

The sixth technological development, potentiates the use of information and communication technologies in Higher Education

El sexto desarrollo tecnológico, potencializa el uso de las tecnologías de la información y comunicación en la Educación Superior

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Abstract

The imminent transformations that take place in the higher education system take on importance due to the circumstances that arise in a technological revolution and a rapid change in the practices of society, with a prevailing use of information and communication technologies (ICT), and that can affect the functions of the education system, allowing innovation in the transmission of new knowledge and that can offer students access to knowledge sources in an unlimited way. Currently, the technological tools of information and communication have produced a profound change in the practice of learning, in addition to the way in which individuals communicate and interact with the prevailing need to manage and administer knowledge, these types of practices produced a change in the way of doing business, causing significant changes in the different areas of organizational operation as they are; commerce, industry, administration, medicine, agriculture, engineering. For this work, a documentary exploration was carried out describing the importance of information and communication technologies as a potential tool in the learning of higher education.

Technologies, Information, Communication, Education

Resumen

Las transformaciones inminentes que tienen lugar en el sistema de educación superior, toman importancia por las circunstancias que se presentan en una revolución tecnológica y un rápido cambio en las prácticas de la sociedad, con una imperante utilización de las tecnologías de la información y la comunicación (ICT), y que pueden incidir en las funciones del sistema de educación, permitido la innovación en la transmisión de los saberes nuevos y que pueden ofrecer a los estudiantes el acceso a fuentes del conocimiento de forma ilimitada. Actualmente las herramientas tecnológicas de la información y la comunicación han producido un cambio profundo en la práctica del aprendizaje, además, de la manera en que los individuos se comunican e interactúan con la imperante necesidad de gestionar y administrar el conocimiento, este tipo de prácticas a producido un cambio en la manera de realizar negocios, provocando cambios significativos en los distintos ámbitos de operación organizacional como son; el comercio, la industria, la administración, la medicina, la agricultura, la ingeniería. Para este trabajo se realizó una exploración documental describiendo la importancia de las Information and communication technologies como una herramienta potencializadora en el aprendizaje de la educación superior.

Tecnologías, Información, Comunicación, Educación

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Introduction

Due to the changes that occur in the technologies of support in education, the challenge arises to know, understand and better implement digital inclusion with the support of computers, mobile communication, video projectors, online platforms, the web; among other technologies. That allows support for teaching-learning activities that seek the development of skills and abilities in students of higher education, so that the media must be used as a channel to instruct rather than inform, students are accustomed to using the information and not to interpret it, that is why care must be taken in the development of pedagogical models that are completely based on technologies or make partial use of them. The curricular integration of the technological means and the use of the didactic advantages is not a simple task. The teacher requires certain skills and technical knowledge, available and above all, how to use them (Hernández, 2011).

ICT (Information and communication technologies) and LKT (Learning and Knowledge Technologies) can become tools for the development of human beings in education, enhancing the use of technologies. In addition, the LKT allows that interdisciplinarity that should characterize a process such as learning, through digital literacy based on the skills of search and selection of information, thus favoring the expression of creativity. The LKTs tools, therefore, go beyond the availability of the technologies in their use; since it is required that learning and teaching be promoted, with the use of the LKTs, which would be a guide for the Professor, who can show you practical applications of -

ExamTime in the classroom in an educational environment, in addition to other tools such as digital communication platforms and search engines. (Zulaica & Villagómez, 2019; Santos, 2019).

The general patterns that characterize development processes according to Schumpeter (1939) is given by the emergence of particular innovations is not a random phenomenon. Technologies interconnect and tend to appear in the vicinity of other innovations.

Nor do they evolve in isolation. Innovation is usually a collective process that increasingly involves new agents of change: suppliers, distributors and many others, to include consumers. Techno-economic and social interactions between producers and users weave complex Schumpeterian dynamic networks to which they are identified as “clusters” conglomerates (Pérez, 2010)

In the traditional international division of labor, based on comparative advantages of a natural nature, it is currently characterized by increasingly relying on technological advances in the field of biotechnology, genetics, electronics, computer science, communications, and others. Fields of Knowledge Romero (2019). The foregoing highlights the axiomatic importance of technological change as a premise to explain the particularities of today's society. The process of diffusion of the successive technological revolutions and their techno-economic paradigms together with their assimilation by the economy and society, with the increases in productivity and the resulting expansion constitute what can be called a “great wave of development” (Pérez, 2002). Figure 1 shows the technological developments that have occurred over time in humanity.

Technological development	First name of the time	Country or countries boosters	What empowers the start of technological development	Year
First	Industrial Revolution	England, (Europe and USA, presence of China)	Arkwright cotton spinning mill in Cromford	1771
Second	The age of Steam and Railways	England (spreading to Europe and the USA)	'Rocket' steam engine test for Liverpool-Manchester railway	1829
Third	The age of Steel, Electricity and Heavy Engineering	E. U. A. and Germany and England	Inauguration of Carnegie Bessemer Steelworks in Pittsburgh, Pennsylvania	1875
Quarter	The age of Oil, Automobile and Mass Production	E. U. A. (rivaling Germany for world leadership) Dissemination to Europe	Exit of the first T-model of the Ford plant in Detroit, Michigan	1908
Fifth	The age of Information Technology and Telecommunications	E. U. A. , rivaling Germany for world leadership, Dissemination to Europe and Asia.	Intel microprocessor announcement in Santa Clara, California	1971
Sixth	Digital age applied to the daily work of society, services, factories and companies.	Germany, Japan, USA, China and Korea.	Convergence of ICT, Sensory and Robotics, Cyber-physical Systems, Internet of things, augmented reality and virtual reality.	2016

Figure 1 The technological developments represented in periods of time

Source: Own elaboration based on (De Santiago, 2009; Domínguez and García: Pérez, 2010; PWC, 2017; IBM, 2019; BBC, 2019; Estulin, 2019)

Learning strategies encompass a whole set of procedures and cognitive resources that students implement when they face learning; which, strictly speaking, are closely related to the cognitive components that influence the learning process.

Anyway, if it is assumed that the student's motives and intentions determine, ultimately, the type of strategies that will be implemented, this implies that the cognitive mechanisms used by the subjects to facilitate learning that depends largely of dispositional and motivational factors. Sin embargo, al establecer los criterios de acciones a tomar o estrategias, se suele ser determinar el "cómo aprender", también concurren razones, intenciones y motivos que guían el aprendizaje junto con las actividades de planificación, dirección y control de todo este proceso constituyen elementos que forman parte de un funcionamiento estratégico de calidad y que puede garantizar la realización de aprendizajes altamente significativos (Valle, González, Cuevas y Fernández, 1998)

Technologies can lead higher education teachers to renew learning processes, but if it is of great importance, adaptation to new technological tools that enrich their teaching technique and strengthen their classroom classes. De Santiago (2009) proposes development to the process of accumulation of technological and social capacities.

From here we can establish a simple and precise definition that gives rise to numerous interpretations in the development of skills. The accumulation of capacities refers to the potential to solve problems and build structures that solve it with their own strength and their own ingenuity.

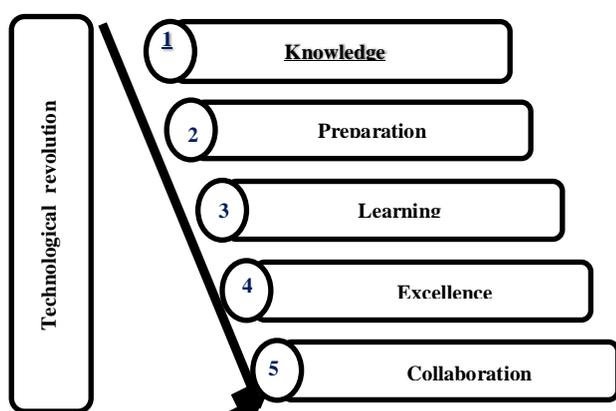


Figure 2 Meta-challenges of education

Source: Own elaboration

Figure 2 shows the meta-challenges of higher education, with knowledge, content preparation, student learning, practices of excellence and collaborative elements implemented.

Social capabilities refer to Education, Science and Technology Research, Public Health, Security, Justice, etc. Any aspect can infer in the extraordinary weight of these issues in the development of a country (Jalife-Rame, 2019).

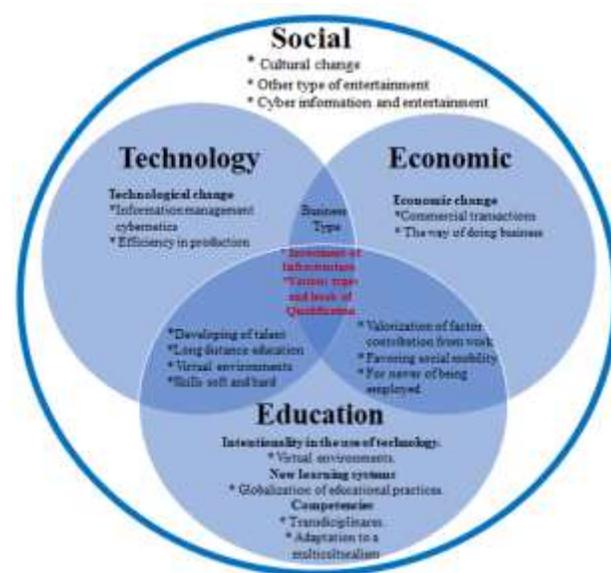


Figure 3 The changes that will be presented by the Sixth Technological Development. Own elaboration based on (Waldman & Jensen, 2007; Gómez y Suárez, 2010; PWC, 2017; IBM, 2019; Equisa Networking, 2019)

The sixth technological development (technological revolution) triggers the confluence of a number of technologies (**Big Data, Internet of things, Cloud Computing, Robotization, Artificial Intelligence, Blockchain, and others**) which is enabling a profound change in the way of life of people and in the business models of companies that adopt these technologies. But beyond the analysis of the causes of the revolution and the technologies mentioned, we are interested in highlighting the different implications on issues such as security, legal aspects, the impact on human resources, business ecosystems and, very in particular education, in the aspects related to the application and use of technology (IBM, 2019). Figure 3 shows the changes that will be presented in relation to the aspect of technology, the economic aspect and education for the sixth technological development.

Development as a process of accumulation of technological and social capacities, depending on the ability of developing countries to take advantage of the different successive windows of opportunity. The nature of these changing opportunities would be determined by the evolution of technologies in the main countries of the world economic system. The changes in the direction of technical change linked to each of the technological revolutions would provide the best opportunities to try to make a leap to development (CEPAL, 2001).

Human participation and machine capabilities complement each other to solve problems, which in isolation could not be solved. The convergence of knowledge and technologies build an interrelation between different disciplines. It is not a fortuitous event, but the consequence of diversification coupled with the growth of economic, productive and societal complexity, whose demands favor responses oriented to the integration of different disciplines to face problems (Hacklin y Wallin, 2013).

The convergence of multiple fields of knowledge constitutes a modularization process that gives rise to new organizational, technological and sectoral dimensions. The integration of knowledge in different disciplines constitutes a critical challenge for innovation and management. Multidisciplinarity emerges as a relevant way to find new solutions, sustained in the programs implemented by industrialized countries (industrial policy, research and development, capacity building) and in large companies, especially in original design manufacturers (Casalet, 2018).

Hernández (2013), according to the 2013 Horizon Report, the trend in educational technology and learning process in higher education is closely linked to openness, massive and open online courses, job skills acquired in informal experiences outside universities, the interest in using new data sources to personalize the experience and measure the performance, in addition, of the change in the role of teachers, due to the great abundance of open resources on the Web and the change of education paradigms before the incorporation of Internet learning.

Las principales tendencias de las “ICT” son:

- I.** The open character Certainly, the word “open” is quite talked about today, as the Horizon Report shows, that this is a trend that applies to resources with this quality, such as online courses and some computer programs. Its impact is due to this term and is linked to a free, or unlimited access.
- II.** Massive and open online courses, MOOCs. The new topic of discussion of multiple universities is undoubtedly the subject of open online courses, which are not only considered as an alternative for distance education, but also as a complement to traditional university courses.
- III.** Work skills acquired in informal experiences outside universities. A trend known as informal learning consists of any type of learning that is acquired outside the formal school environment. It is self-directed learning that fits the student's personal learning objectives.
- IV.** Interest in using new data sources to personalize the experience and measure performance. The traces that students leave on the internet and the tools used online are analyzed, with the aim of improving learning outcomes.
- V.** The role of teachers is changing due to the abundance of open resources on the Web. The teacher must be responsible for empowering students in the most important for them to identify reliable educational resources. The teacher must act as a guide in the domain of the skills required in the Knowledge Society.
- VI.** Education paradigms are changing due to the incorporation of Internet learning. The students are native Internet users, they spend a lot of their time using this tool, which is why education is adopting a hybrid model, face-to-face and online.

MOOCs (massive and open online courses) are increasingly relevant in our society. They allow many people to gain knowledge from anywhere in the world.

The student only needs a computer, tablet or smartphone and an-Internet connection. The offer of the courses is very varied, you can find courses in various subjects such as computer science, business administration, arts, biology, history and many more. Knowledge in the world changes very quickly, so it is essential to have learning options that help complement knowledge or acquire those that companies are demanding (Zambrano, 2017).

MOOC courses are free, a teaching offered by universities and institutions of national or international prestige at no cost, is one of the main attractions to choose this type of online education. A new MOOC course is launched every week, with a wide variety of teachings. In this way, it is very easy to find a teaching that is very limited and corresponds to the interests or needs of training. The only requirement to perform these studies is to dedicate time. As a general rule, MOOC courses require having free 6-8 hours or 15-18 hours per week; a time that can be chosen, making it easier to combine studies with other obligations. In this sense, the student has no obligation to attend classes since he does not have a fixed schedule. Being a really necessary advantage among those who combine studies and work or who already take courses in the university (Gómez, 2016).

Learning strategies

Learning strategies are procedures or sequences of conscious, voluntary, controlled and flexible actions, which become habits for those who are instructed, whose purpose is learning and problem solving both in the academic field and outside it. This way of learning concerns decision making and facilitates the so-called meaningful learning, it is related to practical and work life, that is, a meaning that affects the student and professional future, because it not only assimilates how to use certain procedures, but also knows when and why he uses them, and also favors him in the process of solving a problem or a task to be executed (Díaz y Hernández, 2007; Ausubel, 1963; Monereo, 1990).

The learning strategies used by students affect the goals of an educational model, affect the type of learning that is intended to be achieved.

In the analysis of these strategies used by students in higher education careers, whose institutional model is focused on the student with the focus on competencies, it was found that half of them are helped by tactics in accordance with this model such as the essay, the elaboration, the metacognitive objectives, the self-regulation, the self-evaluation and the emotional support, combining strategies that lead to memorization with those of meaningful learning. But the least used are the planning and organization (León, Risco y Alarcón, 2015).

The adoption of academic models is carried out in a set of relationships between diverse agents that intervene according to their capacity for participation. Fact that impacts within the institutions where different socialization features are presented translated into differentiated definitions of the type of institutional governance. Also, teaching, research, dissemination and extension activities are increasingly taking a different, broader course. The academic objectives of the institutions of all levels of education, but above all the higher ones, are determined externally and shaped to respond to specific proposals of supranational organizations (Figueroa y García, 2017).

Some research identified several perspectives through which they have differentiating elements, which have explained the expansion of higher education. Such perspectives consist of: the social environment, with a focus on the changing circumstances of the moment; human capital, with emphasis on government planning; the radical, which refers to the domination of the upper classes; educational stratification, highlighting the competition for social status, and social dynamics, which is dominated by the interaction between interest groups (Weidman y Namgi, 2000).

Students who are carrying out their professional training in careers designed by competencies bring with them learning that has allowed them to be instructed in a particular way, according to their educational environment, even though in the university subjects are implemented so that they “learn to learn”, from so that they achieve autonomy, independence and self-regulate their own learning, in reality it must be a permanent task throughout the university education.

Change the learning structures, which have been formed for 12 or more years in basic education and media, it is not achieved with the development of some contents that state how to do it; The transformation must be part of the pedagogical practice in all subjects, which implies that teachers must be committed to achieving the purposes that entail the breaking of the paradigms, both in the teaching and learning strategies of the students. Students use several learning strategies that are the product of the experiences of their pre-university training and some new ones, which allow them to approach autonomy, independence and self-regulation.

The strategies of essay or recirculation of the information that students use most are those that allow to evoke the learning when they are required. It is observed that most of them find a relationship between new knowledge and those already acquired; They recognize that what they have learned is related to what is going to be addressed and they use different tactics to integrate and relate the new information to the knowledge they already have (León, Risco y Alarcón, 2015).

In the academic field, learning strategies have been classified as: essay, elaboration, organization, control of understanding, supportive or affective, and metacognitive. These strategies lead to the student becoming "autonomous, independent and self-regulated, capable of learning to learn" (Díaz y Hernández, 2007).

The individual will advance building the sense of knowledge, privilege the processes of codification, organization, elaboration, transformation and interpretation of the information collected, using the necessary resources in accordance with the conditions of the topics addressed. This implies that the student formulates goals, organizes knowledge, building meanings of knowledge, using appropriate strategies and choosing the moments that you consider unavoidable for the acquisition, development and generalization of what you have learned. The educational model that allows the student to form, to become a committed manager of their own learning, is constructivism.

This bases that the human being is a product of his ability to acquire knowledge and to reflect on it, which allows him to anticipate, explain and positively control nature to make culture, highlighting that knowledge is actively erected (Monereo, 1990; Pozo, 1989; Delval 1997).

It is here that cultural change in education becomes important, such as the use of the internet of things with its acronym in English IoT, which deals with unique physical objects, identifiable and connected to the Internet, the efforts of cyber-physical systems, which they refer to the nature of cyber-physical coupling and the system of characteristics of software controlled systems. Common services and functional models, semantics, security and protection standards and standard interfaces for system-to-system interactions (Yan Lu, Morris & Frechette, 2016).

Some tools that can be used as organizational strategies, when studying a subject, students organize it in different ways. An important percentage "not always" does the same; two thirds of the "never" sample use propositional minds, neither comparative tree nor synoptic tables; a little more than half do not use the mindsets, and only "sometimes" mental and conceptual maps. These organizers, among others, are tables that take varied physical forms and each one of them is appropriate to organize the knowledge they possess. (León, Risco y Alarcón, 2015).

The concept map is a graphic tool that allows to represent the relationships of concepts of the same domain through verbal connectives, to enable the communication of knowledge, and also contributes to meaningful learning. They consist of concepts, words links, propositions, contact lines and arrows, cross connections and characters wrapped by ellipses or ovals, whose representations show hierarchical relationships; they use different colors that help, who visualizes the map, to abstract classes and subclasses. Through its construction, students develop higher order thinking skills, allowing them to process, organize and prioritize new information, identifying ideas and interrelationships between different concepts. (Novak, 1991; Ontoria Peña, 2006).

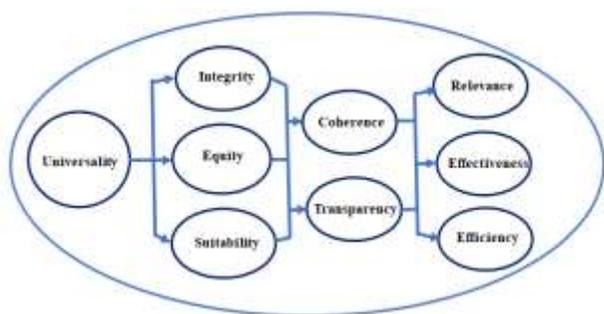


Figure 4 Determining axes of relations with society, knowledge, teaching and learning, an example of a comparative tree

Source: Own elaboration

The mind refers to the way in which the brain internalizes and organizes in a meaningful and natural or logical way the concepts in the context of the semantic network shared for communication. The mind is a product of the mind, an information organization strategy that allows the construction of concepts, as well as exercising and appropriating intellectual operations, defining limits. The mindset can be notional, conceptual, propositional, precategory and categorical (De Zubiría, 2006).

The comparative tree allows us to characterize and establish relationships of similarity and difference between topics, is used to systematize the information and allows contrasting the elements of a topic. It is represented by means of branches, there is a choice of categories that are then described, and descriptive classes are placed at the same level for each category. It is formed by a variable number of branches in which the information is presented vertically and the comparison of the elements between them is established horizontally. These information organization strategies allow students to carry out a constructive reorganization of the subject they are going to learn, which allows them to classify the information with the intention of obtaining a correct representation of it, exploring the possible relationships between their different parts and / or the relationships between the data to be assimilated, as well as the forms of internalized schematic organization by the learner, as shown in Figure 4. (Monereo & Carles, 1990).

As for organizational strategies, when students study a new topic, not everyone uses the organizers to address the new knowledge.

It is necessary for teachers to use the different organizers in the development of their classes mental and conceptual maps, conceptual and propositional mindsets, the comparative tree, synoptic or other pictures, so that students learn to find relationships, structure knowledge, relate it to what you already know and find new meanings, which you will remember because the schemes that are made will have a certain logic that is not forgotten. In addition, they can be used to address any theoretical or practical issue. (León y Risco y Salvo, 2015).

In a teaching-learning process, it is currently decisive in the use of Information and communication technologies as a support in the interaction with didactic activities that integrate the visual, novel and interactive; encourages the use of applications, platforms and social networks; promotes new forms of teaching; It facilitates the search for information and communication, the development of practical activities of the teaching task such as videoconferences, which constitute a service that allows a group of people to be contacted through interactive sessions so they can see and hear a conference.

Students must then travel in an environment of information repositories, where they must be able to analyze, make decisions and master new areas of knowledge in an increasingly technological society. In this context, learning is permanent, in collaboration with other individuals using different communication and information technologies. In order for students to acquire knowledge and skills essential for their development to make them competent, they must move from a teacher-centered teaching to a student-centered one (García, Reyes y Godínez, 2017).

The Incorporation of Technology to Facilitate an Educational Model

ICT, Information and communications technologies, are the technologies that are needed for the management and transformation of information, and in particular the use of computers and programs that allow creating, modifying, storing, protecting and recovering that information. (Sánchez, 2008).

Virtual education has characteristics that differentiate it greatly from face-to-face education.

On the one hand, there is greater autonomy and independence that students enjoy for the development of their learning process, as it is the student who sets their pace of work. On the other hand, many of the students give a more practical character to their learning objectives, because this type of student develops a work activity linked to their formal studies, which greatly favors their intrinsic motivation. (J.A.C. E., 2012)

The incorporation of information and communication technologies in the different activities in which the human being operates has posed new and important challenges in all areas of society, from sending a simple email, reading the newspapers or allowing modeling the transformation of the Valdivian forest and analyze the consequences of certain interventions. In this document, an exposition is made of the positive and negative aspects that the use of information and communication technologies (ICT) entails, in the academic activities of future professionals in university education (Díaz, 2016; Corrales, 2009; Sánchez, 2000).

ICTs are computational and computer tools that allow you to process, collect, summarize, retrieve and present information in various ways, according to the requirements and needs of the users. That is, they are the set of techniques to manage information, especially computers and programs to obtain, save, generate and transmit information (Corrales, 2009; Sánchez, 2000).

The level of use of information technologies is located at medium-low or low levels, despite the general recognition of the importance and usefulness of these resources, of having in the teaching-learning process. Indeed, it is apparently contradictory that there is a consensus between teachers and managers about the importance that these technological resources may have in the purpose of transforming education, and its low use, in practice, in the teaching-learning processes. It is expected, as indicated, that the increase in the levels of use of ICT resources will drive not only a transformation in pedagogical models, but also in the promotion of new scenarios for the acquisition of autonomy of the teaching-learning process in the classroom (Coll, Onrubia, & Mauri, 2008).

Information technologies generate new languages and forms of representation, and facilitate the creation of new learning scenarios, educational institutions cannot remain on the sidelines; They must know and use these new languages and forms of communication. It is urgent that the educational institutions appropriate resources, train their teachers responsibly in the use of new media and create the conditions for their students to benefit equally from them and have equal opportunities in their access (Barreto y Díaz, 2017).

The student must demand greater self-regulated activity, responsibility and commitment. However, virtual education limits them to establishing conventional shared or cooperative learning relationships and situations with other participants, which enrich the cognitive experience and that are typical of traditional education.

But it can be minimized from the correct use of ICTs and, more specifically, from virtual platforms that have resources such as: forums, email, hyperlinks to web pages, links to videoconferences, among others (Suárez y Anaya, 2004)

The approach proposed by Casalet (2018) regarding the progress in the storage and processing capacity of a large volume of data drove the use of algorithms and artificial intelligence for the analysis and systematization of information, and connections between individuals, machines and devices. Data is a new source of competitiveness. To this is added, the analytical visualization (Thomas, 2005).

To have favorable results, the analysis of the information must be carried out to optimize and combine the human and machine capabilities in a collaborative way.

The analytical visualization is an interdisciplinary aspect that goes beyond the traditional approach (scientific visualization and visualization of information), includes statistical and mathematical principles and methods of science of cognition and perception, and the representation of knowledge (Toledo, 2016).

Information Technology in Higher Education

The aspects of university education that should be subject to revision and improvement in the coming years, making them more in line with the new guidelines of the productive sector and with the society in which we are immersed. In particular, the most relevant innovative aspect is the establishment of a new educational paradigm that entails, on the one hand, ¿a change in the teacher's mentality? its objective goes from "what should I teach" to "what should the student"? and, on the other hand, the much more active participation of the student in his learning process. In this way, the teacher happens to have an important motivating value, encouraging student participation and autonomy in the learning process, using strategies that raise their interest (Pelgrum & Law, 2003).

The technological changes of the information and communication society reveal the felt need for the preparation and training of audiovisual and educational professionals, and the public in general. This is a phenomenon typical of globalization, which is manifested in the Information and communication technologies (ICT), by enabling communication, interaction and interconnection between people and institutions worldwide, and eliminating spatial and temporal barriers. ICTs should be used appropriately, in a way that allows developing more democratic and inclusive societies, so as to strengthen collaboration, creativity and the fairer distribution of scientific knowledge and contribute to a more equitable and quality education for all UNESCO (2015).

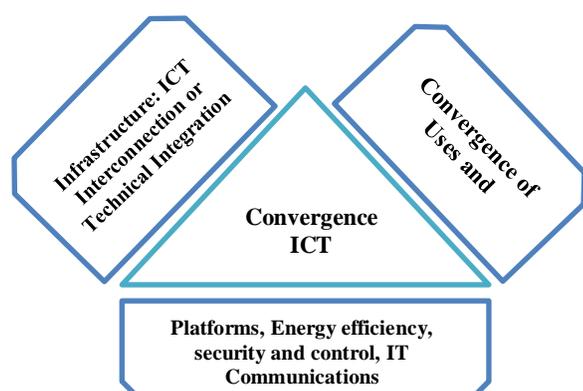


Figure 5 The convergence of ICT, with the platform, energy efficiency, security and control, communications of information technology, convergence of uses and applications, infrastructure

Source: Own elaboration

Figure 5 shows the convergence of ICT, with the importance of having a communication network with security systems, reliable, accessible management and in a flexible environment.

ICT Information and Communication Technologies have introduced fundamental changes in daily life and training processes, and particularly in Higher Education. The knowledge of your situation, your opportunities and challenges, as well as the design of proposals for your best use, is a task cannot be postponed. Information and Communication Technologies are provocative elements of social and economic changes, catalysts of what has been called the sixth technological revolution, this largely due to its penetration into the different areas of human activity.

It is evident that, from this technological perspective, the convergence of the media and information, must be located beyond the approach, complementarity, union, interconnection or technical integration that ICTs can have with each other, the approach will have to be analyzed objectively with all the advantages and disadvantages you have, or how far you can get to interrelate, of the different media, languages, messages, codes, forms or modes of consumption of the information and communication media, and even the commercialization of your own services and content (MEC, 2019).

These transformations have also been presented at the Higher Education Institutions (HEI), not only in the management and government processes, but also in the substantive activities of these institutions such as learning processes, involving reforms for the institutions with the purpose of maintain validity and relevance to social needs This represents a great challenge.

ICTs ceased to be optional tools in HEIs, and now their deployment, but above all their use must be maintained at strategic levels, resulting in the need to travel a route to conduct the operation, management and governance of ICTs in harmony with standards and best practices (ANUES, 2016).

ICTs can favor universal access to education, quality teaching and learning performance, competent teacher training, as well as more efficient administration of the education system, causing changes in many aspects of the education system because they are a great teaching tool, promote communication and collaboration, remove distance and geography barriers, are valuable resources for teacher support and encourage schools to perform their functions more efficiently (García, Reyes y Godínez, 2017).

Learning environment focused on the teacher.	
Previously	At present
Teacher	Teacher
	Learning guide, collaborator, tutor and facilitator in the teaching-learning process. As an evaluator, he identifies errors, reinforces successes, makes pertinent comments, points out work criteria, performance, and so on.
Transmitter of knowledge, information, possessor of the truth and all the answers.	It allows students to be more responsible for their own learning.

Table 1 Changes in teacher roles

Tables 1 and 2 show the teacher-centered learning environment with the change in teacher roles, and learning student-centered, with changes in student roles in student-centered learning environments.

Student-centered learning environment	
Previously	At present
Student	Student
Passive receiver of information.	Active participant of the learning process.
Knowledge player.	Produces and shares knowledge in a more participatory and open way.
Learning is an individual activity.	Learning is a collaborative activity that takes place with other students.

Table 2 Changes in the roles of students in student-centered learning environments

Students must then travel in an environment of sufficient information, where they must be able to analyze, make decisions and master new areas of knowledge in an increasingly technological society. In this context, learning is permanent, in collaboration with other individuals using different communication and information technologies.

In order for students to acquire knowledge and skills essential for their development to make them competent, they must move from a teacher-centered teaching to a student-centered one. (García, Reyes y Godínez, 2017).

Benefits of the inclusion of ICT.
Synthesis of contributions:

- The ease of access to information and the variety of information available.
- The high parameters of reliability and speed available to the processing of information and data.
- The variety of communication channels they allow.
- The elimination of space-time barriers.
- The feed-back possibilities they offer, their great interactivity.
- The development of flexible spaces for learning.
- The empowerment of personal autonomy and the development of collaborative work.
- The optimization of the organization and the development of teaching and research activities.
- Streamlining administrative and management activities, in addition to allowing their relocation from the immediate context.

The ability and willingness to learn in a wide range of contexts and situations is a characteristic feature of people. The learnings that this capacity and this disposition make possible are at the base, both of the processes of socialization and enculturation, which allow us to grow and develop within the framework of a culture, as well as the processes of individuation and construction of personal identity, which leads us to conform as unique and distinct people.

The awareness of the importance of learning has contributed to the delimitation and consolidation of an area of study and research, science or learning sciences, in which the efforts of diverse disciplines such as cognitive science, the psychology of education, neuroscience, sociology, anthropology or computer science (Sawyer, 2006; Coll, 2010).

The following is a classification of ICTs taking into account the types of media and educational approaches, as shown (Suarez, 2017).

Transmission media: They seek to support the effective delivery of messages from the sender to the recipients.

- Demonstrators of processes or products.
- Tutorials for appropriation and consolidation of content.
- Exercisers of rules or principles, with direct or indirect feedback.
- Digital libraries, digital video libraries, digital audio libraries, digital encyclopedias.
- Websites for the collection and distribution of information.
- Systems for pattern recognition (images, sounds, texts, voice).
- Process automation systems, which execute what is expected depending on the state of variables indicating the state of the system.

Active media: They seek to allow the learner to act on the object of study and, based on experience and reflection, generate and refine their ideas about the knowledge underlying that object, using virtual and augmented reality.

- Modelers of phenomena or micro worlds.
- Process or micro world simulators.
- Digital sensors of heat, sound, speed, acidity, color, height with which modelers and simulators are fed.
- Digitizers and image or sound generators.
- Portable, numerical and graphic calculators.
- Electronic toys; electronic pets.
- Individual games of; creativity, chance, skill, competence, roles.
- Expert systems in a content domain. Language translators and proofreaders, natural language decoders.
- Statistical data processing packages.
- Smart agents: search engines and organizers with intelligence.
- Search and navigation tools in cyberspace.

- Productivity tools: word processor, spreadsheet, graphic processor, information organizer using databases.
- Authoring tools and languages for: micro-worlds, web pages, concept maps, computer programs.
- Creative multimedia tools: hypertext, movie, sound, or music editors.
- Non-automatic tools to support administration of; courses, programs, finance, buildings.
- Tools to compact digital information.
- Tools to transfer digital files.

Interactive media: They seek to allow learning to take place through constructive, synchronous or asynchronous dialogue between participants who use digital media to communicate.

- Online, collaborative or competitive games, with closed or open arguments, in two or three dimensions.
- Electronic messaging systems (MSN, AIM, ICQ), electronic board, as well as text or multimedia CHAT environments (video or audio conferencing) that allow synchronous dialogues.
- Textual or multimedia email systems, electronic forum systems.

Estulin (2019) establishes a question or a key question what it is: how will the cognitive balance be organized, of the students who are going to live in relation to the sixth technological development ?, since it will have to be very different from the known strategies and used until now, because it will have to create a Technological Educational Meta-Civilization Language that will have to respond to the amount of knowledge that will be generated with the use of technology, since it is considered that in the next generation of humanity, your knowledge will be quadrupled by technological management.

With dual training in higher education, in which business organizations participate, you can contribute to learning about a greater number of activities, which have a higher percentage of knowledge of the so-called know-how and the development of skills in related areas with innovation and that have a greater diversity of technical knowledge, to potentialize the development of skills, because business organizations in collaboration with higher education can trigger the improvement in education with the use of technology, can be favored with practices in the learning time, to acquire skills with learning - doing, participating in groups with real cases (Soto, Reyes & Infante, 2016).

Both, the learning strategies and the development of the organization of the contents, seek for students to discover and build the understanding of structured data, to find meaning in the information, which implies a cognitive and affective activity that will allow greater management and retention. of information.

It is important to mention the vision of the educational perspective, in the incorporation of methodological tools, applying or developing the most appropriate to be able to incorporate LKTs into the classrooms, and what this implies for the development of digital competence and thus reduce the digital divide existing among teachers, considered digital immigrants, and students considered digital natives. From this analysis, and from theories of constructivist learning (Moya, 2013).

In addition, a movement has been presented in the generation of employment of technologies in educational practices, where knowledge is provided around methodological tools such as LKT learning and knowledge technologies, empowerment technologies and TEP participation, and the use of knowledge management techniques, to improve the process or a situation, potentialize the transfer of knowledge or experiences (Litovicius y Serena, 2017).

Conclusion

Currently there are dynamic changes in society due to technological practice, communication and information technologies are the result of technological development of important advances, in the field of science with rapid implementation in the use and development of society, but used as focal references of the technological application that is lived in most of the developed countries, becoming referents of this sixth technological development.

In higher education institutions, they require renewal and innovation, which not only includes the introduction of ICTs as a means of education, but also requires an organizational, methodological change that should rely on the integration of technologies in the teaching-learning process. The search for solutions must respond to the transformations of educational policies, and this will depend on the management of each learning unit and the commitment made by teachers in the optimal use of ICT in teaching-learning activities.

But the use of information and communication technology in higher education requires an adequate methodological structure of work, with the prevailing flexibility of using the technological resources developed for these purposes, appropriating these technological means, establishing the necessary use to deepen the contents of the platforms, with the search to diversify the access to the information media, using the learning environments and environments suitable for a multidimensional and interactive action, and it will be necessary to establish the sharing of learning roles when prioritizing methodologies based on collaborative, dialogic, research and socialization learning of the contents learned, measuring the degree of understanding of the topics addressed.

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