Modelo de análisis de apropiación tecnológica en profesores virtuales

Analysis model of technological appropriation in virtual teachers

Modelo apropriação tecnologia de análise professores virtuais

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Resumen

Este artículo se fundamenta en el campo de la comunicación y se apoya en la administración para generar una matriz heurística sustentada en un modelo de análisis de apropiación tecnológica aplicable a profesores virtuales. El modelo tiene una base teórica-práctica y está constituido por dos dimensiones: la primera describe los factores externos a la práctica docente y la segunda los factores personales relativos a dicha práctica. Los hallazgos señalan que la relación entre ambiente externo e interno tienen impacto en el proceso de apropiación tecnológica; los profesores estudiados se podrían categorizar entre la *Apropiación intermitente* y la *Apropiación confirmada* del modelo. Lo anterior porque los profesores se identifican como profesores virtuales, pero la relación entre educación a distancia y educación presencial aún produce tensiones en la práctica docente; el nivel de uso de las TIC es alto y el

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perfil de los docentes da prioridad a un liderazgo democrático basado en el aprendizaje constructivista, sin embargo, la generación de productos académico-profesionales se da más de forma individual que colectiva. Además, no existe una confianza en las tecnologías para potencializar las relaciones sociales y la construcción de la identidad del profesor virtual atraviesa una crisis de credibilidad debido al escepticismo en torno a la modalidad.

Palabras clave: TIC, competencia digital, profesor virtual, educación a distancia, apropiación tecnológica.

Abstract

This article is based in the field of the communication and is supported on Management to generate an heuristic matrix sustained in a model of analysis of technology appropriation applicable to virtual teachers. The model has a theoretical basis and consists of two dimensions: the first describes the factors external to the teaching practice and the second the personal factors relating to such practice. Findings indicate that the relationship between internal and external ambient impact on the process of technological appropriation; studied teachers could be categorized between *Intermittent Appropriation* and *Confirmed Appropriation* of the model. The above because the professors identify themselves as virtual teachers, but the relationship between distance education and face-to-face education still produces stress in teaching practice; the level of use of the ICT is high and the profile of them teaching gives priority to a democratic leadership based on the constructivist learning, however, the generation of academic - professionals products happens more individually than collective. Also, there is not confidence in the technologies to empower the social relations and the construction of the identity of the virtual teacher speaks of a crisis of credibility because of the skepticism around the model.

Key words: ICT, digital competence, virtual teacher, distance education, technological appropriation.

Resumo

Este artigo baseia-se no campo da comunicação e depende de gerenciamento para gerar uma matriz suportado por um modelo de análise heurística aplicável aos professores virtuais apropriação tecnológica. O modelo tem uma base teórica e prática e é composto por duas dimensões: a primeira descreve os fatores externos para prática de ensino ea segunda factores pessoais relacionados com a prática. Os resultados indicam que a relação entre o ambiente externo e interno ter um impacto sobre o processo de apropriação da tecnologia; professores estudados poderiam ser categorizados entre intermitente e confirmou modelo de propriedade propriedade. Isto porque os professores são identificados como professores virtuais, mas a relação entre a educação à distância e educação em sala de aula ainda produz tensões na prática de ensino; o nível de utilização das TIC é elevada e o perfil dos professores dá prioridade à liderança democrática baseada no aprendizado construtivista, no entanto, a geração de produtos acadêmicos e profissionais é dado mais individualmente do que coletivamente. Além disso, não há confiança nas tecnologias para potenciar as relações sociais e construção da identidade de professor virtual está enfrentando uma crise de credibilidade devido ao ceticismo sobre a modalidade.

Palavras-chave: TIC, competência digital, professor virtual, ensino à distância, apropriação tecnológica.

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Introduction

The technological fact, understood as a phenomenon that goes back to the man-machine relationship, is at the origin of the reflections on the change of a sustained productive logic in the industrial manufacturing to an informational - communicational paradigm (Castells, 2000), based on the flow of knowledge about advanced science (Bell, 1973). In this way, as in the first and the second industrial revolution, the mediation that plays the technology in the relationship between the man and the nature in the transition of the century XX to the century XXI, It is one of the central points in the reflection of these transformations. In the case of education, technology plays a multi-faceted role, because apart from being a technical instrument that facilitates and extends the academic activities, it is also a paradigm of innovation (UNESCO, 2006) and even an ideology of progress (Habermas, 1986).

The relationship between technology and education forwards, first of all, to the specific circumstances of an individual to use and appropriate technology in the apprehension of learning. Whether is in the education In-House (EP by its name in Spanish), where the Professor is a guide, whose experience and preparation you allows him/her to interact with the students in a physical way (Ruíz, 2011), or, in distance education (EaD by its name in Spanish), which is distinguished by a separation of space and time in teaching and learning environments, where the student becomes the center of active training, with flexibility in evaluation, guidance and follow-up by the teacher (Cabral, 2011). In both cases, the technology plays the role of tool, however, to the extent that the paradigm informational-communicational has reorganized the environment socio cultural, said paper is has been powered in a radical way both positive as negatively, giving rise to critical or pessimistic views against the integrated or optimistic visions.

A limitation on academic research aimed at distance education has to do with the absence of a comparative framework that allows analyzing existing models from their implementation; This is because the contextual differences between the environment where a model is implanted, as well as the particular features of it, produce differences that lead to a diversity difficult to approach from the comparative view of experiences around errors and successes.

There are antecedents of knowledge management strategies such as the ACTIONS model (Bates, 1995), models for comparative studies of educational models between EAD institutions (Abarca et al., 2006), appropriation models applicable to teachers of PE who use In this paper, we present the results of a study of the use of digital resources in teaching and learning in the classroom, as well as general reflections on digital competencies in teachers (Rodríguez and Castañeda, 2002, Pagano, 2008, Prince and de la Fuente, ., 2010, Torres and Rodríguez, 2010). However, the idea of a model to address technological appropriation in virtual teachers is useful in the comparative approach of teaching cases, insofar as the role of the teacher has been transformed to impact on the evolution of teaching competences (Peña Estrada, 2010).

This article is constituted by two stages; The first considers a documentary research about the relationship between PE and EaD, the profile of the virtual teacher as well as the phenomenon of technological appropriation; Finally the presentation of a Model of Analysis of Technological Appropriation in Virtual Teachers (MATEPV). The second considers the mixed application of the model (external dimension and internal dimension) in the teaching population of the EAD system of the Faculty of Accounting and Administration (FCA) of the Autonomous University of Querétaro (UAQ). The above, through the documentary description of the external environment to the teacher and the application of a statistical survey concerning indicators of use and appropriation to know the internal environment of the virtual teacher.

Theoretical framework

Distance Education and Classroom Education

Probably the modern opposition between EP and EaD occurs outside the technological transformations that have occurred since the end of the 20th century, since the potential of technologies reveals areas of opportunity in terms of educational expansion and diversification. Such a transformation, categorized by Bell (1973) as postindustrial, implies a recurrent replacement of analog systems by digital systems, as well as intense use of the computer and telephones. Kaplan (2008) describes a third revolution in science and

technology in which there is a new division of labor based on the global economy and an international political system; This stage is based on nuclear energy and there is an increase in the tertiary sector. Finally, Rifkin (2009) identifies a third industrial revolution based on renewable energies and unlimited storage technologies based on hydrogen, as well as the configuration of an intelligent network that manages human processes, supported by the Internet.

Unlike PE, where teacher and student share the same space and time during the educational process, the EaD implies an almost permanent separation between the two to carry out the teaching-learning process. It also involves different planning and didactic strategies, the use of media, as well as an administrative management that, while still institutionalized, presents differences of flexibility with regard to PE (Keegan, 1996; Moore, 2007). In addition to the differences in communication and knowledge planning, within the EaD, the student becomes the elementary center of an independent formation, since he develops knowledge and skills taking responsibility for the regulation of his own learning (Garcia, 1987). , Moore, 2007), this starting from the accessibility to contents and the synchronous and asynchronous quality in communication.

The concept of EaD as an educational modality acquires academic formality during the sixties at the University of Tübingen, where the term fernstudium is introduced, understood as a type of distance education based on the division of labor; There is a necessary use of technology and there is a demand reciprocity with the industrial working world (Moore, 2007). At this time, during the industrial and economic growth produced by the second postwar period, it is when the concept of EaD receives its contemporary meanings. However, other perspectives are related to the emergence of the EAD with education by correspondence, a modality that has its appearance with the invention of postal mail in antiquity, and that goes through a process of institutionalization in the eighteenth century in Europe and the United States , When educational institutions began to offer correspondence courses that were aided by printed publications (Cabral, 2011).

While correspondence education is a type of EAD, the latter is not limited to the possibilities of postal mail but to a wide range of technologies ranging from basic writing instruments to electronic devices. That is why the origin of the EaD can be traced back to the invention of writing, which makes it a modality that, in a certain way, has always existed within the modality of Face-to-face Education, first under the incarnation of the task Or extra class work and then as the idea of independent private study guided by tutors who are far away, such as letter writing. Thus, rather than constituting an opposition, EaD as a practice is a natural extension of PE, and at the center of this relationship is a process of mediation determined, not conditioned by technologies, as described by Martín-Barbero (2002) in his theory of mediation.

At this point it is necessary to make a distinction between EaD as practice and EaD as modality. From the outset, EaD as a practice is hardly divisible from PE insofar as the use of technologies seeks to overcome boundaries of distance and time as a way of reinforcing learning; However, the EaD as a modality is linked to the process of educational extension that was initially formalized with the mail, then with the television, and today seems indivisible to digital technologies. The context of a third industrial revolution, with the rise of the digital and the supposed evolution of the EAD in e-learning (Cardona and Sánchez, 2011), produces changes in the distinction between EaD as a practice and as a modality; At the center of this transformation is the fragility of educational institutionalization and the emphasis on a self-taught and independent student profile. This process redefines the boundaries of learning between the public and the private.

Within this historical conjuncture of productive transformations traversed by the informational-communicational paradigm (Castells, 2000), the main tensions between EP and EaD refer, among other concerns, to the preservation of educational quality, to the institutional validity of a grid And the updating of teaching. In this regard, Jardines (2010) makes a documentary review of studies comparing modalities, considering three aspects: education model, instructional design and student academic performance. Its main conclusions are that the educational planning of the EaD should not be an imitation of the PD, but that the training must adapt to the use of the possibilities of interaction, which suggests new teaching

competences; Likewise, the student profile is diverse as it is delineated by local socio-cultural features.

In his review of comparative studies, Jardines (2010) finds that the interaction between teacher and student is lower in PE and higher in EaD, since it is potentialized from the possibilities provided by the media (Hazari and Schnorr, 1999 cited by Jardines , 2010); These conditions, coupled with the opportunities of digital technology, give rise to an emphasis on student autonomy, since it acquires responsibility for its formation (Moore, 2002 quoted by Jardines, 2010). The author also points out that the academic performance of students does not present significant differences between the two modalities, and even some studies prove, since the nineties, favorable academic results in EaD from the instant accessibility to networks, contents and planning (Hogan, 1997; Koerlin, 1996 cited by Jardines, 2010).

If the incorporation of technological devices into educational processes is a constant throughout history, then EaD as a modality is not an appendage or an opposition to PE, but rather a complement or an extension. This relationship also resembles the duality between the offline state and the online state, that is, between physical reality and virtual reality. This is due to the fact that the main characteristic of virtuality is that it accounts for a reality that does not exist but only in potentiality (Lévy, 2007), and in the case of EaD technologies enhance the processes of interaction that take place in the EP by recreating them in a reality that is concretized gradually and that goes beyond the possibilities of scope or complexity of PE.

Digital competences in virtual tutors

The learning mediated by digital technologies acquires diverse connotations to the extent that the EaD approaches e-learning. While some theorists (Bates, Morrison, Egaña, Ruiperez and García, cited by Cardona and Sánchez, 2011) see e-learning as a new educational modality that supposes an evolution of EaD insofar as digital technologies dominate the Media spectrum; Another aspect (Rosenberg, Gómez, Reyes, Romero and Malaver, cited by Cardona and Sánchez, 2011) considers that e-learning is not a new modality but a type of EAD that,

although it has been positioned as one of the most replicated Due to digital expansion, is not the only one.

The above excision is important because EaD is often understood as the extension of a formal and institutionalized education, while e-learning refers more to an individualized and autonomous phenomenon of self-taught learning. This transformation refers to the change in the role of the teacher in education, because if it was previously the central point of the educational scheme, now the central role is the student and the work of the teacher is diversified to suit the particular needs of the student.

This diversification is noticeable in EAD models designed by Mexican universities. On the one hand, in the model of the UdeG (2005) the teacher is a facilitator of learning and manages a Virtual Learning Environment (EVA); On the other hand, in the models of the TecNM (2015) and the IPN (2015), in addition to facilitating and managing online-offline learning, the teacher can acquire the role of tutor or advisor, which interact together; Finally in the model of the UNAM (2014), the professor plays diverse roles, since he can act as adviser, tutor, mentor or consultant.

In most EAD systems the teacher is known as a virtual tutor; Which is understandable if one considers the transformation of the teacher into the digital environment, this change points to a personal follow-up and support rather than a hierarchical instruction and evaluation. Thus, the purpose of the virtual tutor is to foster independent development in students, by orienting distance learning (García, 2001) through the development of competencies such as the understanding of online processes, skills and techniques in the management of Technologies, communication skills, experience in the professional profile in question and interpersonal skills (Fuentes y Salmon, 2002).

In this study, the concept of virtual tutor is considered but the idea of virtual teacher is chosen, since tutoring as a pedagogical notion implies a broader spectrum that, as already seen in the models of EaD, maintains differences with other roles That the teacher can acquire in the EaD. The transformation in the role of the teacher within the EaD occurs in a recurrent

way in a process of adaptation of face-to-face teachers to the distance modality, or in a process of expansion of competences due to the need for updating. In Peña-Estrada's perspective (2010), this change has a positive impact on the development of new skills (skills, knowledge and attitudes) on the part of virtual teachers; This from the latent and conscious need for technological or educational training on an ongoing basis. This process is linked to the phenomenon of technological appropriation, a process that refers to the cultural reproduction of meanings of a technology but also to the technical mastery over the object.

Appropriation of technology

The concept of appropriation is present in philosophy, in the natural sciences and in the social sciences, in general refers to a process of reproduction of reality by the organisms of a given system. In hermeneutics, appropriation implies the interpretation, incorporation, and use of cultural symbols as vehicles of self-construction by individuals (Ricoeur, 1989 quoted by Thompson, 1998), this in so far as taking a message and making one's own Its significant content. Appropriation is to assimilate a certain information or practice and incorporate it into everyday life.

Within the social sciences, Proulx (in Siles, 2005, 2001) links the cultural appropriation of a technical object with the set of individual and social meanings that individuals assign to objects. Thus, the process of appropriation occurs when the fulfillment of three basic conditions: a technical-cognitive management of the instrument by the subject; The use of the device in everyday life and new practices developed by the individual about a sense of personal interests. De Certeau (in Siles, 2005, 1980) complements this idea, since he argues that the use and consequent appropriation account for an act of consumption that acquires meaning from the awareness of what that act or practice Means for the individual. Both authors point out that at the micro-sociological level of daily life is where users develop strategies and tactics that build a sense of ownership.

On the other hand, Crovi (2010) argues that the processes of appropriation imply mastery of a cultural object, but involve the recognition of the activity that condenses that instrument and with it the systems of motivations, that is, the cultural sense of the whole. In other terms, when appropriating an object, the individual is also appropriating the practices that his social use establishes as ideals. Hence the meaning of the activity embodied in the object and its insertion in a given context is crucial. Similarly, Crovi (2010) places appropriation as the culmination of an evolution of learning that starts in access, passes through the use and is concretized in technological appropriation.

Model of Analysis of Technological Appropriation in Virtual Teachers (MATEPV)

In contrast to theory, that is, an explanation of reality outside of hypothetical concepts whose purpose extends to guiding, organizing, integrating and updating knowledge (Bisquera, 1989 cited by Carvajal, 2002), models are representations of the Reality produced in function of theoretical assumptions and applied in a logic of replication in different contexts with the objective of verifying assumptions or corroborating expectations; This gives them an instrumental character (Sierra, 1984 cited by Carvajal, 2002).

The purpose of a model is not to adapt reality to a theoretical expectation, but vice versa, because to the extent that a model develops the conceptual flexibility necessary to adapt to a reality that changes gradually, it responds to the expectations of a suitable scientific approach, or At least it establishes antecedents of schematization of the reality that can be taken up in the future. Considering the above, the Model of analysis of technological appropriation in virtual teachers (MATEPV) is a theoretical-practical proposal based on a heuristic matrix to facilitate the analysis of technological appropriation.

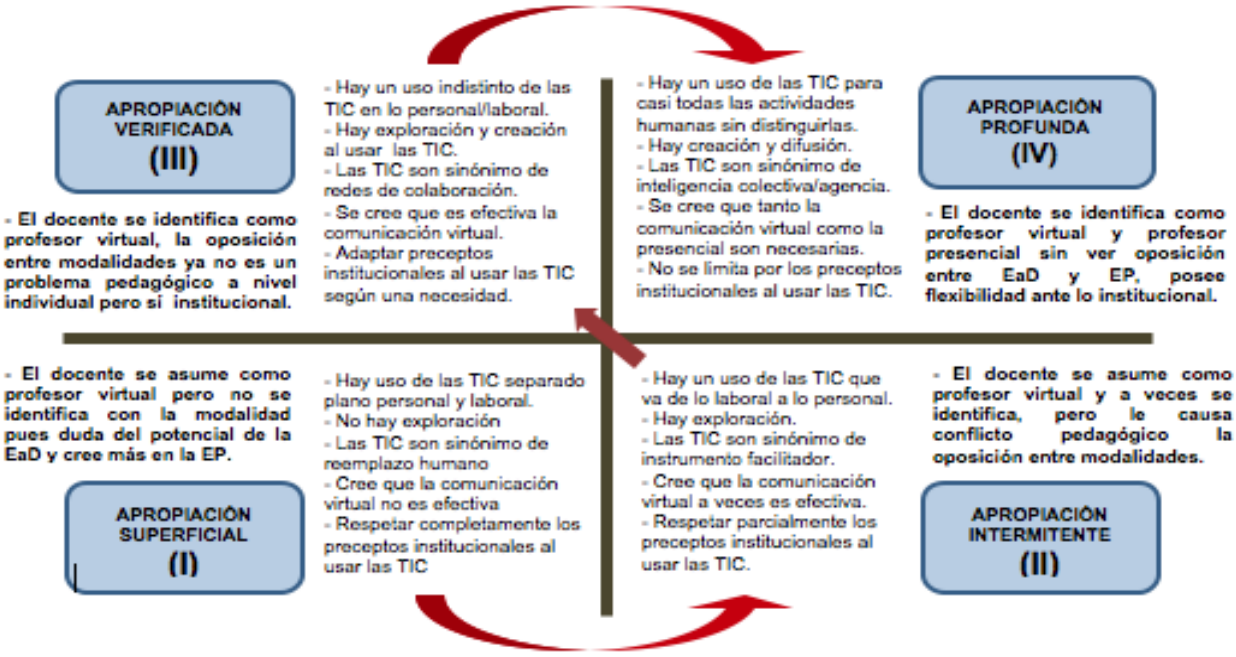
Theoretical base and heuristic matrix of the model

The use of a heuristic matrix to explain the technological appropriation in virtual teachers starts from a cyclical vision to analyze the processes of adaptation, this vision is based on the theory of the four rooms of the change, proposed by Janssen, which contemplates four gradual states . Confusion or maladjustment (I), occurring when the individual lives a dislocation with respect to the reality caused by tensions and feelings of doubt about an activity; Denial or pseudo adjustment (II), given when the personal discipline allows to maintain control and tension on the accomplishment of an activity but still the will is overcome by the obligation; Satisfaction or adjustment (III), where the situation of the individual is perceived by itself as satisfactory because a relaxed effort of activities supports a feeling of consciousness; And finally, the Renewal or creative change (IV), which gives account of a collective sense of work, based on an intense experience of the present with autonomy of reflection and self-confidence.

The dimensions proposed by Janssen (1996-2011) are taken up to represent the process of technological appropriation carried out by virtual teachers. For this purpose, four stages of the process are considered, which is part of the antecedents integrated in the theoretical framework related to the phenomenon Of technological appropriation in virtual teachers; These are explained in Figure 1. The stages are: Intermittent appropriation (I), Surface appropriation (II), Verification appropriation (III) and Deep appropriation (IV).

The model of Janssen (1996-2011) is taken up by Ruiz (2013), who increases the complexity of the scheme by presenting two opposing contextual-type tensions for each stage of the process, which contributes to the diversification of the forces involved in the configuration of the model. In this way, the heuristic matrix starts from a strategic comparison between the external environment to the virtual teacher and the internal environment.

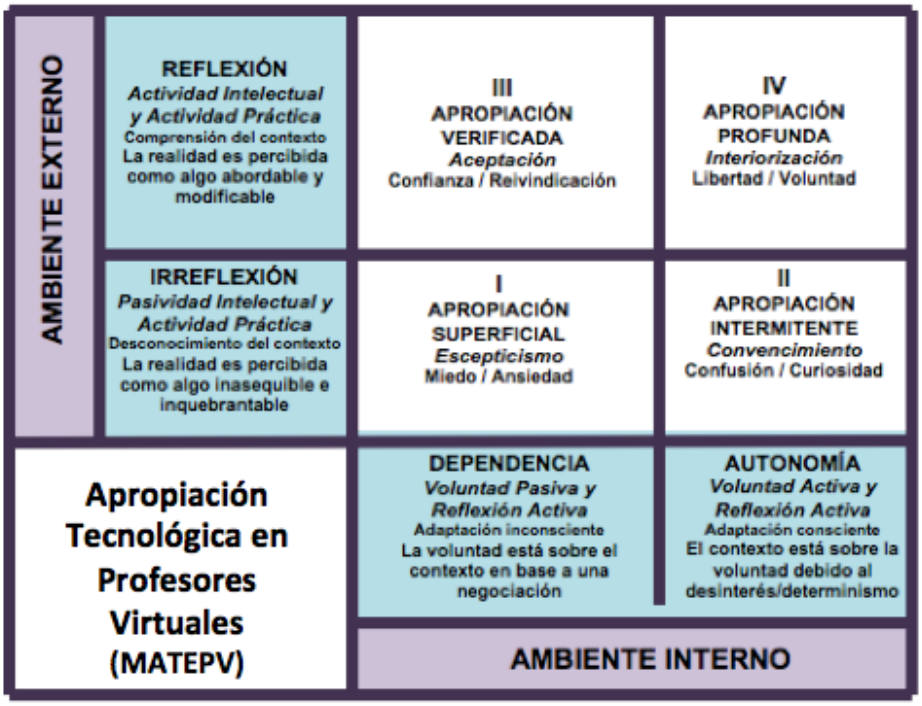
Figure 1. Adaptation process in virtual teachers to generate technological appropriation



Source: Ortiz Cortés (2016) basada en Janssen (1996-2011).

Specifically, the external environment in a teaching practice refers to the contextual, organizational and institutional features that determine it; On the other hand, the internal environment refers to the characteristics, experiences and perceptions of teachers in their teaching process. In the present heuristic matrix the states of the theory of Janssen (1996-2011) are recovered and they are complexed developing the tensions proposed by Ruíz (2013).

Figure 2. Matriz heurística que sustenta el MATEPV



Source: creación propia (2016) basada en Janssen (1996-2011) y Ruíz Guzmán (2013).

General dimensions of the model: external and internal

The general dimensions of the model include, as in the organizational view of organizations (Kotler and Armstrong, 2007), the consideration of an external environment to the teacher as well as an internal environment to the same; This perspective seeks to be integral as it considers the different domains that influence the professional practice of teachers and the phenomenon of technological appropriation. Thus, it is based on the idea that the external environment determines the internal environment, to the extent that the contextual conditions of teaching practice affect the development of teacher competences and their relationship with technologies in function of their role of educator.

While the external environment is based on the documentary consultation to produce a general description of the institution where the virtual teacher performs, the internal environment constitutes a sustained exploration in the practical application of a questionnaire

to a virtual teacher or a virtual faculty Focused on exploring uses and appropriation, and then interpreting the data together with the external aspect.

A) <u>External dimension to the teacher | Documentary research Description</u>

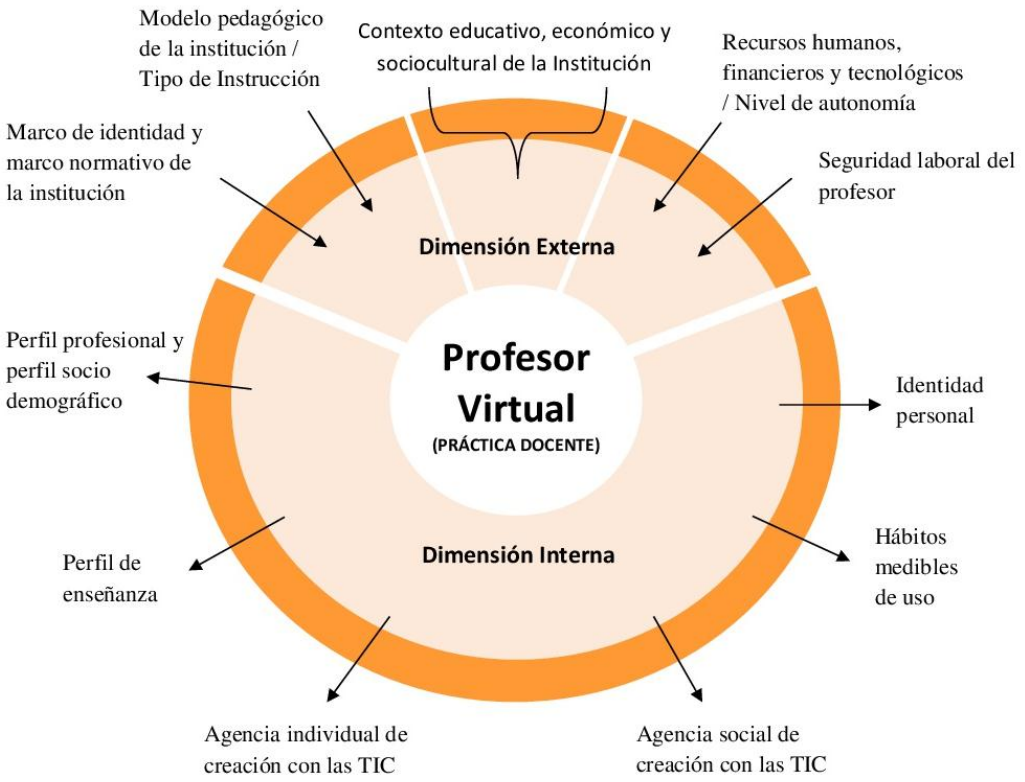
→ *Framework of identity and regulatory framework of the institution:*
Mission, Vision, Objective, Statutes, Regulations.
Pedag Teaching model of the institution / Type of Instruction:
Orientation (learning theory), Teaching role, Instruction (distance or mixed).
 Human, financial and technological resources / Level of autonomy:
Faculty (dimension, qualification, specialization), Financing (type, origin, dimensions), infrastructure (salons, equipment, networks, platforms, laboratories) / Autonomy (total, partial) / Financing (public or private).
Security of the teacher:
Way of hiring, benefits, job training.
 Educational, economic and sociocultural context of the university.
Local and specific circumstances of the institution of the various areas indicated.

B) <u>Internal environment to the teacher | Questionnaire application Description</u>

→ *Professional profile and demographic profile.*
Sex, Age, Career, Institution of origin, Place of Origin.
 Teaching profile.
Teaching preparation, pedagogical orientation and didactic style.
 Individual creation agency with ICT.
Productivity, Institutional integration, Professional independence.
 Creation social agency with ICT.
Productivity, Collaboration.
 Measurable use habits.
Time, Frequency, Types of devices, Purposes.
 Personal identity.

Identification with the Modality, with Institution, Perception around the EaD.

Figure 3. Graphic representation of MATEPV



Source: creación propia (2016) basada en Abarca et al. (2016).

Methodology

Method

This study is non-experimental, transectional and exploratory, according to the classification of Hernández et al. (2010). In this sense, MATEPV includes the description of specific categories of the internal context and specific categories of the external context of the teacher; To achieve this, a documentary review is done in order to describe the external context and develops the application of a questionnaire to explore the elements that make up

the internal context. The methodology implies the link between both areas in the interpretation stage, which is done in the light of the theoretical framework.

Objective

The object of study of the model is to identify how the appropriation of ICT by virtual teachers is based on the criteria proposed from the internal and external dimension; That is to say, it is interesting to discover how the appropriation of technologies is constituted starting from an analysis of qualitative categories extracted from the context and quantitative variables centered on the teacher. The Faculty of Accounting and Administration (FCA) of the Autonomous University of Querétaro (UAQ) has a degree-level enrollment of 300 students in distance education for the period August-December 2016 (FCA, 2016), which are enrolled In the programs of Public Accountant and the Degree in Administration. The Faculty has a total of approximately 4000 students and 1 308 students in regional campuses; Offers nine face-to-face degrees and two distance-learning degrees; In postgraduate: five master's degrees, four doctorates as well as various diplomas and refresher courses.

Application of MATEPV

A) External dimension to the teacher | Documentary research

→ *Framework of identity and normative framework of the institution*

The UAQ is the oldest educational institution of the state, its initial antecedent is the Colegio de San Ignacio founded in 1625 by the Jesuits, which was transformed in 1867 in the Civil College and finally acquires its current status in 1951 (UAQ, 2016). Its mission is to be an autonomous public institution focused on the integral formation of professionals and citizens with humanistic orientation, open to the discussion of ideas through training, research, linkage, diffusion and technological development (UAQ, 2016) ; On the other hand, its vision implies to be one of the best universities in the country and Latin America, with international

prestige, social bonding and sustainable responsibility, to generate and transmit knowledge, preserve, create and spread culture (UAQ, 2016).

This is complemented by the mission and vision of the FCA, since the first one refers to the management of training structures to develop professionals with the necessary knowledge and experience in the administrative economic areas through study programs that are consistent with reality (FCA, 2016); While the second accounts for the consolidation of quality educational, cultural and sporting programs, with which to generate, apply and update knowledge and practices of a profession (FCA, 2016).

Being a public institution, the normative framework of the UAQ is broad and part of the federal Constitution and the State Constitution, as well as of the Law of Public Education of the State. Internally, the most important regulations in the university are the Organic Statute (approved in 2007), the Organic Law, the Organization Manual of the UAQ, the Collective Work Agreement 2013-2015 and the Policy Manual for the use of The financial resources of the UAQ. There are also regulations on student training and EaD, among which the Student Regulations (approved in 2007), the Regulation on admission and promotion of academic staff, the Regulations for the acquisition and management of material resources, and the General research regulations.

→ *Teaching model of the institution / Type of Instruction*

The educational model currently implemented in the UAQ, and consequently in the FCA, is integrated into the Institutional Development Plan 2015-2018; This educational model has a constructivist orientation but also integrates principles of the competence approach; This model is integrated of different elementary items: Quality, Coverage, Linkage, Model and Financing (UAQ, 2015). The role that the teacher acquires in this system is unique and refers to the virtual tutor, each teacher imparts the specific knowledge of his career. On the other hand, the type of instruction in virtual careers imparted by the FCA of the UAQ is entirely at a distance because the student and the teacher develop the course through a permanent

separation, having contact mainly through a Virtual Environment of Learning (EVA), in this case Moodle.

→ *Human, financial and technological resources / Level of autonomy*

The faculty of the distance courses of the FCA is 35 teachers, of which 30 also teach classes in face-to-face mode. All professors have a bachelor's degree and an estimated 69% have master's degrees, 13% develop doctoral studies and 9% have doctorates, these credentials are in the area of economic-administrative sciences, this according to information provided by the coordination Of degrees distance from the FCA. The financing received by the UAQ is of the public type, comes from the federal budget and is estimated at 550 million pesos by 2016, when it presented a 10% increase over the previous year (Camacho, 2015). FCA's infrastructure comprises approximately 40 classrooms, a library, six computer centers and five auditoriums. The UAQ maintains a total autonomy, since its University Council deliberates and makes collegiate decisions without external interference, nevertheless renders accounts to the Secretariat of Public Education (SEP) and to the Government of the State of Querétaro. Likewise, the Academic Council of the FCA makes the decisions of what happens within the faculty based on what was decided in the University Council and with internal autonomy because there is no interference of other faculties, institutions or dependencies in these processes.

→ *Occupational safety of the teacher*

According to information provided by the FCA distance education coordination, the mode of hiring is mixed for a job placement (of which 11% are full time and 60% are subject professors), 29% are hired for fees. The benefits of the workers depend on their contracting scheme, since the professors with a seat have access to different benefits such as benefits, inscription in a health system (IMSS), housing prices, possibility of cultural and artistic rights, among others. In the case of teachers for fees their benefits are more limited because despite being hired by the institution do not have the same benefits. Nevertheless, the entire body of teachers analyzed has the possibility of perceiving stimuli to the teaching performance and the

possibility of advancing in the category of contracting. The training is given on a frequent basis, both by the UAQ from the programs of educational updating in the aspect of didactics and pedagogy, as well as by the FCA in the aspect of technology management and the model of long distance education.

→ *Educational, economic and sociocultural context of the university*

In the case of Querétaro, INEGI (2010) in collaboration with the State Population Council (COESPO) elaborate different surveys on the state of education in the state. In this regard, data from the Population and Housing Census for 2010 indicate that the average schooling level of the queretanos is 15 years, which is equivalent to secondary education completed. Of the 100% of the population, only 20.9% have completed upper secondary education, while the bulk of the population has only basic education.

Another important indicator of the educational phenomenon in Querétaro is that individuals aged 15-24 have a higher literacy rate (98.4%), compared to those older than 25 years (91.1%) (INEGI, 2010). There is also an important contrast between the metropolitan area and the municipalities distributed in the different regions of the state (bajío, sierra queretana, semidesierto, central valleys and sierra gorda).

According to INEGI (2010), the state of Querétaro has an economic growth that is above the national average, which implies a strong attraction of national and foreign investment, which is materialized in the establishment of companies that, above all Are in the electronic, aeronautical and service sectors. This economic context produces an environment of social expectations that favors demographic concentration and urban expansion in the region, which has resulted in important migration processes.

This manifestation of urban concentration through migration rates indicates that in August 2016, an average of 40 families arrive in Querétaro per day, according to data from the government's Secretariat (Rodríguez, 2016). According to this source, the main places of origin of the Queretans who migrate to the Metropolitan Zone are the municipalities of El

Marqués, Corregidora and Huimilpan, that is, those that are nearby. In the case of the states, there is an intense mobility of Mexicans originating from neighboring states of the shoal region, such as Guanajuato, Hidalgo, Jalisco, Michoacán and of course Mexico City. At present, the presence of Mexicans from the northern and southern states of the country has also increased.

Regarding the cultural level, the state of Querétaro counts on an important presence of indigenous languages, being the municipality of Tolimán the locality where the largest number of inhabitants that speak an indigenous tongue in the state is concentrated, with 24.7% of the total Its population; In this region the language hñähñú (otomí) is spoken, in the rest of the state the Nahuatl, mazahua and purhépecha are also spoken (INEGI, 2010). In the case of the Sierra Gorda, cultural features concentrate artistic expressions such as the diversity of festivals dedicated to huapango, religious festivities, especially Catholic festivities, as well as the conservation and tourist promotion of important architectural complexes such as the Franciscan missions of The Sierra Gorda, the pre-Hispanic ruins in several municipalities and the basilica of Soriano in the semi-desert.

B) Internal environment to the teacher | Application of questionnaire

→ *Professional and sociodemographic profile.*
→ *Teaching profile.*
→ *Individual creation agency with ICT.*
→ *Collective creation agency with ICT.*
→ *Measurable Habits of Use.*
→ *Personal identity.*

Instrument

An instrument for data collection was designed; It is a question of a survey of virtual professors of the FCA of the UAQ. The instrument follows a valuation parameter of ICT appropriation based on multiple choice closed questions, as well as questions constructed from a Likert scale. This scale is the starting point in the measurement of the variables selected for the instrument. Once the survey is done, the data are used in the development of a comprehensive analysis that considers external and internal environment.

Validity and Reliability

A pilot test was applied to determine the validity and reliability of the instrument, being acceptable with a value of 0.514 in the Alpha index of Cronbach, which indicates an adequate internal consistency, as a function of the exploration of the variables producing relations and interconnections between the Elements to explore.

Sample selection

The selection of the representative sample for the present study starts from the statistical consideration of a population that ascends to 35 subjects. If the statistical formula for simple random sampling is considered, the sample has a margin of error of 5% and a confidence level of 95%; Likewise, a level of heterogeneity of 50 is assumed, which results in the application of 33 minimum responses. In the case of this study we have a total of 33 responses, which contributes to foster statistical significance.

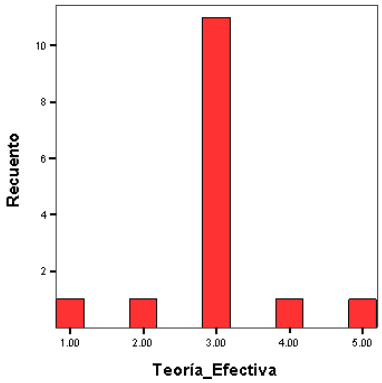
Quantitative analysis

The use of parametric statistics is produced by establishing a multifactor relationship model that uses the basic statistics of analysis, specifically averages, correlations and establishment of hierarchical categories. In this respect, the exploration of the magnitude (but not relevance in the statistically significant sense) of the relations between the observed variables allows to establish mutual effect and reciprocity dynamics (Ritchey, 2002). In the case of the model designed for this study, it is considered that the specific variables are constituted by the dimensions that make up the internal environment of the teacher, while the central category is the appropriation of ICT.

Results

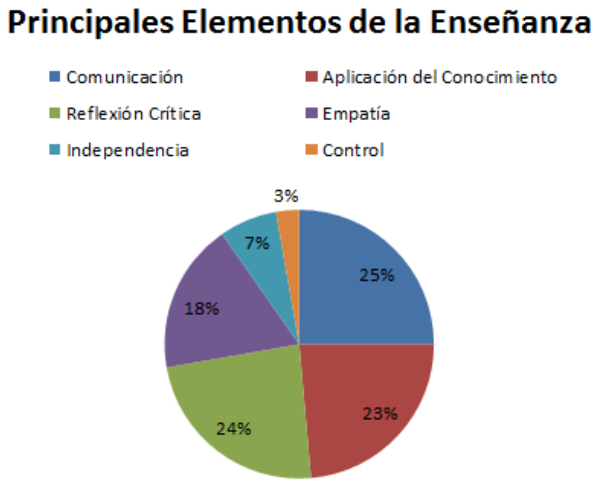
The findings of the application of the questionnaire indicate that the average age of the teaching staff of the UAA FCA EAD system is 42 years; 61% are women and 39% are men; The state of Querétaro is also 61%, with the state of Guanajuato and Mexico City being 11% each. On the other hand, 67% of professors are graduates of the UAQ and 17% are graduates of ITQ, the most prevalent institutions. Of the three styles of leadership employed by the administration and applied to education, 67% lean towards a democratic style, that is, an exercise of power based on the negotiation of a majority, and 33% incline to a liberal style, That is, a horizontal management of power with full freedom. Similarly, the theory of learning less effective in teaching (figure 3) is behaviorism and the most effective is constructivism; This because of the collective value that this theory has in the social construction of knowledge, according to the answers.

Figure 4. Frequency of the theory of learning indicated by virtual teachers



Fuente: SPSS 15.0 para Windows.

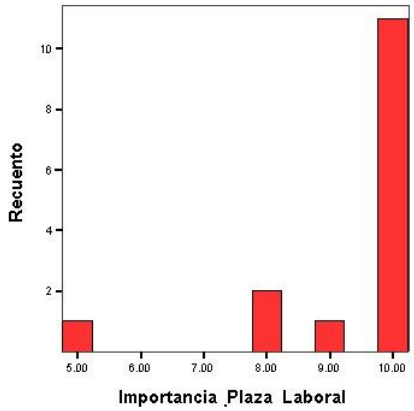
Figure 5. Elements of teaching identified by virtual teachers



Fuente: Base de datos analizado en Excel de Windows.

On a scale of 1 to 10, the level of training in teaching (figure 4) that teachers have had is 8 on average, and predominantly this training came from the institution to which they belong according to their Work activities, or of the curricula in which they have been or are enrolled. Thus, 56% of teachers have been teaching on their own, compared to 44% who have not done so. For the faculty of the distance system of the FCA of the UAQ, the main elements in the teaching process are communication, critical reflection and application of knowledge.

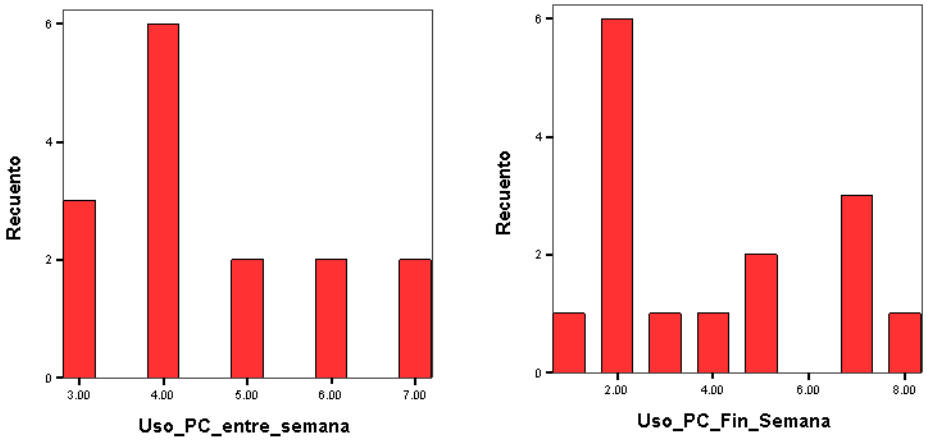
Figure 6. Frequency of the importance of having a job in an HEI



Source: SPSS 15.0 para Windows.

It is important to point out that from 1 to 10, the level of importance that the virtual teachers in question give to the fact of belonging to an institution and having the benefits of a job (Figure 5) is 9, that is, something very important; Which coincides with the time they have been assigned to the institutions of higher education where they work, whose average time is 6 years; However this representativeness is relative because there are teachers who have more than 10 years working in front of others who have 2 to 5.

Figure 7. Frequency of PC usage between weekdays and weekends



Source: SPSS 15.0 para Windows.

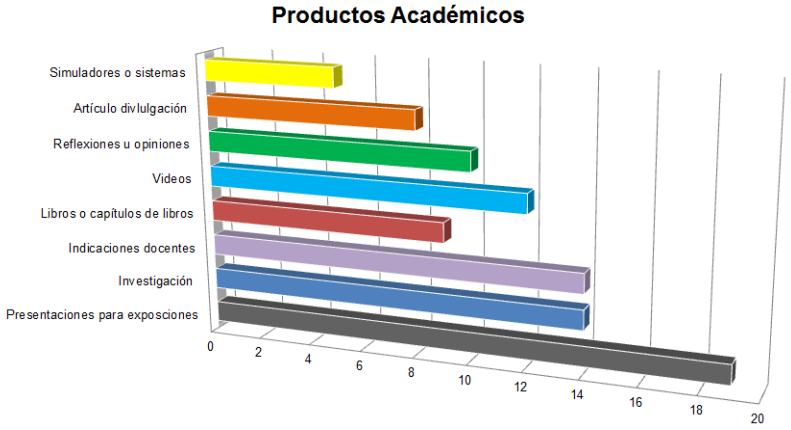
Teachers give a major importance to technology for academic-professional activities, because on a scale of 1 to 10 to identify the level of importance of ICT in such activities all teachers answered 10. This is complemented by the level Affinity or personal taste for ICT, which on average amounts to 9.6, which implies an involvement with technology from the personal to the productive sphere. This affinity is manifested in the usual use of the computer (figure 6), one of the most popular digital technologies; In this sense, on a weekday, the use of the desktop computer runs from 3 to 4 hours, while on weekends is two hours, however, there are users who use it for longer hours on weekends Of week, which implies an important variation because a significant proportion uses the PC of 5 to 7 hours in a day of weekend.

The academic-professional implications of ICT are at the heart of MATEPV. In this respect, the most common products (figure 7) created by ICT-enabled teachers are the

presentations for exhibitions, academic research and teaching indications; In the case of collaborative products the most recurrent are academic research, books or chapters of books and reflections or opinions. The use of ICT continues to have a personal and private nature, because when questioning teachers the level of collaboration they have with other teachers in the development of their functions, the average was 5.8 on a scale of 1 to 10.

Turning to the topic of Distance Education, 61% of teachers had not had contact with this modality prior to their performance as a virtual teacher, compared to 39% who had had some previous experience. This is related to teachers' perception of the value given to EaD in their context, since 50% think that the response to EaD is very good, 33% think it is good and 17% regular. This contrasts with the perception of faculty members of virtual teachers in sharing with them that they are teachers in this modality, since 50% of respondents think that perception is good, but 44% think it is regular and even 6% Defines it as bad.

Figure 8. Academic Products Generated by Virtual Teachers



Source: Base de datos analizado en Excel de Windows.

The social value of EaD as an educational modality lies at the bottom of these perceptions; In this respect, the main advantages of the EaD identified by virtual teachers are the flexibility of space and time for both teachers and students, the educational reach to decentralized areas as well as the formation of a self-taught and self-sufficient student profile. In the case of the disadvantages, a notable lack of knowledge about the modality, faults in internet connectivity, insufficient technological infrastructure, lack of personal contact and perception of spoken

language, as well as the risk that the student loses the goal of Course and decrease their commitment to a good school performance.

Discussion

The objective of the article is to communicate how the appropriation of technologies is constituted through the analysis of qualitative categories extracted from the context and quantitative variables centered in the group of virtual professors of a Higher Education Institution.

In the light of the theory, the relation between external environment and internal environment in the performance of the teaching practice has a significant impact in the process of technological appropriation, because although the institutional and contextual conditions determine the individual freedoms, these in turn Are determined by the agency of individuals.

From the outset, the tensions between EP and EaD identified in the theoretical framework pose an unnecessary differentiation from the role of technologies in educational processes; In this respect, the faculty of the UAA FCA EAD system could be representatively located between the second and third level of appropriation specified in the heuristic matrix, ie, Intermittent Appropriation and Verified Appropriation. In these stages, the level of appropriation of ICT in relation to teaching activities is traversed by the construction of the identity of what it means to be a virtual teacher. While in the intermittent the teacher assumes as teacher of EaD but still occurs conflict from the apparent opposition between modalities, in the verified this opposition is no longer a conflict at the individual level but at the institutional level.

If the description of the Institution's Identity Framework and Regulatory Framework, the Institutional / Type of Instruction, and the Human Resources, Financial and Technological / Level of Autonomy, with the perceptions observed in the questionnaire Around the EaD and its social value vis-a-vis the EP included in Personal identity, it is possible to assume that there is an environment of freedom and institutional autonomy (UAQ) where it is possible to

develop the modality at the faculty level (FCA), combining A university model with the academic needs of the economic-administrative area; In this sense, the interpretation suggests that due to the flexibility that distinguishes EAD and needs to materialize, it is necessary that these programs have a strong institutional support and at the same time a profound flexibility, in this case, this possibility allows Teachers flexibilizar the vision that they have of EaD vis-a-vis PE.

Turning to the teaching profile and the digital competences, the teaching practice of the teachers of the UAA FCA EAD system takes place within a complex and hierarchical framework of institutional norms, as well as from a constructivist model whose main feature Is the plurality and social inclusion due to the public nature of the institution; These traits come together with the sections of Professional profile and socio-demographic profile and the heading of Teaching profile. This relationship is based on the consideration that the level of training in teaching is relatively high and its main source is the university itself in a logic of constant updating or institutional educational programs in which teachers are enrolled.

However, in the area of competences, the appropriation of ICT for productive purposes remains in the second level (Intermittent appropriation) because there is insufficient teaching collaboration in the generation of academic-professional products, which are more than Individual way that collective as indicated by the individual agency of creation with the ICT and social agency of creation with the TIC of the questionnaire.

In the case of measurable habits of use, the digital competences are tied to the personal needs of communication, recreation and knowledge of the teachers, which coincides with the industrial character of the Queretan context. However, it is observed that teachers have not yet developed full confidence in technologies to enhance social relations because the main disadvantage they point out in the practice of EaD is the lack of human contact face-to-face that makes learning more meaningful, Something that does not necessarily remove or give the technology, but the way in which it is seen and used, as pointed out by appropriation theorists in the negotiation of technological use.

The phenomenon of building an identity and social credibility is the most important process by which digital teachers engage in the conquest of technological appropriation. This is because their perception of them is hierarchized below the face-to-face teacher, even though it entails new challenges to achieve a technical mastery and an assimilation of the cultural implications of these technologies in education. This identity is outside the contextual features of the external environment, because the lower proportion of EaD programs compared to PE programs show a "cult of schooling", rather than transforming itself with the impact of technologies on the Daily life, is reiterated in a dynamic of distrust of the new.

Research like Prince and de la Fuente (2015) point out that the lack of training, infrastructure and internet access are the main elements that do not favor the application of ICT in education. The findings of the application of the MATEPV indicate that, within ICT-mediated education, the technical aspect plays an important role in the disadvantages of the EAD, but the main disadvantages have to do with the lack of knowledge of the modality as well as the lack Of social credibility, this is complemented by a marked skepticism as to whether the technologies allow the creation of personal ties that promote meaningful learning. This implies that the incorporation of ICT in educational environments is determined by infrastructure, but only makes sense insofar as the potential image of ICT has a productive utility and social credibility in a context.

Another related study is that of Celaya, Lozano and Ramírez (2009), who study the use of Open Educational Resources (REA) in upper secondary education by teachers, related the process with technological appropriation. In their findings, three levels of appropriation (knowledge, utilization and transformation) are identified and from the cases studied it is concluded that teachers reach the second level, ie there is a use of OER for educational purposes , But there is no modification or adaptation of the OER, which characterizes the third level. This degree of medium-to-high appropriation coincides with the intermediate levels of MATEPV, as there is a technological incorporation based on needs but a level of collaboration and creativity is not reached to renew the educational relations through ICT taking advantage of its potential.

Quesada (2015) retakes the model of evaluation of the appropriation of the TIC in university cases (Montes and Ochoa, 2006 quoted by Quesada, 2015) integrated by the stages of integration, re-organization and evolution; (Orozco, Ochoa and Sánchez, 2002 cited by Quesada, 2015). This is done with the objective of determining the level of technological appropriation of OER in mathematics professors of UNED Costa Rica. In its findings, the author points out that 71.43% of teachers reach the technological appropriation called knowledge; Also, more than 50% of teachers reach the level of technological appropriation of use and more than 50% of the level of transformation. The results coincide partially with those of the present study because the level of appropriation is maintained in an average that goes from half to little more than half; However, the results of Quesada (2015) suggest a higher level of appropriation in teachers when there is a modification of ICT technical projects to produce educational benefits; Something that does not happen so much in the case approached, probably by the theoretical nature of the area of knowledge, that is to say, the economic-administrative sciences.

CONCLUSIONS

The process of technological appropriation identified in virtual teachers, passes through four stages of gradual adaptation, these stages are: Intermittent appropriation (I), Surface appropriation (II), Verification appropriation (III) and Deep appropriation (IV). The above considering an articulation between the uses and the technological appropriation.

In a significant way, the teachers of the distance education system of the Autonomous University of Querétaro (FCA) are between the level of intermittent appropriation and the level of verified appropriation, because although there is a critical incorporation and a conscious use of Information and communication technologies, man-machine tension continues to define many of the expectations regarding the role of ICT in education, especially from radical cultural socio-imaginary rather than empirical evidence or formal research .

The greatest challenge in the construction of a Deep Appropriation is the lack of credibility and lack of credibility of Distance Education in educational contexts even from the own teaching conceptions, but mainly from the institutional guidelines directed almost totally to Face-to-face Education and resistant To technological changes due to the fear of dependence, or to a lack of control in educational institutionalization.

The influence of the external environment on the internal environment within the teaching practice produces a productive orientation of the educational formation, related to the geographical, economic and socio-cultural features of the case. In the FCA of the UAQ, the context of demographic growth and state industrial expansion is linked to relevance and educational demand through the use of EaD, however, there is still resistance from teachers and students at the regional level. Likewise, the institutional vision of autonomy and social inclusion of the UAQ allows the development of a model of EAD that finds a balance between the general university guidelines and the internal administrative organization of a Faculty, and that has produced significant results in terms of expansion indicators Of the educational offer and levels of egress.

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