

Model for the management of knowledge and innovation in virtual education scenarios at the University of Quindío

Modelo para la gestión del conocimiento e innovación en escenarios de educación virtual de la Universidad del Quindío

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Fecha de recepción: 02.04.2024

Fecha de aprobación: 25.06.2024

Fecha de publicación: 30.06.2024

Cómo citar: Ramírez, A., Giraldo, A., Parra, A. (2023). Model for the management of knowledge and innovation in virtual education scenarios at the University of Quindío. *UCV Hacer* 13 (2), e130203. <https://doi.org/10.18050/revucvhacer.v13n2a3>

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Abstract

Knowledge is a topic of interest for those who recognize its impact as intangible asset in organizations, including higher education institutions, which have incorporated information and communication technologies (ICT) in their academic practice, along with the e-learning model to develop their formation and management processes. This work proposes the design of a model of knowledge and innovation management in virtual education scenarios for higher education institutions, starting from the mission axes, such as Extension, teaching and research, where strategies (from doing) and good practices (from being) are evident, which come together in four integrative elements of the model proposed, starting from the construction of knowledge and learnings by implementing processes of socialization, combination, exteriorization, and interiorization proposed by Nonaka and Takeuchi (1995). These processes, undoubtedly, dynamize formation in virtual, remote, and in-person education scenarios. All these elements, dynamic since their conception, are constituted by human capital, structural capital (technology), relational capital (organizational culture), and motivation and innovation (education sector). These elements are presented to consolidate knowledge and innovation management in virtual education scenarios that, day by day, become more important in Universidad del Quindío and global education.

Keywords: Information, knowledge management, innovation, e-learning, virtual.

Resumen

El conocimiento es un tema de interés para aquellos que reconocen su impacto como activo intangible en las organizaciones, incluidas las instituciones de educación superior, las cuales han incorporado en su quehacer académico las TIC y el modelo e-learning para el desarrollo de sus procesos de formación y gestión. El presente trabajo propone el diseño de un modelo de gestión del conocimiento e innovación en escenarios de educación virtual para instituciones de educación superior, partiendo de los ejes misionales como la extensión, docencia e investigación, en las que se evidencian estrategias (desde el hacer) y buenas prácticas (desde el ser), las cuales confluyen en cuatro elementos integrativos del modelo propuesto, que parten de la construcción de saberes y aprendizajes mediante la implementación de los procesos de socialización, combinación, exteriorización e interiorización propuestos por Nonaka y Takeuchi (1995). Estos procesos sin duda dinamizan la formación en escenarios de educación virtual, a distancia y presencial. Todos estos elementos, dinámicos desde su concepción, están constituidos por un capital humano, un capital estructural (tecnología), un capital relacional (cultura organizacional) y la motivación e innovación (sector educativo). Estos elementos son presentados a fin de consolidar la Gestión del Conocimiento e Innovación en escenarios de educación virtual, que día a día toma mayor auge en la Universidad del Quindío y la educación global.

Palabras clave: Información, gestión del conocimiento, innovación, e-learning, virtual.

INTRODUCTION

Knowledge management is an organizational approach and a strategy that privileges the knowledge and practices that people have accumulated as a result of a process of internalization of learning and socialization of experiences to enhance competencies so that they can be transformed into the achievement of the strategic objectives of the institutions. In this context, we find the contributions of authors such as (González Gil et al., 2020), in the book entitled Educational Innovation and Knowledge Management, in which they point out that in the context of higher education, to speak of knowledge management implies a central process in the academic dynamics, since this level of education should strive to enhance the processes of systematization, organization and use of knowledge in the resolution of problems. However, although knowledge is in itself the most valuable asset of a higher education institution, knowledge management is a new field that is fundamental for the social consolidation of universities. On the other hand, the same authors state that innovation must be guaranteed from higher education institutions, through intentional and articulated actions towards pedagogical developments centered on the person, but focused on contexts of generation of new knowledge, technological development and innovation, social appropriation of knowledge and training of human resources for Science, Technology and Innovation (CTEI, from Spanish initials). A Currently, in universities, a high percentage of education is face-to-face, since a model has been followed in which the teacher transmits information and knowledge in lecture classes and students become passive entities. However, the change of paradigm brought about by the pandemic acquires greater relevance in a context characterized by a scenario of uncertainty created by the global public health situation, which leads to reconfigure the educational scenarios, the need to intensify the use of technologies and to strengthen competencies for autonomous and collaborative learning, which is possible from the consideration of knowledge management and innovation. It is evident that the appearance of ICTs brings notable changes in the way of teaching and learning, such as, for example, the management of time and space. This indicates that a new place is created in

which forms of interaction are established in which the barriers of time and physical distance have been overcome. Likewise, different ways of accessing knowledge, promoting its circulation, construction and appropriation are established. Therefore, this research is based on the following research question: What components and strategies make up the structure of a model for the design of knowledge management and innovation in virtual education scenarios, to ensure the strengthening of training processes in higher education institutions? Therefore, in order to respond to the premise that directed this study, the general objective is: To propose a model of knowledge management and innovation in virtual education scenarios for universities, guaranteeing professional training processes in tune with the dynamism of digital societies. Now, to achieve this, the specific objectives are: 1) To analyze and compare good practices, models, strategies and guidelines on knowledge management in virtual education scenarios implemented in higher education institutions; 2) To determine variables and indicators related to knowledge management and innovation in virtual education scenarios at the University of Quindío and, finally, 3) To specify the components of the model on Knowledge Management and Innovation in virtual education scenarios for higher education institutions.

FRAME OF REFERENCE

In accordance with the first specific objective, an analysis and comparison of good practices, models, strategies and guidelines on knowledge management in virtual education scenarios implemented in higher education institutions was carried out through a systematic review of the literature, in theoretical and conceptual aspects. As mentioned above, the foundation was based on the bibliography stored in databases with scientific and information endorsement. Said search determined that the selection and analysis of relevant information results from the years 2017 to 2021, which resulted in a classification of the information in three approaches: - Good practices in knowledge management and virtual higher education. - Knowledge management strategies and virtual higher education. - Models of knowledge management and virtual higher education.

The findings of each of these proposed categories are presented below:

a. Good practices in knowledge management and virtual higher education.

In order to carry out an adequate knowledge management, it is necessary to know, understand and apply in a context-appropriate manner the practices that are optimally adjusted to Higher Education. In this context, the authors Mondragón & Moreno (2020), in the article entitled "Review of the concept of good educational practices that integrate digital technologies at the higher level: approaches for their detection and documentation", have determined that the concept of good practices are a set of actions that, due to the results obtained in their application, deserve to be replicated. On the other hand, Rodríguez & Artiles (2017), in the article "Learning and Good Practices for the Management of the Higher Institution", state that these good practices must be delimited taking into account the context where they are developed, starting from the general, personal and professional, with an adequate mediation of the knowledge manager by potentiating teamwork giving participation to the entire university community. On the other hand, the approach presented in the article "Training in good teaching practices for virtual education", by the authors Durán & Estay-Niculcar, (2016) suggests that for teachers to adopt good practices when proposing learning activities on virtual platforms depends on the mechanisms of approval and monitoring of the curriculum adopted by universities that offer virtual education programs. In accordance with the above, the authors Carmona & Rodríguez, (2017) recognize in virtuality another way of approaching the university with the regional community, through the design of strategies that offer quality education such as usability, accessibility, adaptability and modularity in search of a quality standard in virtual education, contributions presented in the article entitled "Good practices in virtual higher education from specifications of e-Learning standards". Now then, knowledge management practices and teamwork are key to the productivity of research groups, and as concluded by Sanchez-Rodríguez et al, (2021), when stating in the article "Knowledge management practices and teamwork in higher education institutions: measurement scales", that "the scale of knowledge management practices is formed by two dimensions: institutional strategy and

knowledge creation; and the teamwork scale is composed of three factors: learning community, collaboration and cooperation, and functional diversity" (p. 166), which clearly demonstrates that knowledge management and innovation arise from the synergy between being and doing as an academic and organizational community.

b. Knowledge management strategies and virtual higher education:

Talking about knowledge management in virtual higher education places us in the configuration of learning environments that privilege other forms of connectivity, which require strategies that facilitate the management of the most important asset that an organization has which, for our case study, are the sciences and disciplines that surround the higher education institutions in their faculties. Undoubtedly, virtual education bases its curricular proposal through various strategies that allow teaching and learning processes in scenarios anchored to knowledge that respond to reality, in other words, these strategies are the product of the relationships established in the context. For authors such as Martínez et al. (2018) the virtual education modality suggests the application of strategies according to the context, from which the teacher creates an effective communication and an exchange of information, fundamentally, through ICT as a means for the qualification of communicative competencies. In this sense, virtual learning environments are a challenge from the perspective of the teacher (Morado, 2018), since it is not only about managing knowledge, but also about knowing how to do it (González de Dios & Hijano, 2017), given that it is not only about presenting knowledge, but also about knowing how to communicate it. On the other hand, there are strategies according to the use of the media, for which Humanante-Ramos et al. (2019) expose the importance that the use of information and communication technologies has acquired for the exchange and dissemination of knowledge. In this sense, in the educational context, technologies have long depth given their benefits (López et al., 2019) related to connectivity, motivation-centered learning and e-learning teaching (Neroni et al., 2019). In summary, virtual learning processes are characterized by being a flexible strategy for the dynamics of learners (Benitez-Saza et al., 2020). Likewise, Ferrero et al. (2021) argue that knowledge management has revolutionized the academic environment and that ICTs are a

strategic ally. This is in line with Bermeo-Giraldo et al. (2020) who consider that educational institutions should favor strategies that focus on ICT spaces, suitable for the generation and transfer of knowledge, in which knowledge management is perceived as a daily process that requires constant traceability (Cuadrado, 2020). In this sense, the university should promote the configuration of spaces that review knowledge management from the different training, research and extension activities (Naranjo et al., 2016). Cognitive psychology, on the other hand, contributes with other types of strategies, in which authors such as Visbal-Cadauid et al. (2017); Theobald (2021) and (Hamid et al., 2021) consider that learning is made possible thanks to the use of cognitive and metacognitive strategies. Other types of strategies are related to knowledge as an intangible asset. In this sense, Castro et al. (2019) emphasize that talking about knowledge and its management as a corporate asset is a highly relevant and novel topic, due to the fact that it is found in human capital. Similarly, Hernández et al. (2020), state that it is vital to have a successful connection between knowledge and the needs of the environment, since knowledge management is considered a roadmap within educational management (Paredes et al. , 2017); and according to Barbón & Fernández (2017), this type of strategies reveal the need to weave relationships between knowledge management, science, technology and innovation as vital components for the realization of strategic plans within an organization. Finally, the strategies understood as agents of change are presented, which visualize knowledge management as an agent of change that contributes to the solution

of educational problems (Correa-Díaz et al., 2019). In this sense, knowledge management is an activity whose strategies should focus, mainly, on human capital and its motivation and are characterized, according to Beltrán et al. (2019), by attending to the knowledge society, reviewing the needs of the environment and managing this intangible asset, with the purpose of strengthening the different processes that make up a higher education Institution.

c. Models of knowledge management and virtual higher education:

For some decades now, the notion of Knowledge Management Models has been used to refer to the transfer of knowledge from the place where it is generated to the place where it will be used with the purpose of identifying, capturing, developing, distributing and retaining organizational knowledge. In this sense, the concept establishes a series of proposals and models that serve as a horizon for the fulfillment of the objectives of organizations and generate intellectual capital to help solve problems. It should be noted that for Nonaka & Takeuchi (1995) there are four modes for the conversion of knowledge: Tacit to Tacit; Explicit to Explicit; Tacit to Explicit; Explicit to Tacit.

Table 1 presents a detailed compilation of model proposals that took as the base model Nonaka & Takeuchi (1995), authors who present the processes of Socialization, Externalization, Combination, Internalization (epistemological dimension - ontological dimension), as a way of knowledge movement through the spiral.

Table 1
Comparison of Knowledge Management models.

Name of the Article	Knowledge Management Model
Martínez (2009). Knowledge Management through e-Learning. A Scenario-Based Approach. E-learning integration model in the knowledge conversion cycle (Adaptation of the Nonaka and Takeuchi model).	Author’s Contribution: Socialization: Group work, Chat, audio/video conferences, e-mail, Discussion forums, Externalization: Word processing, Blogs, chat, electronic whiteboards, e-mail, discussion forums, distribution lists; Combination: Content Module, Content Index, Search Engines, and Internalization: Training itineraries, Adaptation of contents to the user’s profile (LCMS), Simulations.

Avendaño & Flores (2016). Theoretical models of knowledge management: descriptors, conceptualizations and approaches. Within sciences: Dialogues in the Knowledge Society. Epistemological analysis of models.	Riesco (2004). Integrated situational model: Double dimension; Holistic and particular with social and technological perspective. Acquisition, storage, transformation, distribution and utilization.
Escorcia & Barros (2020). Knowledge management in Higher Education Institutions: Characterization from a theoretical reflection. Bibliometric analysis to identify groups and lines of research.	Paniagua y López (2007). Componentes del modelo de gestión tecnológica del conocimiento. recursos de conocimiento, actividades de transformación del conocimiento y factores de influencia en la GC. Ángulo y Negron (2008). Holístico. El modelo que se propone tiene los siguientes procesos: socialización, creación, modelado y difusión.
García et al. (2020). Knowledge management as a determinant of innovation capacity in higher education institutions. Appropriation to knowledge management according to Nonaka and Takeuchi.	Identification phase, Creation phase, Distribution phase, Measurement phase. Author's contribution: I: Intention, R: Redundancy, A: Autonomy, F: Fluctuation and creative chaos, V: Variety of requirements.
Acevedo-Correa et al. (2020). Formulation of knowledge management models applied to the context of higher education institutions. Methodological proposal to implement knowledge management models in HEIs.	Author's contribution: Phase 1: Diagnosis-state of knowledge; Phase 2: Design of KM strategies; and Phase 3: Implementation and validation of KM strategies.
Paredes et al. (2017). Knowledge management and its relevance in university education. Contribution of knowledge management to higher education.	Sense-Making de Choo (1998). The intelligent organization in which common sense, knowledge creation and decision making are highlighted as its bases. This model focuses on selecting and incorporating information elements into the organization's actions, thanks to the concentration and assimilation of information from the environment. Davenport e Prusak (1998). Knowledge process, dividing it into three stages: - Knowledge Generation. - Knowledge Codification. - Knowledge Transfer. Firestone y McElroy (2004). They establish a relationship between organizational learning and knowledge management, where in organizational learning individuals, groups, teams, communities and the organization itself learn to make decisions and take actions for operational and knowledge management, while knowledge management consists in the creation of a sustainable innovation system.
Correa-Díaz (2019). Knowledge management: An alternative for the solution of educational problems. Epistemological-documental analysis of successful educational models based on knowledge.	Tiwana (2002). Tacit and explicit knowledge in four phases: 1. Assessment of the infrastructure; 2. Systems analysis; 3. Systems deployment; and 4. Performance evaluation. Model of the new knowledge management Firestone and McElroy (2003). Differentiation between knowledge management (KM), knowledge processing (KP) and business processing (BP). Sallis y Jones (2002). The model proposes to each organization to create its own KM system.

Fuente: Elaboración propia a partir de revisión bibliográfica de los modelos de Gestión del Conocimiento.

The above context shows that little has been done in terms of models for knowledge management and innovation with virtual mediation, hence the proposal presented in this project seeks to contribute to the consolidation of a model of its own, based on the experiences and studies carried out at a general level.

METHODOLOGY

The methodology developed to achieve the objectives proposed in this work seeks to relate the type and approach of research with the techniques and instruments to obtain as a result an operational sequence that runs from the complementary to the data collection scenarios that integrate quantitative and qualitative processes. In this sense, the methodological process was based on an approach of methodological complementarity, which is linked to the use of multiple strategies to approach the study of a research object. These authors proposed [...] using alternative forms of data collection to the interviews and surveys predominant at the time. These were variants of observation that shared the characteristic of not being reactive, that is, of not altering the subjects and their environment (Forni & De Grande, 2020, p. 165) For their part, the authors Blanco & Pirela (2016), in their article entitled “Methodological complementarity: Strategy for the integration of approaches in social research”, describe this research approach as the use of quantitative and qualitative techniques to broaden the understanding of the phenomena being studied. This is evidenced through the use of techniques such as a survey (quantitative), complemented by techniques such as the focus group (qualitative), in order to have a much more complex, broad, systemic and global vision of how knowledge management processes work in training scenarios, thus responding to the proposed objectives.

Focus group interviews: application of open-ended questions to focus groups of teachers of the programs under study.

The qualitative measurement variables in the survey to teachers are incorporated through the recognition of motivation and innovation tools and strategies present in the educational sector, focused on the research that takes

place in groups and seedbeds to promote knowledge management either synchronously or asynchronously. The above is strengthened and complemented by what is proposed in Euroforum’s Intellect model (Bueno & Instituto Universitario Euroforum, 1998), starting with Human Capital, which refers to the perception that teachers have of the capabilities offered by the university for training and motivation contributed to academic quality; followed by Structural Capital (Technology), which is evidenced in the implementation of transmission and communication mechanisms to demonstrate the explicit knowledge resulting from academic production; Finally, the Relational Capital (Organizational Culture) focuses on the relationships with students, graduates, suppliers, educational institutions, the State, the community, the institutional image and the social capital that allows the promotion of the creation of new knowledge, in order to strengthen the extension and social development to meet social needs.

Self-administered structured questionnaire:

For the application of this questionnaire, the following variables were defined, which allow to follow up the student’s training:

- Strategies used for learning are related to the retention of the lessons learned in the different academic areas.
- Strategies used to dialogue and share prior knowledge with classmates, i.e., those strategies used to interact through dialogue with their classmates.
- Strategies used to make the knowledge learned known, i.e., those used to reflect on the learning acquired.
- Strategies used to make known the information acquired and the new knowledge constructed, i.e., those used to transmit new knowledge.
- Strategies employed to internalize and/or do metacognition of the lessons learned, which lead to reflecting on and valuing the lessons learned.
- Synchronous and asynchronous strategies and tools used by teachers, which are materialized in the appropriate tools to transmit the teachings of the program curriculum.

- Strategies used by teachers to promote the creation of new knowledge, taking into account the frequency with which teachers use strategies so that you can create new knowledge, product of the knowledge you have acquired with the teachings received.

- Overall perception of teacher teaching related to student satisfaction with the level of advice provided by the teacher, for interaction in an ICT-mediated learning environment.

Systematic review of the literature:

In this regard, a bibliographic search protocol was established in sources with scientific recognition. These sources were the paid database engines Scopus, ScienceDirect and the free engine Redalyc. For the selection of articles located in these databases, initially, the last 5 years of publications (2017-2021) were taken into account.

Once the database engines and date ranges for the information search had been established, the search protocol was defined using three criteria, which are closely related to the proposed objectives and are described below:

- Best practices in knowledge management and virtual higher education

- Knowledge management strategies and virtual higher education

- Knowledge management models and virtual higher education

Population and sample:

- Universe: Taking into account that the population is the universe of elements to be studied, we declare that the universe selected to carry out the research is the academic community of the Universidad del Quindío.

- Population: two undergraduate programs with face-to-face modality, two programs with distance modality and one program with 100% virtual modality, which belong to different Faculties of the University.

- Sample: For the calculation of the sample size, parameters have been set that depend on the type of study. The sample presents a casual or incidental sampling. For this research project, full-time teachers and students from sixth semester onwards are taken as a sample.

Phases of the investigation:

In this section, the following phases and concrete actions were defined. This allowed the triangulation of the information obtained with the inputs from the responses of students, teachers and systematic review of the literature:

Table 2

Cuadro resumen Fases del proceso metodológico

Research question: What components and strategies make up the structure of a model for the design of knowledge management and innovation in virtual education scenarios, which guarantees the strengthening of training processes in higher education institutions?		
General objective: To propose a model of knowledge management and innovation in virtual education scenarios for universities, guaranteeing professional training processes in tune with the dynamism of digital societies.		
Specific objectives	Phases	Activities
Analyze and compare good practices, models, strategies and guidelines on knowledge management in virtual education scenarios implemented in higher education institutions.	Phase 1: Systematic review of the literature.	This phase included the systematic review of cases and practices related to possible models and strategies that have been the result of research processes or implementation of approaches to knowledge management and innovation in higher education institutions. The purpose of this phase was to establish not only the state of the art but also of the practices around knowledge management, to identify common elements in these approaches and strategies and to integrate such inputs in the construction of the model proposal for the University of Quindío.

To determine variables and indicators related to knowledge management and innovation in virtual education scenarios at the University of Quindío.	Phase 2: Collection and analysis of information.	With the application of the survey to students and the interview to focal groups of teachers, it was possible to obtain empirical data that were translated into variables and indicators on knowledge management and innovation in virtual education scenarios at the University of Quindío. The development of this phase was of vital importance for the final proposal of the model, since it provided the empirical and contextual support, which will guarantee its conceptual and technical viability.
To specify the components of the model on Knowledge Management and Innovation in virtual education scenarios for higher education institutions.	Phase 3: Triangulation of information	This phase was based on the idea of creative synthesis and integration of the two previous phases to generate the conceptual, functional and technical components of the model of knowledge management and innovation in virtual education scenarios for higher education institutions. Taking as a case study: The University of Quindío.

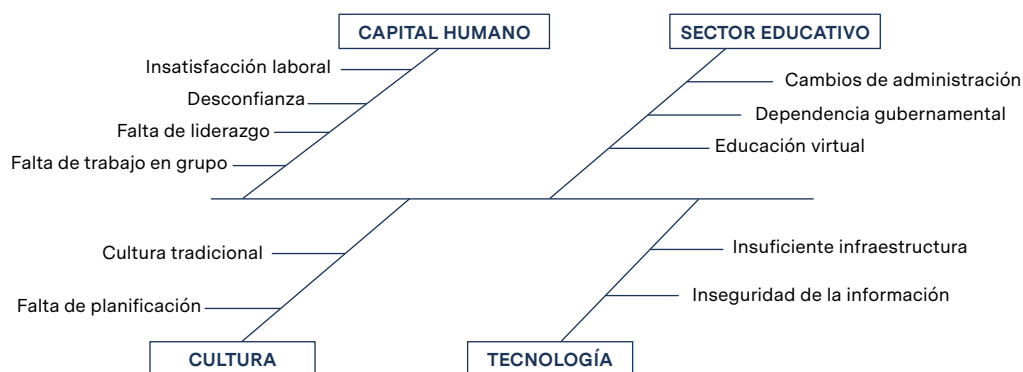
RESULTS AND DISCUSSION

La determinación de las variables e indicadores relacionados con la gestión del conocimiento e innovación en escenarios de educación virtual en la Instituciones de Educación superior se realizó, a través del análisis de los resultados obtenidos en la metodología planteada para el desarrollo

del trabajo investigativo, donde se identificaron algunos factores que influyen en la adecuada gestión del conocimiento, tomando como caso de estudio la Universidad del Quindío y que permitieron la propuesta de Diseño de Modelo de Gestión del Conocimiento en escenarios de educación virtual para Instituciones de Educación superior y que se ilustran a continuación en el diagrama Ishikawa.

Illustration 1

Ishikawa diagram to illustrate the factors that influence adequate knowledge management:



Source: Prepared by the authors of the illustration based on the diagram proposed by Ishikawa.

Knowledge Management Model

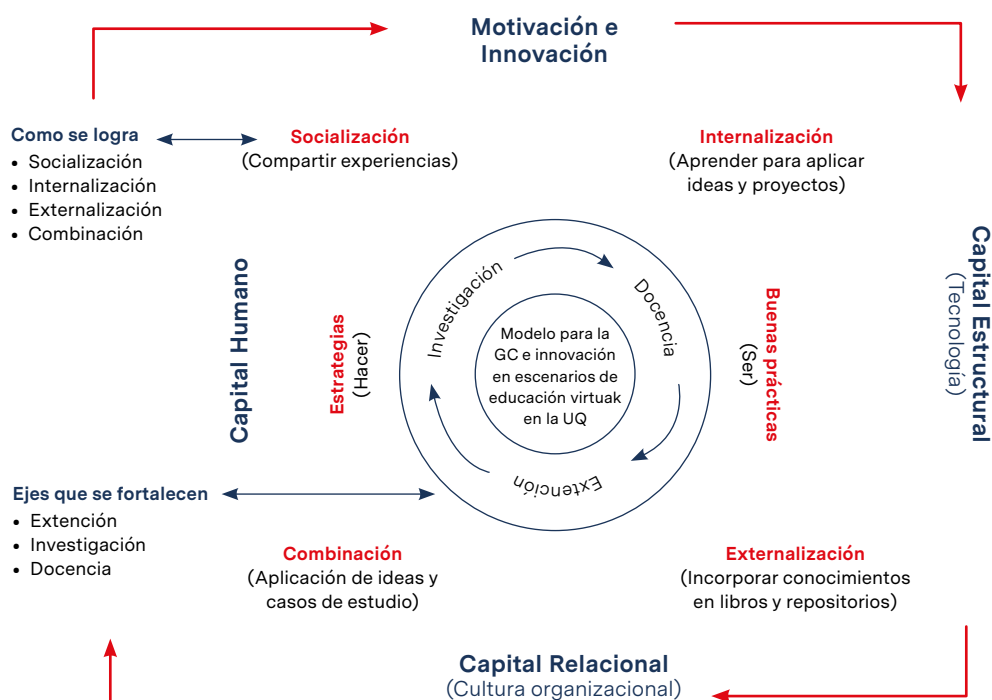
Structure of the KM Model

Components of the KM Model for UQ

The following illustration shows the components of the KM model that seek to achieve innovation and adequate knowledge management in the institution:

Illustration 2

Components of the Model for Knowledge Management at the UQ



Fuente: Elaboración propia.

It can be seen how this proposed model is made up of a combination of aspects of different interrelated components that represent a possible solution to the needs presented in the institution, which, in synergy, contribute to the effectiveness of the results. Next, each of the categories of the model proposed in the development of this project is supported, taking into account the mission pillars such as Teaching, Research and Extension:

• **Internalization (Learning to apply ideas and projects):** This category takes into account research processes that lead to participation in research seminars, in research projects applying various study techniques for socialization in the different academic spaces.

• **Externalization (Incorporating knowledge in books and repositories):** This category takes into account the collective construction of knowledge through interactivities and interactions of extension and social projection making use of ICT tools (discussion forums, documents, visual design, virtual platforms) and the application of good practices in Knowledge Management and virtual higher education (teamwork, curriculum monitoring, usability, accessibility, adaptability and modularity, asynchrony, synchrony, research).

• **Combination (Application of ideas and application of case studies):** This category takes into account aspects such as:

- New knowledge (content provision, strategies for information retrieval and acquisition, through communicative and written skills and use of databases).
- Motivation in the knowledge management process (teamwork, integration between teaching and research, cognitive strategies, mentoring, dialogue).
- Knowledge management strategies and virtual higher education (context, use of media, cognitive and metacognitive psychology (communities of practice), knowledge as an intangible asset and human capital and motivation).

• **Socialization (Conferences, experience sharing):** This category of the model focuses on the use of media and educational resources, through the application of study techniques through synchronous and asynchronous activities with the use of audiovisual tools.

In accordance with the above, teachers, through didactic sequences and with the help of the resources and activities provided by the LMS Moodle platform and external online tools, can propose interactivities and interactions for the student to appropriate knowledge in real contexts supported by information and communication technologies, under a constructive, collaborative and meaningful

teaching model, for the enhancement of knowledge. This teaching methodology is framed in a self-motivated student who assumes his own training process, through academic tools and asynchronous feedback, readings, page links, permanent advising by teachers, who have previously produced, transformed, processed and used the information for their students (tacit to explicit knowledge).

Illustration 3

Activities carried out in virtual education scenarios, in the context of Nonaka & Takeuchi's Model (1995).



Source: Prepared by the authors

Elements involved in the structure of the proposal of the Model for knowledge management and innovation in virtual education scenarios at the University of Quindío.

Human capital

For the implementation of the model, it is necessary to carry out a sensitization process with the institution's human capital related to virtual education scenarios. This is important because this is where we intend to capture the attention and commitment of the administration and the institution's personnel in general.

According to the causes identified on the factors that influence knowledge management, the importance of human capital on the correct management of knowledge is determined. Therefore, a key factor for the success of this type of project is to achieve the commitment of

the administration, staff and teachers. Otherwise, this initiative will only represent a waste of time and money.

With respect to Human Capital, the necessary policies should be proposed to stimulate their talent, seeking that their knowledge grows and their selection is based on their knowledge and skills according to the requirements of each level. Similarly, strategies or mechanisms should be sought so that knowledge becomes part of the institution, i.e., it does not remain only in the human capital, but transcends. The following is a list of plans that should be designed to improve working conditions and serve as a means to optimize knowledge management:

- Restructuring plan and selection of personnel
- Organizational climate plan
- Training plan

With regard to virtual education, teacher training

should continue to be promoted based on the educational and methodological needs of the incorporation of Information and Communication Technologies (ICT) in the Institution, in order to develop and strengthen the competencies that will allow teachers and students to make a more effective use of technology and information.

While it is true that the University has already started a path towards strengthening the skills of teachers and students, there is still a need to expand training and exploration into new topics that are currently trending in virtual education such as artificial intelligence, data mining, mixed reality, among others.

Relational capital (Organizational culture)

When considering organizational culture “as one of the main conditioning variables of the processes of knowledge creation and management”, it is necessary to pay special attention to this point, even more so when there is a traditional culture.

The plans developed in order to minimize the traditional culture must be aimed at trying to change the attitude of the personnel and avoid resistance to change, which can be achieved through campaigns and reflection spaces. Although it should be noted that staff motivation is closely related to job satisfaction, since a worker who develops in a healthy environment will surely be more willing to collaborate and make changes that favor productivity and the organization in general.

Cultural change plan: Promote campaigns and continuous awareness of the importance of cooperation and teamwork, motivation on the advantages and benefits of sharing information and constant updating of knowledge. In addition, promote campaigns on the need for planning, risk forecasting, specification of procedures, manuals and content management for virtual academic spaces.

Structural capital (Technology)

Technology is considered a key factor in the correct management of knowledge, of course, taking into account that it is of no use by itself if it is not accompanied by officials who use it and know how to get the most out of it. It is necessary to identify the infrastructure that the university has: Intranets, web portals, content management systems or digital files, document management, help systems, learning management systems to

finally determine what it has, what needs to be improved and what should be acquired in order to improve the technological conditions that allow a better knowledge management.

In terms of knowledge and technology management, the university must have the following plans in place to ensure security, the necessary technology and the necessary means of communication for the proper management of knowledge:

Technological plan: it is required that the investments, developments and acquisitions tending and oriented to a benefit and gradual fulfillment of the missionary objectives of the entire University. This plan will establish sufficient processes and mechanisms for the implementation of technology improvement or replacement by another. Incorporation of information systems that allow the management of information for decision-making purposes, as well as adequate systems for the administration of learning that allow an adequate capture of knowledge so that it does not reside only in human capital.

Information security plan: To have available all the necessary infrastructure to ensure that there is no loss of institutional information, providing the possibility of having periodic backup of the information and specialized software in computer security.

Risk plan: It is convenient to make a measurement of the key people within the organization and that their removal from the institution may create some traumatism due to the knowledge and/or skills they have. With this analysis it will be possible to create a risk plan to reduce the problems that this would entail, taking into account that one way to reduce the risk of losing key personnel is to transform them into Structural Capital. In this way, the knowledge would no longer remain in the person, but would become the property of the enterprise.

Motivation and innovation (Education sector)

Here, it is important the commitment of the administration, to review the influence of changes in projects related to the correct management of knowledge. In this aspect, the institutionalization of the knowledge management project should be planned and proposed, so that it becomes an institutional policy and even if there are changes

of administration, the projects and plans associated with knowledge management are not affected for the benefit of the organization and its productivity.

CONCLUSIONS

This research project, in accordance with the general and specific objectives, started from a qualitative analysis based on the comparison of good practices, models, strategies and guidelines on knowledge management, giving way to a quantitative analysis, by determining variables and indicators related to knowledge management. The above, through the application of different techniques of information gathering and data processing. The results allowed to specify the components of the model on Knowledge Management and Innovation in virtual education scenarios for the University of Quindío. Taking into account that the scope of the research proposal is up to the Design of the Knowledge Management Model, for the application and analysis phase, new research is required with the purpose of deepening these aspects.

The first specific objective, Analyze and compare good practices, models, strategies and guidelines on knowledge management in virtual education scenarios implemented in higher education institutions, resulted in a systematic review of the literature in which the information was classified into three approaches: Good practices in knowledge management and virtual higher education; Knowledge management strategies and virtual higher education; Knowledge management models and virtual higher education.

With respect to the second specific objective, to determine variables and indicators related to knowledge management and innovation in virtual education scenarios at the University of Quindío, through the reading of context and motivation immersed in the formative processes assumed, both teachers and students evidenced the trend towards the use of audiovisual tools, without displacing the written text for teacher-student and student-student communication. It is clear that the use of synchronous and asynchronous mechanisms, without showing a tendency towards one in particular. All these

processes articulated with the CIDBA program's research group and implicitly evidencing the implementation of Knowledge Management and Innovation in the Alma mater's virtual and traditional education scenarios.

Thus, the results were obtained from the focus group interview conducted with teachers; a self-managed structured questionnaire applied to students, specified in the intentional sample; and the systematic review of the literature in scientific databases on good practices, strategies and knowledge management models in virtual higher education allowed to specify the "Design of the model for knowledge management and innovation in virtual education scenarios at the University of Quindío.

Finally, it should be highlighted that knowledge management and innovation in the field of virtual higher education depend on the dynamization of the proposed model, since it is not a static process and responds to the learning needs in the face of internal and external policies of higher education institutions, opening up to extension and internationalization, taking into account that the university is an entity of connection and services to the community, a space for teaching and learning, an axis of research, which allows a holistic vision, based on KM and facing the needs of tacit and explicit knowledge, giving as an added value an integral model, based on elements of internal and external order to the organization that interact with all the social actors of the educational process. Hence, knowledge management and innovation are implicit in the various institutional processes and must be assumed as an organizational project for the achievement of the mission objectives with a systemic approach.

Contribución de los autores:

Angélica María Ramírez Agudelo: Elementos teóricos, análisis, metodología, recursos, escritura inicial y final.

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Alejandra María Parra Sánchez: Elementos teóricos, análisis, metodología, recursos, escritura inicial y final.

Financiación: Sin financiamiento.

Conflicto de intereses: Los autores no incurren en conflictos de intereses.

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