DIGITAL CONVERGENCE IN THE COLOMBIAN UNIVERSITY. From XXth to XXIst century

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RESUMEN

La investigación presenta los orígenes de la convergencia digital[4] desde la tecnología educativa, con la educación programada, la evolución, tendencias teóricas y la prospectiva en el contexto universitario colombiano. El período de estudio se enmarca desde el siglo XX, con la tecnología educativa hasta la prospectiva en el siglo XXI, con el reto de integrar las innovaciones tecnológicas, para optimizarla calidad en las funciones misionales, la competitividad, el reconocimiento y la cobertura estudiantil en el nivel universitario. Por tanto, analizamos algunas experiencias de influencia de la unificación de medios y la forma como se pueden beneficiarlas instituciones universitarias dentro del contexto de la legislación colombiana. El método se sustentó en la historia social de la educación con la metodología de la educación comparada. Las estrategias se soportaron en fuentes documentales de legislación, informes y la bibliografía acompañada de proyectos en desarrollo. Se concluye cómo la convergencia digital permite la fusión de las dependencias en Tecnologías de la Información y la Comunicación (TIC) de las universidades, para producir contenidos y servicios académicos, cambios en los hábitos de consumo de información por parte de los sujetos sociales y generar actitudes colaborativas y de aprendizaje autónomo,

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[4]Para este trabajo, es entendida como una mezcla y unificación de innovaciones tecnológicas (en uno o varios dispositivos) que permiten almacenar y acceder a múltiples medios de información, con un potencial de cambio e innovación.

que permiten aportar a los procesos de enseñanza y aprendizaje y a la construcción de conocimiento desde cualquier momento y lugar.

***Palabras clave**: Revista Historia de la Educación Latinoamericana, convergencia digital, TIC, universidad.*

ABSTRACT

This research presents the origins of 'digital convergence' towards a fundamental review on evolution, prospective and basis of "Digital Gathering" in the Colombian university context, due to the technology and education integration challenge in order to improve quality of its mission, competitive standards, recognition and higher education. Every year higher education institutions invest large amounts of money in order to innovate their technological appliances and its teachers' quality, this sometimes may not be a solid evidence of pedagogical improves nor pedagogical transformation in its academy community because of its use, besides, digital technology advance might sometimes represent a variation in subject's culture while having to forget what was once learned in order to re-learn again. Therefore, this document analyses some cases of difficulties while making this "digital gathering of knowledge" and the way in which all higher education institutions can benefit. This research involved a deep review of document sources and advance reports' about projects in development phase, in RUDECOLOMBIA CPTU[5] Education Sciences PhD Program's office framework. "Digital Gathering" is an opportunity to join all areas of Information and Communication Technologies (ICT)[6] at universities for content development and academy services taking advantage of individuals' information necessity in order to stimulate collaborative attitudes and self-learning habits that may add to both teaching and learning processes and knowledge development at any moment and any place.

Key words: *History of Latin American Education Journal, Digital Gathering, ICT, University*

CONVERGÊNCIA DIGITAL NA UNIVERSIDADE COLOMBIANA. RUMO AO SÉCULO XXI

RESUMO

Este trabalho realiza uma revisão sobre a fundamentação, evolução e prospectiva da tendência denominada "convergência digital" no contexto universitário colombiano, devido ao desafio de integrar as tecnologias na educação para melhorar a qualidade de suas funções missionais, a competitividade, o reconhecimento e a cobertura estudantil. Anualmente as instituições universitárias realizam altas inversões em inovação tecnológica e formação docente, que em ocasiões não evidenciam transformações pedagógicas e sua apropriação por parte da comunidade acadêmica. Ademais, as tecnologias digitais ocasionam variações na cultura dos sujeitos, o que implica um desprendimento para voltar a aprender. Portanto, o texto analisa alguns casos de influência da convergência digital e a forma como podem se beneficiar as instituições universitárias. Este trabalho envolveu uma revisão minuciosa de fontes documentais e avanços de projetos em desenvolvimento, no marco do doutorado em Ciências da Educação de RUDECOLOMBIA CADE-UTPC. A convergência digital é uma oportunidade para fusionar as dependências em Tecnologias da Informação e da Comunicação (TIC)[7] das universidades,

[5] T. N. Colombian Pedagogical and Technological University

[6] In Colombian framework, National Estadistics Department (NED) accepted in 2003 the term ICT as: "group of tools, gadgets or communication media such as mobile technology, computers, e mail, and internet that make possible all communications between people or organizations" , National Estadistics Department (NED), *"Metrics of Information and Communication Technologies. Executive Brief"*. (2003). http://www.dane.gov.co/files/investigaciones/tics/tics.pdf (February 12 2013). Also at: Law 1341 2009 (6th article) which defines basic principles and concepts on information society and ICT managment, ICT as "group of tools, gadgets, resources, equipment, software, apps, network or media used in process compilation, of information transitions and backup in: voice, text, images, video or data"

[7] No caso da Colômbia, o departamento Administrativo Nacional de Estatística (DANE) adotou em 2003 a definição de TIC "como o conjunto de instrumentos, ferramentas ou meios de comunicação como a

produzir conteúdos e serviços acadêmicos, aproveitar as mudanças nos hábitos de consumo de informação por parte dos sujeitos e gerar atitudes colaborativas e de aprendizagem autônoma que permitam contribuir com os processos de ensino e aprendizagem e com a construção do conhecimento a partir de qualquer lugar.

Palavras-chave: *Revista História da Educação Latino-americana, convergência digital, TIC, universidade.*

INTRODUCTION

Reflection on the future of Colombian and Latin American universities since digital convergence leads us to consider the feasibility of ICTs[8] in an environment where virtual education has opened a path separate from distance[9] education. We start from the fact that has been discussed elsewhere that, "we cannot currently envisage the university without analyzing the trends of development of this institution within the "knowledge society[10]" that "articulates new social processes, which involve physical and mental spaces, new forms of communication and new actors[11]". Currently, this knowledge-based society must consider where the university is going with a student global population that is estimated for 2025 at 262 million[12] and that in Colombia for December 2011 was established, in total for the 288 institutions of higher education, an

telefonia, os computadores, o correio eletrônico e a internet que permitem comunicar-se entre si com pessoas e organizações". Departamento Administrativo Nacional de Estatística, *"Medición de las Tecnologías de la Información y las Comunicaciones. Resumen Ejecutivo".* (2003). http://www.dane.gov.co/files/investigaciones/tics/tics.pdf (12 de fevereiro de 2013). Na lei 1341 de 2009 (Artículo 6), se define os princípios e os conceitos sobre a sociedade da informação e a organização das TIC, são definidas como "o conjunto de recursos, ferramentas, equipes, programas informáticos, aplicações, redes e meios que permitam a compilação, processamento, armazenamento, transmissão de informação como: voz, dados, texto, vídeo e imagens".

[8] In the case of Colombia, el Departamento Administrativo Nacional de Estadística (DANE) created in 2003 the meaning of TIC (ICT) " as the instruments or tools of communication such as: telephone, the computers, e-mail, and internet; these allow to communicate among people and organizations." Departamento Administrativo Nacional de Estadística, *"Medición de las Tecnologías de la Información y las Comunicaciones. Resumen Ejecutivo".* (2003). http://www.dane.gov.co/files/investigaciones/tics/tics.pdf (12 de febrero de 2013). En la Ley 1341 de 2009 (Artículo 6), in this article it is defined the principles and concepts about the society of information and organizations of ICT group of tools, gadgets, resources, equipment, software, apps, network or media used in process compilation, of information transitions and backup in: voice, text, images, video or data".

[9] The distance Education is the conceptual part that has the disposition to learn since the work at rhythm taking into accounts the different methodologies and ongoing assessment sometimes with a minimum of attendance to the classroom. The difference with virtual education is that at last it works in internet places.

[10] Diana Soto Arango, "La Universidad Latinoamericana. Un futuro en construcción", *en Independencia e Universidade NaAmérica Latina. Tradicoes, Tempos e territórios*, José Rubens Lima Jardilino, Leandro de Proença Lopes, Valéria Andrade Silva (Orgs.)(Sao Paulo: Paco Editorial. Sociedad de Historia de la Educación Latinoamericana, 2011), 193-234. "The knowledge has become in objet of economical, political and cultural challenges, until the societies we can observe in the future are societies of knowledge". Jerónimo Binde, *Hacia las sociedades del conocimiento. Informe mundial de la UNESCO*(París: Ediciones UNESCO, 2005),5. www.unesco.org/publications (25 de mayo del 2010).

[11] Research Project "Universidad y Nación". Research group "Historia y prospectiva de la universidad Latinoamericana. HISULA". Dirección de Investigaciones, Universidad Pedagógica y Tecnológica de Colombia. 2009.

[12] UNESCO, "La Nueva Dinámica de la Educación Superior y la búsqueda del cambio social y el Desarrollo", en *Conferencia Mundial de Educación Superior* (París: Comunicado final, 2009).

enrollment of 1,876,000 students, of whom 54.8 % were in the public sector and 45.2 % in the private. It is recognized that the number of college entrants is deficient and that the government policies aim to extend the same in 2012 by 202,000 and in 2013 by 674,272 so as to achieve the goal of a 50% increase of this registration by 2014 [13]. In addition, it must be said that it lies within the policies of the Colombian State to promote virtual education with the requirement of the use of ICT in all academic programs [14]. On the other hand, the reality is that the institutions of higher education in Colombia (IES) are not isolated from the current information and knowledge society along with the opening of boundaries towards international trends that integrate digital technologies in education. It should be recognized that Colombian universities have made investments in technological innovation that cause change in the culture of subjects. However, in some cases these changes are not reflected in pedagogical transformations and adoption by the academic community.

The main questions that continue to preoccupy us are[15]: To what extent has higher education been the engine of sustainable development within national and international plans? Has this sector lived up to expectations in promoting change and progress in society, and in acting as the primary factor in the construction of future knowledge societies? How can higher education, using digital convergence, contribute to the development of the educational system in general? What are the most significant trends that will shape the new virtual higher education and research areas? How are learning and learners changing to include new forms of virtual learning? What are the new challenges for 'quality' and 'equity' from digital convergence? Are they assimilating technologies such as virtual teaching in a knowledge and information society[16] that leadsto an individuality that fears to engage in personal dialogue in the university? Are the skills necessary to use digital convergence in the teaching and learning processes being developed[17]? Are we inventing a scenario, like our colleagues in the sixties, who asked if TV and tape recorders would replace university teachers?[18]

[13]According to SNIES, SACES, Observatorio de la Universidad. Educational policies Data of Misnisterio de Educación Nacional. 2011-2012. Revisado en webs de septiembre, octubre del 2012.

[14]According to Decreto 1295 of april 20th 2010. Art. 5.8 indica "Disponibilidad y capacitación para el uso de por lo menos los siguientes medios educativos: recursos bibliográficos y de hemeroteca, bases de datos con licencia, equipos y aplicativos informáticos, sistemas de interconectividad, laboratorios físicos, escenarios de simulación virtual de experimentación y práctica, talleres con instrumentos y herramientas técnicas e insumos, según el programa y la demanda estudiantil real o potencial cuando se trate de programas nuevos.

[15]Diana Soto Arango, "Criterios comunes para el desarrollo de una educación universitaria global. Una propuesta latinoamericana", en *Colección Historia y prospectiva de la universidad latinoamericana*, Tomo II **(**Sao Paulo: UNINOVE, Universidad Pedagógica y Tecnológica de Colombia, RUDECOLOMBIA, 2006), 239.

[16] Society of knowledge as the UNESCO states, and has an influence on social and cultural transformations.

[17] The competence of project 6X4 was stablished as a capacity to do an activity. Diana Soto Arango "La investigación y la innovación en los programas de Historia y Ciencias Sociales en Colombia. Una propuesta desde el Proyecto 6X4**",** en *Revista Historia de la Educación Latinoamericana*, Tunja, N° 9, (2007), 203- 230.

[18] To test the movement, the cultural conditions that make it posible, the people who study and its roles, the caracteristics to clasify the period and tendencies that appear and continue to the present. David

These are some of the questions that we pursue via relevant documentation and research into experiences of the influence of digital convergence and how it can benefit academic institutions in Latin America. We organize this investigation in terms of the beginning of educational technology, the rise of programmed education, and then the evolution, theoretical trends, and prospects for technological innovation in the context of the Latin American university. The challenge is to integrate technology into quality education with regard to its mission, its competitiveness, and its recognition and student involvement. We must also bear in mind that the digital technologies cause changes in the culture of the subjects and therefore in the process of unlearning in order to learn again. Our methodology is grounded in the social history of education, using the methods of comparative education. The strategies were supported through documentary sources, legislation and the accompanying bibliography of projects in development, in the framework of the doctorate in Sciences of the Education of RUDECOLOMBIA.

1. Educational technology versus programmed education, on the road to distance education

Educational technology first appeared in the United States during the opening decades of the 20th century. One product of this was 'programmed learning', which was defined as 'the use of tools or machines with a fixed process or method.' Arising from this, early programmed learning was delivered by teaching machines. One of the pioneers of programmed learning was B. F. Skinner (1904-1990). Nevertheless, we must also recognize the contribution of Sidney L. Pressey who, in the State University of Ohio (1920), built a machine for marking examinations that he later developed into a teaching machine. The machine displayed multiple-choice questions. Each item appeared in a small window with three possible responses. If the student got the correct answer, s/he would immediately receive what we would call reinforcement. Pressey's machine was not fully acknowledged in his time because he did not clearly spell out its objectives, as Skinner was to do later.

We must note that Skinner had started his experiments at the University of Harvard since 1931. It is exactly here, in this institution that the methods that he had used in the training of animals were transferred to the teaching of humans under the principle that, 'the teaching of a child and the learning of a rat are similar processes… the organism learns responses that have been reinforced.' Certainly, these studies provided the basis for the 1954 synthesis of his experiments with regard to learning that he presented at a conference on 'The science of learning and the art of teaching' at the University of Pittsburgh, along with a machine for the teaching of arithmetic. Then, in 1970, he published his book, 'The Technology of Teaching' which was used widely in the first degrees in 'Educational Technology' in Colombian universities.

While Skinner was one of the most relevant thinkers in this educational tendency, we cannot leave aside the influence of international organizations such as the International

Portman, *The Universities and the public. A history of higher adult education in the United States*. (Chicago: Nelson Hall, 1978).

Audiovisual Via Satellite Centre (IAVSC), which was a private organization funded by commercial US businesses such as ITT, RCA and General Electric. Furthermore, in his 1963 presidential address to congress, President Kennedy emphasized the importance of this new technology in spreading cultural values to other countries.

Without any doubt, programmed education found an echo all across Latin America. At the National Autonomous University of Mexico, its 1973 Commission on New Methods found that this form of teaching was a pedagogic method that permitted the transmission of knowledge without the direct intervention of a teacher or monitor that suited the specific characteristics of the pupil. More explicitly, it considered that such a program was, 'a sequence of material carefully ordered and organized in a manner that assured the best possible learning for the pupil.'

Similarly, followers of this method such as Gabriel Ofiesh claimed that, 'programmed instruction is the first complete system of instruction to appear in the art of pedagogy.' For this author, the basis was the final behavior. Another opinion was given by Gardener, who considered that programmed instruction, 'is the first valid technological system of education and training that our society has developed.'

Moreover, it is relevant to realize that programmed instruction, framed in behavioral psychology, spread across Latin America in the 1970s with the assistance of AID, the World Bank and the United Nations, which financed programs at all levels, for its training and diffusion. In this decade, voices of protest were raised that this method of education was, 'automatizing and mechanizing for teacher and student, killing off creativity and analytical ability in the student and blocking exploration and discussion between teacher and student.' Also, because of a clear ideological factor that Skinner expressed in his work, some critics, such as Walden Dos, saw him as projecting an ideal society of the future in which, 'his heart belongs to the eternal minority, the intellectual elite and the superior race, while the people are conditioned into incompetence and low capacity.'

There was no uniform picture. A great debate took place in the universities, with other authors appearing on the battlefield with other educational models that analyzed the processes of learning and teaching, with other theoretical concepts, such as the cognitive, as developed by Piaget and Ausubel, based on the fact that, 'knowledge derives from action and to know something is to act on it and to transform it.' In Colombia, critique of the behaviorist educational model, which was associated with the use of technology, was expressed, for example, by José Galat Numer, presidential advisor to Carlos Lleras Restrepo in 1969, who said that education via satellite seemed to him to be a vast plan for the ideological occupation of the continent.

What is certain is that the psychological principles espoused by Skinner in the 1970s regarding the use of the computer as an instrument of control in learning are now familiar as 'the idea of using the computer in the educational process, which had taken form long before the appearance of microcomputers in the second half of the 1970s.'

Precisely this combination led to the take-off in sales of personal computers for educational purposes in the 1980s, given the continuing fall in the price of computers.

We cannot avoid referring to this recent past, from the 1980s, because of the relationship between computing and education, and with the appearance of new technology in the field, with the title of 'computational education'. That is to say, computing has entered the educational curriculum with increasing speed via the appearance of on-line education, which has transformed what can be offered educationally via the Internet.

We can thus suggest that, in the Colombian educational context, curricular flexibility as a mechanism for student mobility in other forms of learning, below an academic one, contributes to the evolution and growth of the internet, hypermedia, multimedia, e-learning, m-learning, Web 2.0 and 3.0, among other applications, that are part of the means or tools that support the teaching and learning of new distance learning programs that are presented on the register of qualifications in Colombia's CONACES.

We can certainly conclude that the passage of time has seen how, 'little by little, these new information and communication technologies are being incorporated into the field of education, generating some new issues, false expectations, prejudices and problems.' Moreover, this complex transition has influenced the investment of time and money, the infrastructure and the qualifications of lecturers and students.

2. The university and its entry into distance education

We could say that, parallel with the discussions of new methods of teaching based in educational technology that developed into programmed learning, the application of the same to university education also emerged. As might be supposed, the entry of educational technology left its mark on the route taken by the institution. For example, significant conclusions were reached at Pacific Northwest Conference on Higher Education[19], which took place in the United States on the 20th and 21st April 1967, the aim of which was to make curriculum proposals for higher education. This conference stated that a university must have: 'Flexible curricula. To develop creativity in the face of the prevailing pragmatism. To develop departments in interdisciplinary ways. To use technology for individualized instruction in order to give professors more time for research"[20].

In the same way, professors of European universities, led by the university of Berlin, met in order to study the mechanisms of collaboration that would enable them to face up to what they predicted would be the third industrial industrial[2122], revolution, with

[19] Robert Dusenbery, *Toward the 21st Century in Higher Education*. (Corvallis: Oregon State University Press, 1967)
[20] Dusenbery, *"Toward the"*, 5.
[21] Roberto Rodríguez Gómez, "Universidad y globalización. Contexto, tendencias y desafíos de la educación superior en América Latina", en *Pensamiento Universitario* (México: CESU,1996),73.

effects on production and on the organization of labor, and in which the university would have the responsibility of providing ways forward.

It must not be forgotten that for Latin America, in the 1960s, a new proposal for universities, thought out and organized by a group of Brazilian intellectuals, led by the first rector in the city of Brasilia, Darcy Ribeiro, 1997[23], was asking, 'Is it possible, in underdeveloped countries, to create developed universities? Can we link universities more securely to the nation so that they take on not only conservative functions, but, on the contrary, act towards positive renewal[24]?' That is to say, from different perspectives, people were looking critically at how the universities could innovate in their curricula and forms of teaching [25].

Combined with the above came the period of university expansion[26] in Europe and the United States and, of course, the situation was not different in Latin America, especially from the 1970s on, when the previously suppressed enrolment of women in university[27]. gathered pace. Without doubt, this situation presented the university education system with problems to which it had no immediate response. One of the most evident was in the training of teaching staff. The fact is that in Latin America the number of university students increased from 25,000 in 1960 to 700,000 in 1994 'without any simultaneous increase in the capacity to train lecturers' and this insufficiency weakened both their pedagogic work as well as their research[28] productivity. In Colombia, the numbers in Higher Education were the lowest in Latin America, with only 8.51%, while countries such as Argentina and Uruguay reached levels of 39% and 42% respectively[29]. These facts made people think about how to increase university access. It was in this way that, in government circles, the idea was established of drawing support from the methodology of distance education, creating a state university using the rudimentary media that were available: written guides, the telephone and educational television, always supported by face-to-face tutorials with a lecturer in each location[30].

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[22] Roberto Rodríguez Gómez, "Universidad y globalización. Contexto, tendencias y desafíos de la educación superior en América Latina", en *Pensamiento Universitario* (México: CESU,1996),73.

[23] In 1956 starts the carree as professor in Etnology en the University of de Brasil, in Río Janeiro. Javier Ocampo López, "Darcy Riveiro: sus ideas educativas sobre la universidad y el proceso civilizatorio de América Latina", en *Revista Historia de la Educación Latinoamericana*, No. 8, (2006): 137- 160.

[24] Ocampo López, *"Darcy Riveiro"*, 152.

[25]Diana Soto Arango, "Criterios comunes para el desarrollo de una educación universitaria global: Una propuesta latinoamericana", en *Políticas universitarias en América Latina*, Tomo II, Colección Historia y prospectiva de la universidad latinoamericana. (Sao Paulo: Ediciones Doce Calles,2006), 225- 242

[26] Gaston Deurinck, "Introduction" *A university of the future. Project 1. "Educating man for the 21th Century*, trad. Gaston Deurinck (Bruselas: Martinus Nijhoff,1974), 188 a 193.

[27] Rosaura Sierra y Gisela Rodríguez, (compiladoras), *Feminización de la matrícula de Educación Superior en América Latina y el Caribe* (México: Unión de universidades de América Latina, 2005), 14.

[28] Galo Burbano López, "La Educación Superior en la segunda mitad del siglo XX. Los alcances del cambio en América Latina y el Caribe", en *Revista Iberoamericana de Educación*, Madrid, OEI,(1999),

[29] In the Higher Education the panorama was terrible, with inscriptions of undergraduate programs and posgraduate programs of 487.448 students in1990.

[30]Diana Soto Arango y Olegario Negrín, "El programa de la UNED de España en Guinea Ecuatorial: Una experiencia universitaria en un país del tercer mundo", *Revista Vía Abierta***,** Bogotá, NO. 5(1990):5-15.

At the same time, we must point out that this is a different perspective on educational technology from locating it as a field of study that is characterized by the design and scientific control of the teaching[31].

We must repeat that at this time, technology and computing coincided in their application to university education in Colombia. It is well known that these fields have developed in such a manner that today's knowledge is out-of-date tomorrow and perhaps our educational media do not advance at the same pace as our socio-cultural customs and concepts.

Ultimately, the good intentions of the institutions in the utilization of technology in the university sector focused on: a) improving the quality of learning; b) offering students the life skills in information technology that they would need in work and everyday life; c) increasing access to education and training; d) responding to technological imperatives; e) reducing the costs of learning, and f) improving the cost-efficiency relationship in teaching[32].

It must be said that digital technologies are entering the market, promising a new model of university with continuous services and information available at all times, as well as a speeded-up bureaucracy[33]. Results have manifested themselves as a proliferation of on-line programs with an effect on culture and education. However, it would seem that it is the 'educational market' that has been given primacy in the application of technology, and this has permeated the university's sense of mission with little reflection on its ethical values or the quality of higher education[34].

On the other hand, it is clear that, 'since the invention of the printing press, no innovation has had such an impact on education, and especially on higher education.'

3. Investigation and innovation towards digital convergence

In the first instance, and in order to approach a conceptualization of digital convergence, it is relevant for us to look at the origins and evolution of its significance, together with an analysis of the social aspects of the transformation involved. Starting from a classic notion of the definition of terms, we understand that "convergence" means 'the union of two or more things that flow together at the same point"[35] and the word "digital" refers

[31]Manuel Área Moreira, *Los medios y las tecnologías en la educación* (Madrid: Ediciones Pirámide, 2004), 31.
[32] Tony Bates, *Cómo gestionar el cambio tecnológico: estrategias para los responsables de los centros universitarios* (Barcelona: Gedisa, 2001), 35.
[33]Sergio Ortega Santamaría, "La nueva e-universidad. Estrategias de comunicación en los portales universitarios", *Revista Académica del Foro Iberoamericano sobre Estrategias de Comunicación.* Año III, No 6, Mesa III (2007): 19- 34.
[34]Susana Finquelievich y Alejandro Prince, *Universidades y TICs en Argentina*. *Las universidades argentinas en la sociedad del conocimiento*. (2005): http://www.scribd.com/doc/4940962/Finquelievich-y-Prince Las-Universidades-Argentinas-en-la (20 de Noviembre de 2011).
[35]www.wordreference.com, *"convergencia".* http://www.wordreference.com/definicion/convergencia(27 de Febrero de 2012).

to the change from analog electronics to digital[36]electronics. An approach to the conceptualization and characteristics of digital convergence requires us to review the different theoretical trends involved.

From an entrepreneurial perspective, Meir Finkel conceives digital convergence as, "the meeting of technological innovation with political, social, economic and cultural transformation that leads to the unification of means of capturing, storing, updating, processing, transmitting, distributing, consulting and selling information drawn from multiple sources, devices and appliances[37]."

On the other hand, Alfonso Vázquez Atochero defines it from what he calls an 'iberanthropological' stance. In these terms, with a humanistic vision in which technology is applied to human well-being, he states, 'Digital convergence aims to collect all the functionalities developed by technological industry in recent decades in order to produce increasingly sophisticated devices and, in a short space of time, will offer less complex, more humane [38]solutions to our problems.' A perhaps more instrumentalist position suggests that, 'digital convergence represents the possibility of accessing different media and technologies via a single device.' [39] Cindy F. Salomon, however, taking account of the effect on people's work, states that, 'digital convergence substantively affects our personal lifestyle and style of work. It transforms telecommunications, computing, internet use, the media, electronics and service industries to create new ecosystems and sets of values[40].'

Others, such as Harry Strausser, see it as a question of applications for communication and, for this reason, they focus their conceptualization on telecommunications, the internet, media, electronics and entertainment[41]. Digital convergence is characterized by digital writing, hypertext, multimedia, hypermedia, cyberspace, media, e-learning [42] and "the human desire to be connected with each other." [43]

[36] The analogic electronics uses "Electric signs that change in a variable and continue way". The digital electronic uses electrical signs that can take finite elements, normally 0 and 1" (bajo o alto). According to José Roldán Viloria, *Automatismos y cuadros eléctricos* (Madrid: Editorial Paraninfo, 2004), 203.

[37]Meir Finkel, *Convergencia digital*, http://www.slideshare.net/meirfinkel/convergencia-digital (12 February, 2012).

[38]Alfonso Vázquez Atochero, *Ciberantropología: cultura 2.0* (Barcelona: Editorial UOC, 2008), 25.

[39] The Hermeneutic Cgp, *Convergencia digital: una unión de conocimientos tecnológicos*, http://hermeneuticoscgp.blogspot.com/2011/03/convergencia-digital-una-union-de.html (17 de Enero de 2012).

[40][Mitraducción] original in English "Digital Convergence substantially impacts our personal lifestyle and work style! It transforms Telecommunication, IT, Internet, Media, Electronics and Services industries creating new ecosystems and value chains". Cindy F. Salomon. *WhatIs Digital Convergence?* (2010) http://www.slideshare.net/CFSolomon/what-is-digital-convergence(10 de febrero de 2012).

[41]Harry Strasser. *Digital convergence*, http://www.digitalconvergence.eu/ (10 de febrero de 2012).

[42]Meir Finkel.*Convergencia digital* (2010), http://www.authorstream.com/Presentation/meirfinkel-330259-convergencia-digital-new-tecnology-education-ppt-powerpoint/ (20 de Febrero de 2012).

[43]Planning De Ogilvy Latina,*¿Cómo vivimos la convergencia digital de hoy?* (2006) http://www.laflecha.net/canales/comunicacion/noticias/200607211 (27 de Febrero de 2012).

1.1 Figure 1. Digital Convergence

Source: Harry Strasser. Digital convergence, http://www.digitalconvergence.eu/ (10 February 2012).

Thus, digital convergence does have common ground with regard to the theories that analyze the term, indicating the varied use of information technologies. However, there are also differences in the uses given to them. Other voices, from a more critical point of view, suggest that digital convergence is just another fashion, a product of advertising and the consumer society. Followers of technological innovation respond that the use of digital technology is a present-day necessity and part of everyday life for users who make up (as we do) the information- and knowledge-society.

For our part, we understand digital convergence to be a mixture and unification of technological innovations (in one or more devices) that allows for the storage and access of information in various media with a potential for change and innovation. What is relevant to the field of university education is that this is regarded according to the principles of ethics and civic values. We believe that this is what will allow the transformation of teaching and learning processes and the construction of knowledge through different communicative competencies[44]. More explicitly, outreach to students through virtual education presents individual problem situations that need to be attended to in order to reach the goals of a more equitable and egalitarian society, including the principle of the unity of men and women, through their differences and complementarity, in solidarity with each other[45].

Another aspect of this social transformation is in reference to the fact that the complex interactions between the mass media (radio, press, television, cinema, hypermedia[46],

[44]The competences wew analized so far by the Program 6X4. Diana Soto Arango, "La investigación y la innovación en los programas de Historia y Ciencias Sociales en Colombia. Una propuesta desde el Proyecto 6X4**",**en *Revista Historia de la Educación Latinoamericana,* Tunja, N° 9, (2.007): 203 -230

[45] The papers by Roger Chartier about the history in the reading skill. See specially the following texts in spanish: *Historia de la lectura en el mundo occidental* (Madrid: Taurus, 1998); *Libros, lecturas y lectores en la edad moderna* (Madrid: Alianza, 1993); *El mundo como representación: estudios sobre historia cultural*(Barcelona: Gedisa, 1995); *Cultura escrita, literatura e historia: coacciones trasgredidas y libertades restringidas, conversaciones de Roger Chartier* (México: FCE, 1999).

[46]The possibilty to adapt the same graphic to the user account, and the multimedia elements.

videogames and others) transform reality. In this way, 'mass is converted into public opinion and beliefs that lead to life in a world of illusion, myth and magic[47]'.

In the same way, we must mention the collective construction of knowledge through the Internet. This cannot be seen as a simple, static repository of information, but as a meeting place where groups (social subjects with common interests) converge, and the real users are those who collaborate and interact with each other in order to generate information. This vision of collective knowledge has guided the development of applications to be found on the internet and their free use, which is what gives an opportunity for access to, and use of, ICT to members of society excluded by an economic divide.

Another aspect is connected to the market that has developed through ICT. The reality is that people find themselves immersed in a culture and counter-culture of technological convergence. For example, at the beginning of the 1970s, computer programs were seen as a form of future income and companies started to sell software as items of value. Thus, universities fail to receive the source code for the programs being used by their research groups and students, because the software authors perceive the possibility of profit. This is how the concept of proprietary software emerged, where the author receives a fee for its use (licenses) and remains the only person authorized to modify the programs (whenever that seems profitable).

As is well known, the above brought with it consequences in the form of changes of platform and optimization of systems, which caused economic barriers as well as the cutting off of some cultures from access to knowledge. Users who could not access these programs sought strategies to counter the problem. One example is the counter-culture movement, 'Free Software', which advocates user freedom to copy, run, distribute, study, change and improve software, adapting it to their needs.

Finally, quite clearly, another aspect to consider regarding digital convergence is, without doubt, the progress made in electronics that allowed the advance of 'informatics'. This last term was coined in France in 1962 as a contraction of the words 'information' and 'automatic.'[48] We should state that it was originally used to mean the completion of tasks by machines (automatons), but it is now understood as, 'the science that deals with the conception, realization and use of systems and structures that process information[49].'

Lastly, telecommunication[50], which can be defined as 'communication at distance', refers to the bidirectional sending of messages and includes those technologies that have

[47]Jesús Martín. Barbero, *De los Medios a las Mediaciones, comunicación cultura y hegemonía* (Barcelona: Anthropos Editorial, 2010), 31.
[48]Carmen De Pablos Heredero, et al, *Informática y comunicaciones en la empresa* (Madrid: ESIC Editorial, 2004), 14.
[49] Miguel Hernández González y José Luis Prieto Pérez, *Historia de la Ciencia. Volumen II* (Tenerife: Fundación Canaria Orotava, 2007), 245.
[50]It is a Word divided in two: One from grec, *tele*, that means faro r distance and the other from Latin that meand *communicative*, it means communication to put in common. Antonio Ricardo Castro Lechtaler

developed since the telegraph, such as radio, telephones, television, computerized communication, combined with advances in satellite communication, fibre-optics and the internet, among others. In addition, communication can be defined as 'the imparting, sending or exchange of information between different entities[51].' Moreover, the emergence of telecommunications, especially the internet, has brought about new ways of transmitting, disseminating and reporting that have transformed people's daily life.

For the International Telecommunication Union (ITU), at an international congress held in Madrid in 1932, telecommunication was defined as 'any transmission, emission or reception of signs, signals, writing, images, sounds or information of any nature by wire, radio, optical or other electromagnetic systems.' [52] Currently, in terms of distance communication we encounter the transmission of data, voice, images and video.

We could conclude that these advances allow for the digitalization of any information, for the provision of services, for networking and, in this case, for the support of educational processes in academic institutions.

3. Experiences of digital convergence

For the development of the digital world in the university context, we start from the premise that the whole society is immersed in information that it generates and transmits by whatever means are available. Thus, any changes or innovation in the systems used to organize, store, send or receive it make up part of digital convergence. Nevertheless, the manner of accessing that information takes two forms: the formal, in accord with the globalized world, representing culture; and those excluded from that world, who seek access via the use of technology.

With regard to research that demonstrates scientific interest in generating scenarios of digital convergence in the university context, we focus on a number of leading institutions in this community which need to be included as far as advances in technological development are concerned. We then analyze some new research projects in Iberoamerican universities.

First, in an international context, and based at a number of Spanish universities, we have the project, 'Campus for Digital Convergence CONDICAMPUS', presented by the Unversity of Alcalá de Henares, The National University of Distance Education (UNED), and the Higher Centre for Virtual Learning (CSEV). The aim here was to modernize and internationalize these universities. The project was based on three axes: 'information and knowledge in the network society through the creation of a Center for Digital culture analysis; Spanish in digital intercommunication and as a language of

y Ruben Jorge Fusario. *Teleinformática para ingenieros en sistemas de información* (Barcelona: Editorial REVERTE 1999), 598.

[51] Enrique Herrera Pérez, *Introducción a las telecomunicaciones modernas* (México: Editorial Limusa, 2004), 21.

[52] Aníbal Raúl Figueiras Vidal, *Una panorámica de las telecomunicaciones* (Madrid: Pearson Educación, 2002), 31.

culture, but also as a language of science; and program implementation, which considered population, environment and citizenship in a global society.' This experiment demonstrates the aim of universities to undertake innovative projects in research and training activities.

The second example presents innovative work on digital convergence and education in some research activities carried out by universities into educational environments in e-learning, and specifically m-learning, where processes of change towards digital convergence were evidenced. Special mention should be made of the underpinning of ontology in virtual laboratories in computer engineering. This work shows the process of creating Virtual Laboratories, which first involved designing a structure and characterization of conventional laboratories, then creating a formal specification based on ontology[53], and finally creating a platform for real learning. The principle is to innovate through the unification of web media (virtual labs), as a change in traditional learning environments[54], as a way of optimizing resources and educational processes and in this way establishing the relationship of digital convergence.

A third piece of research, the product of a doctoral thesis at the Open University of Catalonia, refers to: 'Technology, economy and the university: An analysis of the effects of information and communication technology on the economic efficiency of virtual universities[55].' In this case, the process examines the transformation of the universities of members of the Organization for Economic Cooperation and Development (OECD) over the last two decades, specifically the parameters of their evolution towards the concept of a networked university and its interaction with the adoption and diffusion of ICT in teaching and university management. The findings regarding the relationship of digital convergence are given by e-learning, as an alternative in methodology and costs that differs from traditional structures implemented in the university sector.

why digital materials were introduced into university teaching, particularly with regard to the study of the design and creation of digital teaching materials. The study's findings extend knowledge about the elements and dynamics of the integration of technology into the classroom, beyond mere snapshots and establish a framework for teacher reflection on the articulation of their teaching beliefs and the possibilities that ICT

[53] "Las ontologías son un medio para representar las construcciones mentales (abstracciones) creadas por un ser humano" José María Cavero Barca, Belén Vela Sánchez, Esperanza Marcos Martínez, *Aspectos filosóficos, psicológicos y metodológicos de la informática* (Madrid: Librería-Editorial Dykinson, 2005),103.

[54] Josep Prieto Blázquez, "Caracterización y especificación basada en ontologías de los laboratorios virtuales en las ingenierías en informática" (Tesis de doctorado en la Universidad Oberta de Cataluña, 2008) http://openaccess.uoc.edu/webapps/o2/bitstream/10609/1474/1/tesi_jprieto.pdf(11 de Octubre de 2010).

[55] David Castillo i Merino, *"Tecnología, economía y universidad: análisis de los efectos de las tecnologías de la información y la comunicación sobre la eficiencia económica de las universidades virtuales"* (Tesis de doctorado en la Universidad Oberta de Cataluña, 2004) http://www.tdx.cat/bitstream/handle/10803/9116/Tesi_dcastillo.pdf?sequence=1 (13 de Octubre de 2010)

offers. Evidence was found of cultural changes in the lecturers' style of work, leading to new attitudes regarding the use of digital technologies.

A fifth investigation, which incorporated the use of mobile technology in primary education, was carried out at Mexico Metropolitan University. Small digital devices were used to monitor their use and acceptability, with content aligned to the subjects being studied[56]. The objectives in the area of Spanish were to develop the children's spoken and written communication skills; in mathematics it was reasoning and understanding texts in order to solve problems and learn to link their knowledge with the world around them.

The sixth study, 'Cellular phones used in education with ICT', took place in 2008 in Zamora, Buenos Aires, Argentina. The project's objective was to study the use of mobile phones as an educational resource. The findings show that, with proper management, mobile technology supports a high degree of creativity and innovation, in line with the social parameters of the XXI Century. Although these investigations were in non-university contexts, they show the adaptation and use of devices in which different media converge in order to influence educational processes positively.

The seventh study we selected took place in Venezuela, with the use of cellular technology as a means of mass communication[57]. It observed student behavior in cell phone use and sought to determine rules and restrictions for their proper use, based on the following problem: "The widespread use of mobile technology in pornographic photos and videos, taken by students, generated controversy among their teachers regarding the use of mobile phones within educational institutions because it also creates distraction which reduces student attention in class." This shows that the convergence of technologies also creates drawbacks which must be better understood through scientific research.

The eighth piece of research was carried out by the University of Colombia. "A model for speaker identification in context, Global System for Mobile Communications (GSM) and its application in Colombia". This study used ICT in the shape of a transmitter and telephone, by which means a speaker and/or teacher helped with the dissemination of issues in digital books, aimed at Asilah Carlos Vásquez School, (Dragal Lane, the municipality of Algeria, Antioquia) to support students who did not have sufficient library resources. The author concluded that it was possible to improve the academic level of the students of the school, which will be then benefit the social context in which students are working and developing their daily activities. It combined various media to transform study habits adapted to educational communities.

[56]A small devide that can be mixed with the computer Dispositivo de pequeño tamaño que combina un ordenador, teléfono/fax, Internet.

[57] Anthony Barreto, Luis Arias y Jorge Petit, *"Uso de la tecnología celular como medio de comunicación masivo"* (2008) http://www.monografias.com/trabajos62/telefonia-celular-medio-comunicacion-masivo/telefonia-celular-medio-comunicacion-masivo2.shtml (20 de Junio de 2011).

We now highlight a ninth experiment that was conducted in the Colombian national context, under a research project into the criteria required for the construction of virtual educational settings, as a convergence of traditional scenarios, based on technological mediation. This first exploration of cooperative and collaborative virtual learning environments achievedof the provision of spaces in which there was the development of individual and group skills during the development of new learning. Of particular relevance was the fact that the project managed to involve students located in different regions of Colombia. In this case, each student was responsible for their learning[58], but in turn also responsible to the other members of the group. Results of the research demonstrated how digital convergence and its application permitted changes in the learning process, emphasizing the collective. Moreover, these results indicated that the use of virtual environments (convergence and innovation through educational processes), managed to reduce the isolation of the student (a major drawback of the distance education model) and activate processes of self-directed learning and autonomy (act as pedagogical models that contribute to the development of educational virtual environments), which transcend individual dynamics and project into collaborative group work such that learning is established based on the conjectural.

Finally, the state of the art of the Grid, developed by Oscar Giovanni Medina Alfaro[59], indicates that computational grids[60] have the same advantages as distributed systems, such as fault tolerance, resource sharing, parallel processing, etc. What makes it different from distributed systems is that such features are in multi-level institutions, and thus enable the management of geographically distributed resources. This study showed that computational grids can transform work habits that benefit research processes and the management of services information in universities. In short, in these nine experiences, plus the state of the art, we see how university systems, learning environments, models and methodologies, traditional educational attitudes and habits, migrate to digital systems with innovations in electronics, telecommunications and / or software for progress towards changes that streamline and digitize information, and thus extend outreach and enter the knowledge economy.

Thus, research has demonstrated the interest of scientific knowledge in the university context in generating scenarios of digital convergence. We believe that these institutions are located as leaders of innovation in teaching and learning process supported by digital technologies.

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[58] Carlos Andrés Pérez, *"Herramientas Computacionales para la generación de Multimedia Educativa", Revista TEA (Tecne, Episteme, Didaxis)*. Universidad Pedagógica Nacional. Vol:3 fasc: 6 (2005): 20 - 26

[59] Oscar Giovanni Medina Alfaro, *El estado del Arte del Grid* (2011). http://www.google.com.co/url?sa=t&rct=j&q=Investigaciones+sobre+la+grilla+computacional&source=web&cd=8&cad=rja&ved=0CGIQFjAH&url=http%3A%2F%2Fpegasus.javeriana.edu.co%2F~CIS1010SD01%2Farchivos%2FAnexo2.docx&ei=ydwaUbWkJYGc2QXI3YDQAw&usg=AFQjCNHgJnJm-8nJWW8kjO7tk7RdqAN4Jw

[60] The systems grilla is: "Aplicación de recursos computacionales de varias computadoras en la red para un problema único, grande y complejo". Kenneth CLaudon y Jane Price Laudon, *Sistemas de información gerencial: administración de la empresa* (México: Pearson Educación, 2004), 192.

Similarly, it can be concluded that some universities have projects and partnerships in different countries, to share learning resources, virtual campuses and communities, customized training and knowledge management[61], together with the constant creation of innovative services[62], seeking to place institutions at the forefront of technological leadership and add value to their teaching, research and management.

Other actions include the promotion of free software[63], open systems, work[64] with various technology platforms, the creation of innovation labs with developments in content and assignments adaptable for different devices and electronic media (MP3[65], e-book, audio book and video book), as well as virtual[66] reality and augmented[67] reality projects, along with more accessible, flexible and socially oriented academic services for different users spread around the world. Ultimately, the above shows the path taken by the university sector towards technological and media convergence.

4. A sketch of the evolution of digital convergence in the Colombian context

In order to understand the use of ICT in Colombian universities, we have to start with distance education as a historical period when social communication media, information technology and educational technology were established. As early as 1982, with Decree 2412, the Council for Open and Distance[68] Education was inaugurated, responsible directly to the President of the Republic[69]. In less than a year, conceptual changes were introduced and the need for meetings established. There was total government support for this new educational model, establishing government facilities and radio and

[61] The following information was taken by Universidad Oberta De Cataluña, insttution that is important internationally because of the ICTs in the education.

[62] "Conjunto de técnicas, herramientas y prácticas que persigue la creación, distribución y almacenamiento y aplicación del conocimiento tanto en el seno de una empresa, como dentro de una red de empresas" Joaquín Alegre Vidal, *La gestión del conocimiento como motor de la innovación: lecciones de la industria de alta tecnología para la empresa* (Castellón de la Plana:Universitat Jaume I, 2004), 48.

[63] "Es aquel software, producto o desarrollo a medida, que se distribuye bajo una licencia, según la cual el autor cede una serie de libertades básicas al usuario en el marco de un acuerdo de concesión". José Ángel Martínez Usero y Pablo Lara Navarra, *La producción de contenidos web* (Barcelona: Editorial UOC, 2007) ,15.

[64] "lo que significa que se diseñan sobre protocolos estándar que permiten combinar equipamiento y software de diferentes vendedores", María Isabel Alfonso Galipienso, *Ingeniería del software. Séptima Edición* (Madrid: Pearson Educación, 2005), 242.

[65] Es un formato de sonido, (MPEG audio layer III), que es el formato comprimido (de) calidad casi de CD". Sara Osuna Acedo y Carlos Busón Buesa, *Convergencias de medios: la integración tecnológica en la era digital* (Barcelona: Icaria Editorial, 2008), 157.

[66] "Es la manipulación de los sentidos humanos (tacto, visión y audición) por medio de entornos tridimensionales sintetizados por computadora en el que uno o varios participantes acoplados de manera adecuada al sistema de computación interactúan de manera rápida e intuitiva, dejando como real el entorno generado por la computadora". Enrique Ruiz Velasco Sánchez, *Educatrónica: Innovación en el aprendizaje de las ciencias y la tecnología* (México: Ediciones Díaz de Santos, 2007) ,12.

[67] "Consiste en añadir gráficos virtuales, en tiempo real, al campo de visión de una persona. Su finalidad es superponer al entorno real la información que interesa visualizar", Begoña Gros et al., *Videojuegos y aprendizaje* (Barcelona: Grao, 2008), 143.

[68] El Decreto 2412 de agosto 19 de 1982 reglamenta la educación abierta y a Distancia en Colombia y la define en el artículo 1, como " el conjunto de actividades y programas de carácter temporal o permanente, formal y no formal, que adelanten las instituciones facultades para ello por las autoridades estatales competentes, de acuerdo con planes de formación o capacitación, total o parcialmente desescolarizados"

[69] Decreto 1820 de junio 28 de 1983, artículo 2.

television programs for open and distance learning[70]. But we should note that since 1974 the University of Antioquia had implemented what this institution called the University Deschhooling. Supported by contemporary legislation, the first Colombian universities with distance learning programs employed the use of correspondence, print modules, TV and telephone, without abandoning classroom tutoring, as practised by the Open University in Spain, which was one of the models used in the first state university at distance in Colombia[71].

We can say that the expansion of this educational mode surpassed expectations. This was doubtless influenced by Decree 2277 of 1979, which established 'as mandatory, the mode of distance education as one of the mechanisms of Colombian teacher training' (art. 45). A boom in teacher training was the order of the day. Even today, we still see universities that have tripled their number of students in distance mode[72]. Of course, we should also note that some universities have tried to make the move to virtual education, leaving behind the face-to-face support. In these cases, as in Boyaca, enrollment fell totally in the distance mode. This leads us to conclude that the move to virtual education entails socio-cultural changes in some regions.

Indeed, the thesis of Edith González[73], gives us some answers regarding the historical journey of distance education in Colombian universities. The author asks: 'What pedagogical models have oriented teacher-training for distance education and virtual learning environments in the Javeriana and Antioquia universities during the period 1974-2002?' [74] Her research distinguishes three stages: the first characterized by written modules, conventional mail, telephone and television. The second features some technological mediation (hypermedia), and the third the use of internet and educational platforms, indicating the use of technological media in recent years. One relevant conclusion is that the implementation of virtual learning environments requires care regarding quality, openness and flexibility. In another study by Carlos Patiño, considers that:

> *'Institutions of higher education, for their part, have not all experienced the convergence process in the same time period, so that their heterogeneity and complexity have incorporated these scientific and technological changes on different time scales. These disparities have led to problems of quality and*

[70]Decreto-Ley 22 de 1983, artículo 26.
[71], Diana Soto Arango y Olegario Negrín. "El programa de la UNED de España en Guinea Ecuatorial. Una experiencia universitaria en un país del tercer mundo", 5-15.
[72]For example in the University of Tolima, in 2012 presented 12 students and 42.000 tousand t distance.
[73] Edith González Bernal, *"Formación del tutor: para la educación a distancia y los ambientes virtuales de aprendizaje en la Universidad Colombiana, 1974-2002"* (Pontificia Universidad Javeriana, 2006), 16.
[74]Edith González Bernal, *"Formación del tutor: para la educación a distancia y los ambientes virtuales de aprendizaje en la Universidad Colombiana, 1974-2002"*, 18.

> *relevance at undergraduate and graduate levels that affect the research capacity of the country.'*[75]

Added to this is the fact that technological innovations are slow to be taken up in educational processes. The progress report for the first half of 2007, from the Use of Media and New Information and Communications Technologies, revealed high levels of access to computers and internet in Colombian higher education institutions. Also, virtual education was present through broadband and through the introduction of Digital Terrestrial Television (DTT), the latter with its advantages of multichannel reception in mobile or portable devices and interactivity with the content. [76]

Also, we should note that some universities are creating some digital convergence scenarios by mediating open virtual content via participation in the National Bank of Learning Objects, linking to regional networks and through them to the National Network of Advanced Technology (RENATA), thus accessing services such as the transmission of live events. Other cases involve accessing college radio stations (56 in the country in March 2013), some of which can be heard online, and participating in the university TV channel, "Zoom".

Another medium used in Colombian universities is the university internet channel. The expertise of Channel "Prism TV" at the National University of Colombia is recognized. Others take things further, for example the " Penthouse Center " at Javeriana Pontifical University, which sets out to:

> *'... support academic units and external agencies in training, research and development of image projects (film, video, television, digital and electronic art design), audio and acoustics (radio and sound), assisted education and Information & Communication Technology, advising and encouraging the creation, experimentation, innovation and implementation of proposals.'*[77]

Other universities have websites that include multiple online services (administrative rather than academic), and have social networks that demonstrate the growth of a digital environment for content and services, focused primarily on the Internet, in order to be available through mobile devices. Moreover, this visibility is measured by the results of the Ranking Web of World Universities: Webometrics[78], issued by the Cybermetrics

[75]Carlos Patiño Millán, "Apuntes para una historia de la educación en Colombia". http://www.scribd.com/doc/35036644/APUNTES-PARA-UNA-HISTORIA-DE-LA-EDUCACION-EN-COLOMBIA (20 de Noviembre de 2011).

[76]Ministerio de Educación Nacional, *"Informe de Avance Primer Semestre 2007. Programa de uso de medios y nuevas tecnologías de información y comunicaciones"* (2007) http://www.colombiaaprende.edu.co/html/mediateca/1607/article-167890.html(21 de Noviembre de 2001).

[77]Centro Ático. "Razón de ser" http://puj-portal.javeriana.edu.co/portal/page/portal/Centro_Atico/presentacion1/razon_objetivo (15 de noviembre de 2012).

[78] Sitio Web: http://www.webometrics.info/es (Ranking Web de Universities Colombia, november 2012).

Laboratory, which belongs to the National Research Council of Spain (CSIC), Spain's major national research centre. In these measurements, visibility corresponds to a new indicator called Impact, which has a value of 50% in calculating ranking and refers to the amount of incoming links (inlinks) the university web site has.

Regarding those Colombian university students called Digital Natives, they demonstrate a need to communicate and interact through these means, partly for entertainment purposes (listening to, or downloading music, social networking, and other hobbies.) Therefore, our question for the universities is, 'What are the expectations, and what educational experiences, can innovative digital convergence offer these digital users? Since the formulation of CONPES 3072, in 2000, the state is looking for an enabling environment for ICT take-up, which for 2011 is lagging significantly behind other countries[79] in the region in the use of the internet and computers.

On the other hand, as has been stated in this paper, there are two scenarios in the context of universities that will allow them to move towards convergence: Scenario 1: Merging ICT units of the University to produce content and academic services. From the technological standpoint, the digitization of any information (data, audio, image, video), its distribution over the Internet at higher speeds, and wireless technologies are driving the trend to bring all media together in one device. Therefore, universities tend to integrate or merge their ICT needs (radio, television, digital design, virtual education, virtual libraries, etc.) in order to combine technological and financial efforts to maximize their capabilities and ways to disseminate and produce interactive content and quality products and services, making traditional and isolated functions complementary in order to respond to the new demands of the educational community. It should be noted that some tend more towards academic and administrative purposes, but the ideal is to focus on educational uses.

Scenario 2: Here, the aim is to benefit from changes in information consumption habits on the part of academic communities. As the University expands its portfolio of academic content and services (from hypermedia into cloud computing, which may be accessed from anywhere and by one or more devices (smartphones and / or tablets, which are falling in price), and given that such educational and informational resources are attractive to the educational community[80], this will increase their tendency to routine access (ownership), being both beneficiaries and protagonists in their uses, that:

> *' . . . may have more and more varied options to choose from, with the addition of an increasing move towards personalization, demanding- and getting-bundles and services dependent on your own aptitudes and personal needs, and as a function of time, space and location. At the same time, the already mentioned permeability will tend to increase competition, with an expected reduction in*

[79]Ministerio de Tecnologías de la Información y las Comunicaciones. "Vive Digital Colombia. Versión 1.0" (2011) http://vivedigital.gov.co/files/Vivo_Vive_Digital.pdf (21 de Noviembre de 2011), 11 -13.

[80] "Se utiliza para definir a un sistema informático basado en internet que permite gestionar archivos y aplicaciones sin necesidad de instarlas en la computadora" Virginia Caccuri, *Computación para docentes* (Buenos aires: Fox Andina, 2012), 270.

> *costs and prices of benefits and services. And, as a last attribute favorable to consumers, it includes the growing possibility that they are also providers, contributing their own content, ideas and solutions to the Net.'* [81]

Therefore, from an educational point of view this will enhance collaborative behavior and interaction with other students, teachers and cultures on a daily basis, as all participate through the fusion of digital media in order to build knowledge.

Digital technologies are paving a path of convergence of technologies (microelectronics, and telecommunications) which has allowed the digitalization of any type of information, and the provision of services and networking, but it is in building a broader stage, with digital convergence allowing multiple media to converge into a single device, which should be engaging universities.

The application of technology in education and universities also involves a journey, a greater degree of ownership and development of digital convergence scenarios (television, radio, hypermedia, multimedia, e-learning, m-learning, web 2.0, 3.0, etc.), which they should continue preparing through policies, infrastructure and training in new skills in the fusion of digital media for their academic community.

It is of vital importance in the preparation of university teachers that they are sensitized to the use of digital convergence and able to develop virtual environments of an educational quality that is required at university[82] level. The need to be connected should be used to create educational change through collaborative attitudes and autonomous learning that enables lifelong learning and knowledge-building from any time and place.

However, we cannot ignore state policies on the use of virtual environments which are established in Decree 1295 of 2010. Moreover, to obtain qualified registration or renewal of a university academic program in Colombia, the institution is required to ensure the availability of an appropriate technology platform, infrastructure connectivity and methodological tools necessary for its development, as well as strategies for the monitoring, audit and verification of the operation of the said platform. It is also required to provide relevant information to the community about the technology and connectivity requirements needed to take the program.

Ultimately, universities must centralize their IT infrastructure into a single unit (physical and administrative) that will strengthen digital convergence within universities and impact on their academic and research processes. Furthermore, universities should offer more digital[83] resources and information for educational purposes. It is a fact that digital consumption is advancing at an accelerated rate and the education system is still

[81]Enter y Centro de Análisis de la Sociedad de la Información y las Telecomunicaciones, *Convergencia digital en España* (Madrid: Editorial Enter, 2006), 7.
[82]Diana Soto Arango, "El profesor universitario de América Latina. Hacia una responsabilidad ética-científico-social", en *Revista Historia de la Educación Latinoamericana*, NO. 13, (2009): 166-188.
[83]Diana Soto Arango, "El profesor universitario de América Latina. Hacia una responsabilidad ética-científico-social", en *Revista Historia de la Educación Latinoamericana*, NO. 13, (2009): 166-188.

debating what should be the ABC of digital literacy. So, we turn to doctoral [84],candidates in education, because it is from doctoral theses that new new curricular avenues prioritizing the social individual may emerge, marking out paths for the future of a more just and equitable society in terms of educational and employment opportunities.

CONCLUSION

Based on our initial questions, '*What are the new challenges for quality and equity in higher education in Colombia? Are universities assimilating new technologies such as virtual education in a knowledge and information society, leading perhaps to an isolating individuality that could threaten personal dialogue on campus?*', we have established, in the first instance, a historical review, beginning with programmed learning as a product of educational technology and summarizing the debate that occurred in Latin American universities in the 1970s.

Indeed, out of this period have arisen the concepts and controversies of a system that, for some, represents a new teaching method that isolates the student. Furthermore, the same universities have taken on the task of conducting research on this subject. This paper reports nine experiences that promote, from different perspectives, the use of digital convergence in the teaching and learning processes.

All this research explores ways that lead to digital convergence, thus supporting the construction of knowledge, where social subjects adapt to these changes and overcome digital, generational and content-based divides. We conclude that digital convergence allows fusion of separate Information and Communication Technology (ICT) units at universities, in order to produce academic content and services, along with changes in information consumption habits by social subjects. These generate collaborative attitudes and autonomous learning, which are carried over into teaching and learning processes and the construction of knowledge at any time and place.

It is not our purpose to sing the praises of a system that includes digital convergence. However, it must be recognized that the knowledge society changes on a daily basis and social subjects, based on ethical values, must take ownership of the new educational technologies in order to build a university that is inclusive from the perspective of implementing quality with regard to its mission, competitiveness, recognition and student outreach. All of the above must be oriented towards a more equitable and egalitarian society, including the principle of the unity of men and women, respecting their solidarity both in difference and complementarity.

We hope for a return to the recommendations of the Commission of Elders (??) of 1994, to investigate in the first instance the 'backwardness in education, science and technology,' starting with an investigation of the role of education and educational

[84]Diana Soto Arango, "El profesor universitario de América Latina. Hacia una responsabilidad ética-científico-social", en *Revista Historia de la Educación Latinoamericana*, NO. 13, (2009): 166-188.

doctorates that might lead to a change in values emphasizing solidarity and tolerance in the Colombian population.

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