with traditional face-to-face education.

Scientifically and empirically, the perceptions and results of satisfaction, professional preparation and use of technologies in education must be compared among students and teachers from different countries to identify best practices and areas for improvement at the global level. Finally, it is proposed to develop a study that examines how students use online resources and AI tools for self-education, identifying which ones are most effective and how they can be better integrated into the university curriculum to maximize autonomous learning.

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