

# INFORMATION AND COMMUNICATION TECHNOLOGY AND ITS EFFECT ON THE CONVERSION OF HIGHER EDUCATION FOR THE PROMOTION OF THE GLOBAL ECONOMY

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## ABSTRACT

This article reflects the role of Information and Communication Technologies (ICT) and its influence on teaching and learning processes from a conceptual point of view. Higher education has changed in India in recent decades, to respond decisively to the needs of a revitalised society that looks to educated professionals effectively managing university and administrative processes during this period of economic globalisation. The method used in this study is part of a documentary evaluation of studies and publications conducted over the last decade. The results show ICTs have contributed to different neuralgic components.

**Keywords:** Higher education; Information and communication technologies; globalization; economy

## I. INTRODUCTION

Today's society, characterized by a context of globalization and by the rapid growth of Information and Communication Technologies (ICT), has promoted the creation of mechanisms for incorporating different technological advances in various economic and social sectors, strengthening such scenarios in terms of their efficiency and dynamism (Baller et al., 2016). The education sector does not escape this reality, incorporating ICT as an imminent phenomenon with a high incidence in the educational context, in response to the need to promote innovation and creativity as a mechanism of competition (Sanz et al., 2012), in which Higher Education Institutions (HEIs) must be framed, for the operationalization of their substantive functions. The teaching-learning system adapts to these changes through the creation of educational policies that integrate these tools into learning environments (Herrera, 2015). In the literature there are various approaches to figure out at a conceptual level, what are ICT? From a technical perspective, ICTs are based on: those relating to communication technologies (broadcasting media, television and telephony, among others) and information technologies, which encompass the mechanisms in which they are stored and managed data and information (Austin et al., 2016).

In a global sense, ICTs correspond to the mechanisms and tools through which information from various sources can be processed, stored, distributed, and disseminated. Becoming a distinctive element of innovation that characterizes modern society, and that is influencing the learning of individuals and traditional ways for the dissemination of knowledge (Zempoalteca et al., 2017). Specifically, in the educational context, ICTs correspond to a set of technological tools to support the teacher to strengthen the teaching-learning process at all levels of education (Arancibia et al., 2010).

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), incorporating ICT in higher education is used in the development of teaching materials, sharing content, and improving communication between the actors in the educational process, promote and develop research and ease institutional administrative processes, among others (UNESCO, 2013). In most HEIs, ICT has been adopted as a means for the transformation and improvement of teaching-learning processes in the educational system, after raising awareness of its limitations and usable factors (Koh et al., 2015). However, the use and implementation of ICTs is not synonymous with guaranteed success to develop efficient mechanisms for the creation and dissemination of

knowledge. For this reason, it is important to promote spaces with the right conditions for the maximum use of these tools (De Witte and Rogge, 2014).

## II. METHODOLOGY

In this study, a detailed review of scientific publications in the last 10 years in relation to the use of ICT in higher education in India was conducted. Likewise, an exhaustive review of the international literature was made to put the issue and the discussion in an international context and compare the current situation with that of India. The compilation of the information was conducted in an organized manner and contemplating aspects such as objectivity, impact and analysis of the concepts articulated or linked to ICT in higher education. The IEEE explore specialized database, the Scielo scientific and electronic library, the Dialnet open information system for journals, and the Redalyc database of Scientific journals were used to search for articles and scientific publications in Spanish.

For international literature in the English language, the publications of journals indexed in the Web of Science (WoS) and in Scopus were explored. The process was conducted in three phases: location of keywords in search engines about the origin, evolution, and influence of ICT in higher education, selection of recent publications and reflective construction based on the aspects proposed by the various researchers in each one. of the consulted works.

## III. RESULTS AND DISCUSSION

When conducting the literature review, it has been possible to show, as said by (Bejarano et al., 2013) that the origin of ICT is in the mid-1940s, based on the disciplinary field of electronics and initially used in industrial and scientific processes. The period following World War II promoted the development of a varied number of innovations, applicable to both the military and civil spheres. The most notable have been the transistor as a fundamental element of microelectronics and so the programmable computer. Advances in electronics gave way to the creation of the microprocessor, in the mid-seventies, which became a key piece for the development and growth of microelectronics. In this way, the origins of ICT are linked to the development of computers, led by the incipient IBM companies,

These advances made it possible to open new fields of innovation in which telecommunications were a sector that developed rapidly (Roldán et al., 2016). Evidence of this is that in 1969 the first industrial electronic switch was created and the following year the digital one was developed, taking a significant step in this direction (Sarduy and Felipe, 2014). These actions led to recent developments, such as fiber optics. Industrially manufactured by Corning Glass in the seventies and in the following years the improvement of the communication network of the United States Department of Defense called Advanced Research Project Agency (ARPA) that would later become what is now known as the internet (Adell et al., 2015).

The above described cemented the bases of technological developments, such as: cell phones, personal computers and personal video and audio devices, automation, and the internet for everyday things, among others (Pinto et al., 2012); which promoted a set of technologies that today are known as ICT (Sarnou, 2015). This led to alternative forms of communication and dissemination, affecting how the individual accesses and gets information currently, which most times comes from multiple sources and formats, generating an additional problem, over information (Recalde, 2015). Thus, the ability to respond and process these large volumes of information, which are currently generated in the networks, is one challenge that the individual must face. Considering the quality and veracity of the information, the greatest difficulty is found in its use and disposition in a logical context, which allows its transformation into accurate knowledge (Hernández et al., 2017).

## IV. ICT IN THE WORLD

Society at a global level has been notoriously affected by the effect generated by ICT in all its dimensions; Social, economic, educational, and cultural transformations have made possible new scenarios where the individual has strengthened all the aspects that have been proposed in search of a more comfortable and stable panorama according to their life expectations (Jin and Cho, 2015). Along the same lines, the production and service aspects have varied dramatically, reaching levels of excellence never seen before, where users and clients receive enormous benefits derived from the advances made in both technology and information (Pérez et al., 2018).

According to studies of various methodologies carried out by various organizations, the most notable influences of ICT at a global level have to do with the universalization of things, because if technologies and the dissemination

of information have grown thanks to known advances , it has been possible to connect the entire world in all areas, fostering increasingly fluid, dynamic and competitive meeting points, which has undoubtedly promoted well-being and socio-economic growth for many communities ( Asongu and Le-Roux, 2017 ).

In matters of particular sectors there are many examples that can be cited, since from the massive systems of transport, health, production of goods and even education programs of all levels, improvements and innovations have been seen that have made it possible to shorten distances, reduce attention times, carry out procedures not contemplated and promote the proximity between cities and interest groups, which has undoubtedly made possible the opening of a virtual society where physical presence is not essential to carry out the developments or processes that are required in certain aspects ( Baldassar et al., 2016 ).

#### 4.1 ICT in the educational context

In the educational context, ICTs have been incorporated in recent years, with special impetus specifically in the teaching / learning processes (De la Hoz-Correa et al., 2014). This has triggered a series of changes in modern society, related to the creation of less rigid learning environments, in which the temporal or spatial location factor is practically ruled out (Cabero, 2010). As shown in Figure 1, ICTs have filled spaces that were previously not contemplated in traditional education.

Under this scenario, it applies to mention the importance of digital natives, a term coined by Prensky (2001), who argues that their thinking structure differs significantly from that of those who did not grow up in today's digital environment. Therefore, this generation of digital natives thinks differently from the rest of the earlier generations. In this sense, for digital natives the experience in using ICT creates new demands in the learning processes, which the educational system strives to meet. The contemporary student uses technology as a basic tool in the personal context and hopes that it will also be so in the educational one (Bello, 2018). However, it should not be expected that all digital natives will know in depth the use of ICT automatically, since their skills and knowledge about technology vary according to the characteristics of each individual (Boyd, 2015).

Since digital natives have greater skills in using technological resources, and that their way of thinking is adapted to a certain extent to these, the teacher becomes a guide whose primary aim is to facilitate the usability of the technological means, for beneficial educational purposes. This use can be understood, in higher education, as the efficient transfer of knowledge that encourages the student to understand and generate new knowledge (Avgerou et al., 2016).

#### 4.2 ICT applications in education

Taking into consideration the postulates cited so far, it has been possible to show that teaching / learning strategies have strengthened to spaces of greater flexibility, innovation, and creativity. Delegating to the teacher designing alternative ways of promoting the appropriation of knowledge by students and of managing multiple means of communication with students (Albion et al., 2015). Figure 1, shown below, outlines what has been previously described.

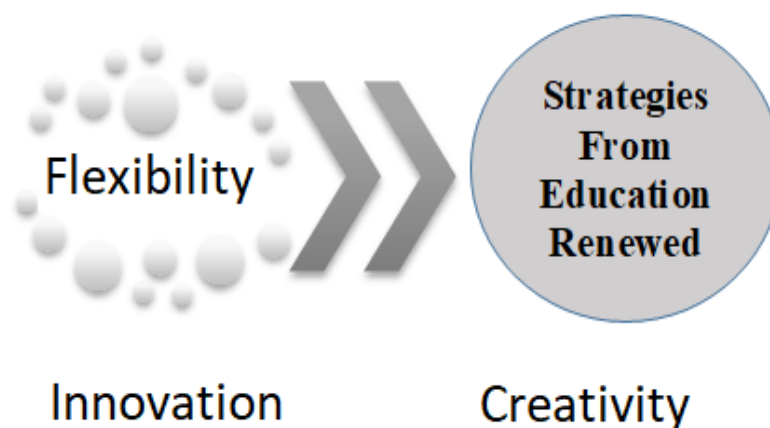


Figure 1 Teaching / learning strategies with ICT mediation (taken from Albion et al., 2015)

As seen in figure 1, the integration in the same plane of aspects such as flexibility, innovation, and creativity, promote a scenario of application of pedagogical strategies much broader than that used until a few decades ago; energizing associated processes and supplying spaces, previously not contemplated, that will ease interaction between the various actors. It is important to highlight that for the strengthening of ICTs in educational contexts, as tools that promote the innovation of teaching processes, the strategies must not only be applied from the pedagogical approach, but they must also generate action scenarios in which appropriation is encouraged. of technologies in the educational model, in the production of digital materials, (Marín et al., 2017).

ICT offers the tools for the creation of such scenarios and enable the design and implementation of new pedagogical strategies. An example of this is the use of Virtual Teaching - Learning Environments (EVEA), operationalized through virtual platforms, which allow interaction between teachers and students around specific content, and using well-defined methods and techniques, to promote skills and generate knowledge meaningfully (López and Hernández, 2016). In this order of ideas, the diversity of devices that currently exist, such as smart phones and tablets, can easily be integrated into this digital ecosystem, to recreate innovative spaces that stimulate learning.

M-Learning (mobile electronic learning) is a space in which the student learns through their interaction with mobile devices, dynamizing their learning process in a real and virtual context (López, 2016). This opens the way to the possibility of using these mobile devices to integrate them into the so-called Personal Learning Environments (EPA) which can be categorized into Educational EPA and Technological EPA, as described in figure 2. Consistent with the graph, the pedagogical EPAs promote self-learning to use web resources. In this way, the student is the protagonist and owner of their learning process, setting up their guidelines and goals. Technological EPAs conceive the learning environment as a platform composed of content and various management and communication tools (Liyaganawardena et al., 2014).

Regardless of the trends, the EPAs promote extra spaces for learning, in which the protagonist of the teaching-learning process is the student. This contrasts with the traditional teaching method, in which the teacher is the one who guides and totally leads the process. This set of possibilities opens the way to new strategies to spread knowledge, providing flexible opportunities and spaces with various advantages for the student (García-Gómez et al., 2016). The implementation of these innovative strategies, based on ICT, supplies a comparative space for reflection based on the analysis of advantages and limitations, see figure 2.

The major advantage of incorporating ICT in the educational environment based on EPA, consists in the generation of greater dynamism and interactivity between teachers and students. In this sense, new channels and forms of communication emerge between the different actors in the educational process, enriching and enhancing the interaction between them (Molina et al., 2015). However, there could be a limitation in terms of the acquisition of mobile technological resources that the student must have to access the EVEA and the learning curve in their use.

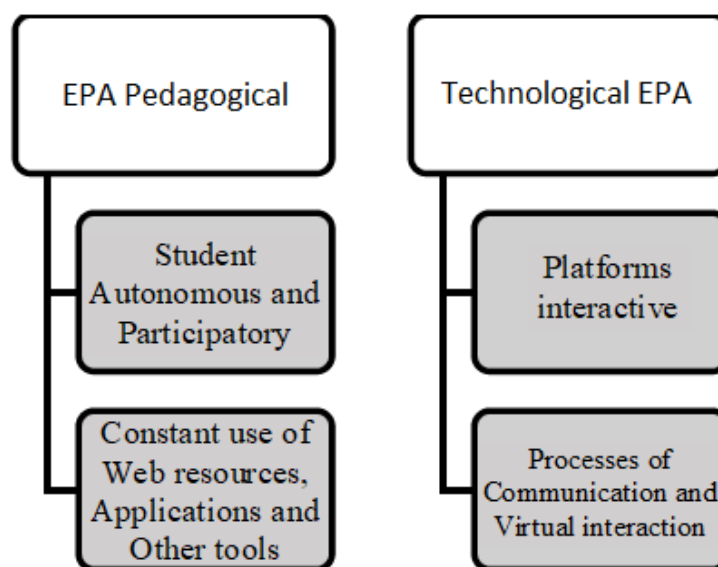


Figure 2 Categories of Virtual Learning Environments (Taken from López, 2016)

Although the use of mobile devices has become popular in recent years as apps are becoming increasingly intuitive in terms of their use alternatives, there are several aspects that can be analyzed and reviewed. It is complex for institutions to subsidize the acquisition of these resources (which have a personal connotation), given the high investment that this implies. It is important to note that incorporating software and equipment to this digital ecosystem is not enough; an adequate strategy is also needed for its implementation in the educational process (Cabero, 2010). Thus, Figure 3 illustrates the aspects with the greatest advantage and limitations that could be based on the guidelines set forth.

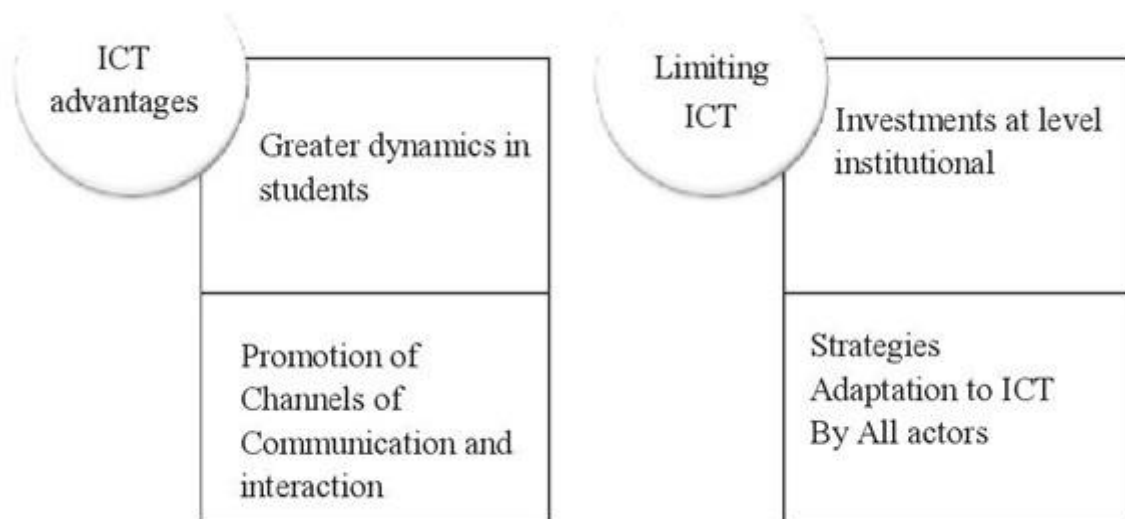


Figure 3 Advantages and disadvantages of adopting EPA-based ICT.

In this order of ideas, ICT should not be confused only with the acquisition or use of technological equipment, which, although it is an important part of the process, implies a greater commitment from the actors involved in the educational act which consists primarily in generating a cultural and structural change in teaching practices (Mac Callum and Jeffrey, 2014). In this sense, the evidence of such commitment must be defined from the design of the strategies needed to achieve an adequate implementation of ICT in teaching processes based on EPA, integrating three key elements or components in the implementations, as seen in the figure 4.

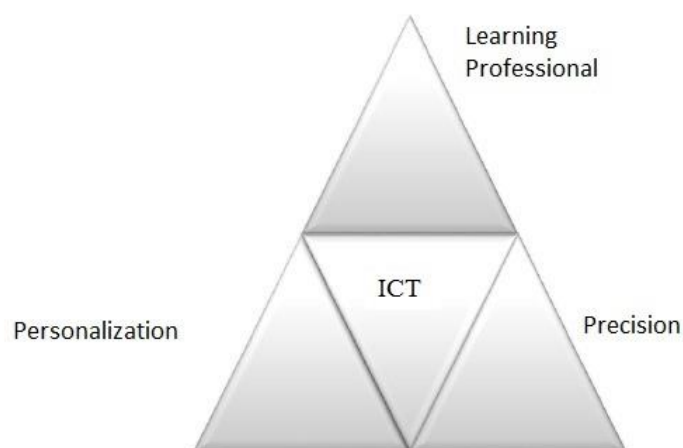


Figure 4 Components needed for implementing ICT based on EPA.

ICT-related studies describe these three components: accuracy, professional learning, and personalization. In the first place, precision refers to the access and proper use of the data and information available, which meets the requirements of updating, security, timeliness, and accessibility, so that the teacher can develop the proper learning

strategies (Castelló and Cladellas, 2013). Professional learning corresponds to the training process of teachers and the updating of the knowledge used in the teaching practices that take place in the classrooms. The above is closely tied to customization. The role of the teacher and his focus of attention, should be focused on keeping his teaching practices updated based on the personalization of learning and incorporating didactic strategies oriented to the learning of each student (Puentes et al., 2014).

However, the teacher is not the only actor who must adapt to this change in basic assumptions; the higher education institution is also part of this commitment, creating the conditions for implementing ICT in training processes, through the revision and change of curricula to incorporate ICT in their development. Giving it characteristics (personalization), which should commit resources for the expansion and improvement of technological assets, stimulate the use of virtual platforms and facilitate interaction between teachers and students, to generate more efficient learning environments (Avello and Duarte, 2016).

## V. CONCLUSIONS

According to the work presented and the results got, it can be said that ICTs have notably dynamized processes in various fields, starting with the improvements inserted in production, health, and transport systems. Aspects such as education have suffered a relevant impact, since with the tools derived from technological processes and information management, it has been possible to promote new knowledge, which stimulates social and economic growth in the society this last aspect is not only observed in the country but at a universal level, for which ICTs are considered as a component of great importance for aspects of general interest.

Thus, it can be seen from the review conducted that the transformation that ICTs have incorporated into educational environments has been comprehensive, since it has not only promoted additional spaces or environments but has also enabled the generation of new knowledge and its diffusion by diverse mechanisms. Aspects such as the are relevant for the impulse of the economy, since if important advances and representation are made in academic environments, they are replicated in the production, service and trade processes that have a direct impact the development of the country, once the professionals graduate from the different institutions and corporations and make all their talents and knowledge available to the community they comprise.

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