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Artículos científicos

Gestión del conocimiento como determinante de la capacidad de innovación en instituciones de educación superior

Knowledge management as a determinant of innovation capacity in higher education institutions

A gestão do conhecimento como determinante da capacidade de inovação em instituições de ensino superior

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Resumen

Introducción. El conocimiento representa el activo intangible más importante de las organizaciones para impulsar la innovación y ventaja competitiva. La gestión del conocimiento se traduce en mayor eficiencia en el uso de recursos, mejor desempeño productivo y óptimos procesos innovadores. **Objetivo.** El propósito de la investigación es analizar la relación observada entre la gestión del conocimiento y la capacidad de innovación en instituciones de educación superior. La hipótesis central es que la gestión del conocimiento se relaciona positivamente con la capacidad de innovación. **Método.** Se desarrolló una investigación cuantitativa de tipo descriptivo, explicativo y confirmatorio. Establecido el problema de investigación y fundamentadas teóricamente las variables generación de conocimiento e innovación, se procedió al análisis de la relación existente entre ambos constructos. Se utilizaron herramientas de análisis estadístico descriptivo, factorial exploratorio y confirmatorio. Para la modelación y prueba de hipótesis se aplicó análisis de ecuaciones estructurales. El universo de estudio fueron 77 instituciones de educación superior del sureste de México, donde laboraban 8603 personas. El tamaño de muestra fue de 441 trabajadores, y se determinó mediante muestreo probabilístico por conglomerados, asumiendo un error de muestreo de 5 %, nivel de confianza de 95 % y varianza de p = .50, q = .50. La información de campo se obtuvo mediante la aplicación de un cuestionario estructurado de 88 ítems en escala de Likert, el cual fue diseñado con base en los objetivos de investigación y en otros instrumentos utilizados en estudios similares, identificados durante la revisión de literatura. El cuestionario aplicado consta de tres secciones. En la primera, se ofrece información sobre el perfil sociodemográfico de los entrevistados. En la segunda se establece la escala de medición de la capacidad estructural de gestión del conocimiento, a partir de los constructos estructura, cultura, recursos humanos y tecnología. Finalmente, la tercer sección se orienta a identificar la capacidad de innovación

presente en las instituciones de educación superior. **Resultados**. Se encontró que entre las variables analizadas existe un coeficiente de correlación de 0.921; una relación estimada de 1.267 y estandarizada de .96, y un valor p (0.000), lo que proporciona evidencias de la presencia de una relación positiva entre ambos constructos. **Conclusiones**. La gestión del conocimiento influye positivamente en la capacidad de innovación en las instituciones educativas de nivel superior estudiadas, con lo cual se confirma la hipótesis planteada.

Palabras clave: capacidad de innovación, conocimiento, gestión del conocimiento, innovación.

Abstract

Introduction. Knowledge represents the most important intangible asset of organizations to drive innovation and competitive advantage. Knowledge management translates into greater efficiency in the use of resources, better productive performance and optimal innovative processes. **Objective**. The purpose of the research is to analyze the relationship observed between knowledge management and the capacity for innovation in higher education institutions. The central **hypothesis** is that knowledge management is positively related to innovation capacity. **Method**. A descriptive, explanatory and confirmatory quantitative investigation was developed. Once the research problem was established and the knowledge generation and innovation variables were theoretically based, we proceeded to analyze the relationship between both constructs. Descriptive, exploratory factorial and confirmatory statistical analysis tools were used. Structural equation analysis was applied for modeling and hypothesis testing. The universe of study is 77 higher education institutions in the southeast of Mexico, where 8,603 people work. The sample size is 441 workers, and it was determined by probabilistic cluster sampling, assuming a sampling error of 5%, confidence level of 95% and variance of p = .50, q = .50. The field information was obtained by applying a structured questionnaire of 88 items on the Likert scale, which was designed based on the research objectives and other instruments used in similar studies, identified during the literature review. The applied questionnaire consists of three sections. In the first, information is requested on the sociodemographic profile of the interviewees. In the second, the scale for measuring the structural capacity for knowledge management is established, based on the constructs of structure, culture, human resources and technology. Finally, the third section is

aimed at identifying the innovation capacity present in higher education institutions. **Results.** It was found that among the analyzed variables there is a correlation coefficient of 0.921; an estimated relationship of (1,267) and a standardized relationship of (.96), and a p value (0.000), which provides evidence of the presence of a positive relationship between both constructs. **Conclusions.** Knowledge management positively influences the capacity for innovation in the higher-level educational institutions studied, thus confirming the hypothesis raised.

Keywords: Knowledge, Innovation, Knowledge Management, Innovation Capacity.

Resumo

Introdução. O conhecimento representa o ativo intangível mais importante das organizações para impulsionar a inovação e a vantagem competitiva. A gestão do conhecimento se traduz em maior eficiência no uso de recursos, melhor desempenho produtivo e processos inovadores ideais. Objetivo. O objetivo da pesquisa é analisar a relação observada entre a gestão do conhecimento e a capacidade de inovação nas instituições de ensino superior. A hipótese central é que a gestão do conhecimento está positivamente relacionada à capacidade de inovação. Método. Foi desenvolvida uma investigação quantitativa descritiva, explicativa e confirmatória. Estabelecido o problema de pesquisa e fundamentadas teoricamente as variáveis de geração de conhecimento e inovação, procedeu-se à análise da relação entre os dois construtos. Foram utilizadas ferramentas de análise estatística descritiva, exploratória e fatorial e confirmatória. A análise de equações estruturais foi aplicada para modelagem e teste de hipóteses. O universo de estudo foram 77 instituições de ensino superior no sudeste do México, onde trabalhavam 8.603 pessoas. O tamanho da amostra foi de 441 trabalhadores, e foi determinado por amostragem probabilística por conglomerados, assumindo um erro amostral de 5%, um nível de confiança de 95% e variância de p = 0,50, q = 0,50. As informações de campo foram obtidas por meio da aplicação de um questionário estruturado de 88 itens na escala Likert, que foi elaborado com base nos objetivos da pesquisa e outros instrumentos utilizados em estudos semelhantes, identificados durante a revisão da literatura. O questionário aplicado consiste em três seções. Na primeira, são oferecidas informações sobre o perfil sociodemográfico dos entrevistados. Na segunda, estabelece-se a escala de mensuração da capacidade estrutural de gestão do conhecimento, a partir dos construtos

estrutura, cultura, recursos humanos e tecnologia. Por fim, a terceira seção visa identificar a capacidade de inovação presente nas instituições de ensino superior. Resultados. Constatou-se que entre as variáveis analisadas existe um coeficiente de correlação de 0,921; uma relação estimada de 1.267 e uma relação padronizada de 0,96 e um valor de p (0,000), o que fornece evidências da presença de uma relação positiva entre os dois construtos. Conclusões. A gestão do conhecimento influencia positivamente a capacidade de inovação das instituições de ensino superior estudadas, confirmando a hipótese levantada.

Palavras-chave: capacidade de inovação, conhecimento, gestão do conhecimento, inovação.

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Introduction

In the current context of globalization and neoliberal economics - with a more open, interconnected and competitive world - knowledge has become a key factor for the economic and social development of countries and their inhabitants. The intensive use of information technology requires national economies to modernize and prepare to compete in a world economy where the generation, use and dissemination of knowledge derived from science, technology and innovation are determinants of economic and social success . For this reason, governments, companies, public and private organizations, as well as educational institutions seek to keep up to date with strategic knowledge to generate competitive advantages. In this context, the management of intangible assets, such as knowledge, are of strategic importance for the development and growth of countries and organizations (Salete, Tcholakian and Selig, 2013).

De Long and Fahey (2000) classify knowledge into three types: a) human knowledge (what individuals know, their ability or expertise to do and includes tacit and explicit knowledge); b) social knowledge (collective knowledge that is more than the sum of the individual knowledge of the team members and is largely tacit, the result of joint work), and c) structured knowledge (it is incorporated into the systems, processes and tools of an organization). In this regard, it is important to mention that structured knowledge is explicit, since it exists independently of human knowledge, which is why it is considered essential for

every institution. For this reason, its management and transfer constitutes a basic principle in the administration of organizations Grant (1996).

Knowledge management (KM) can be understood as the individual or collective ability to generate, disseminate, share and use knowledge, both tacit and explicit. Therefore, CG has become a useful learning tool, since it adds value within an organization, economy or society (Barragán, 2009). In this way, the organization's innovation and competitive advantage processes turn out to be more efficient under the positive influence of CG practices (Segarra, 2006). Therefore, KM is a fundamental strategic activity for the development and growth of any organization, especially in highly competitive environments (Drucker, 1993; Lee, Leong, Hew and Ooik, 2013; Piri, Jasemi and Abdi, 2013) . Even compared to physical and financial capital, knowledge tends to become one of the most important intangible assets (Reza and Pahlavani, 2013). Thus, given its strategic importance for innovation and competitive advantage, KM becomes a permanent task of the organization (Darroch, 2005; Lee *et al*., 2013).

KM emerges as a strategic philosophy to help organizations develop their capacities to cope with the dynamism and uncertainty of today's complex environment. Through the systematic acquisition, creation, exchange and use of knowledge, organizations make better use of their assets and are more proactive and adaptable to external changes, thus developing innovative and competitive advantages (Nguyen, 2010). For the organization to be able to generate innovation processes based on the knowledge it possesses, it is necessary to implement management processes. The various QA approaches are focused on facilitating the innovation process (Swan and Newell, 2000), which turns out to be more efficient when its workers are provided with adequate training, as well as opportunities to generate new ideas (Bidmeshgipour, Khairuzzaman and Omar, 2012). Thus, various studies have investigated the relationship between innovation and human capital, understood as the set of knowledge, skills and abilities possessed by the organization's workers (Bornay, De la Rosa, López and Valle, 2012). In this regard, there is sufficient evidence of a direct and positive effect of the quality of human capital in innovation (Cabello, López and Valle, 2011).

In summary, it can be considered that the capacity of an organization to innovate is closely related to the intellectual assets and knowledge it possesses, and that organizations that manage knowledge use the resources they have more efficiently, are more innovative and they have a better performance (Darroch, 2005).

Knowledge management

As mentioned, knowledge is the most important asset of the organization for innovation and competitive advantage (Nonaka and Takeuchi, 1995). Therefore, organizations strive to achieve an efficient QA to boost their innovation capacity (CIN) (Davenport and Prusak, 1998). The relationship of KM and CIN within organizations has been extensively studied. López and Meroño (2011) found that the GC strategy has a positive impact on innovation and productive performance. El-Kot and Gamal (2011) confirmed that there is a positive and significant relationship between KM and organizational innovation, as well as sustainable competitive advantage. For their part, Mehrabani and Shajari (2012) observed that the creation, organization, dissemination and application of knowledge as substantive activities of the KM is directly associated with the CIN. In the same way, Palacios, Gil and Garrigos (2009) found that the introduction of a CG program in the organization contributes to the development of skills of acquisition, transfer, diffusion and application of accumulated knowledge. In summary, this empirical evidence confirms that QA contributes to organizations effectively applying their productive resources, as well as organizational CIN.

The literature on QA of organizations in general supports it in two dimensions: infrastructure capacity and process capacity. The first corresponds to the general activities of the organization and comprises four aspects: organizational structure, organizational culture, human resources and information technology. The second corresponds to the structured coordination created in order to effectively manage knowledge and is essential, since it allows the organization to capture, process and transfer knowledge, as well as effectively manage internal and external knowledge (Gold, Malhotra and Segars, 2001). It is made up of the acquisition, conversion, application and protection of knowledge (Gold et al., 2001; Lee and Choi, 2003; Nguyen, 2010).

Likewise, the importance of the organization's structural capacities (culture, functional structure, human and technological resources) is highlighted as strategic aspects that drive the processes of acquisition, retention, transfer and use of knowledge (Chuang, 2004; Lee and Choi, 2003). For this reason, in this research it is considered that the structural capacities of the organization constitute strategic aspects of KM, since they determine the relationship of the KM capacity with the innovation capacity. In short, KM must be understood as an institutional mechanism that enables knowledge to be created, exploited

and shared (Palacios et al., 2009), and this process of knowledge exchange leads to the generation of new ideas, processes and products , that is, to innovation (Camelo, García, Sousa y Valle, 2011).

Innovation

The innovation construct implies the adoption of a new idea or behavior of an organization (Damanpour, Walker and Avellaneda, 2009). At the organizational level, innovation is understood as the adoption for the first time of a technology, strategy or management practice, or a significant restructuring or improvement of a process (Haiyang and Kwaku, 2001).

Innovation can take many forms. Depending on the results it produces, it can be process, product and service (Prajogo and Pervaiz, 2006). According to the level of alteration or change it introduces, it can be incremental and radical (Darroch, 2005). Technological innovations correspond to modifications incorporated into current products and processes based on the application of technologies (Lee et al., 2013). Non-technical or organizational innovation involves the functional structure and administrative and management processes (Abdullah and Hassan, 2013). Technical innovation is divided into product innovation (new products or services introduced to meet an external user or market need) and process innovation (refers to new elements introduced in the production or service operations of an organization) that it can improve operations, save costs, increase efficiency, productivity and performance in a short time (Shu, Page, Gao and Jiang, 2012).

In this regard, Damanpour et al. (2009) distinguish between two types of product innovation (goods and services), and two types of process innovation: innovations in operational processes (such as customer services, logistics and procurement), and innovations in processes management (such as strategic planning, project management and employee evaluation). They also classify three types of innovation that are applicable to service organizations: service, technological processes and administrative processes. Regarding service innovations, Damanpour et al. (2009) mention that innovation research has not generally distinguished between product and service innovations, which is due to the fact that both have an external focus, are mainly driven by markets, and their results They are the introduction of changes in the production of the organization for its consumers or

clients. Like product innovations, the drivers of service innovation are the demand and desire to introduce new services to existing markets or new market niches.

Regarding process innovations, these same authors say that contrary to product or service innovations, process innovations have an internal focus, since they aim to increase the efficiency and effectiveness of the organization to facilitate production and the delivery of goods or services to customers. New processes may be associated with the technological core or technical system of the organization (technological process innovations), or with the administrative core of the organization (administrative process innovations). Technological process innovations constitute new elements introduced into the organization's production and service system. This type of innovation seeks to reduce delivery times, increase operational flexibility, and reduce production costs. Therefore, technological process innovations modify the processes and operating systems of the organization. In service organizations, these innovations are associated with information technology, which is why it is also known as technological innovation.

Finally, innovations in administrative processes correspond to new approaches and practices to motivate and reward members of the organization, design the strategy and structure of tasks and units, and modify the organization's management processes. Technological innovations are directly related to the work and main activity of the organization to produce changes in its operating systems, and administrative innovations are indirectly related to the basic work activity of the organization and mainly affect its management systems. Administrative process innovations refer to changes in the organization's structure and processes, administrative systems, knowledge used in performing management jobs, and managerial skills that enable it to function and be successful through the use of its resources effectively. This type of innovation is also known as administrative innovation (Damanpour et al., 2009). In the current context of modernity and intensive use of communication technologies, for higher education institutions the development and application of technological innovations in their administrative and academic processes is essential.

It is clear then that organizations capable of managing knowledge (CGC) obtain better results, and that this is the main engine of innovation and competitive advantage (Nonaka and Takeuchi, 1995). However, for knowledge to be created and exploited it has to be shared, which in turn serves to generate new ideas, processes and products, that is, innovation

(Camelo et al., 2011). For this reason, the CGC must be assumed as a permanent task to promote the institutional CIN (Palacios et al., 2009). The investigations of Nonaka and Takeuchi (1995) on the creation of organizational knowledge conceive knowledge as the main requirement for innovation and competitive advantage. In this line of research, the central purpose of this research is to analyze the relationship between the CGC and the CIN in higher education institutions.

In the analysis, innovation capacity is assumed as a dependent variable and is made up of product innovation and process innovation. The first refers to the development or improvement of new products and services introduced to existing or new markets (Wang and Ahmed, 2004; Damanpour et al., 2009). The second corresponds to new production methods and / or management approaches (Damanpour et al., 2009; Wang and Ahmed, 2004). For its part, the CGC is assumed as an independent variable, and is based on the infrastructure capacity and the process capacity of the higher-level educational institutions studied.

In summary, knowledge is recognized as the most important resource for competitive advantage and a key element for innovation within organizations. The productive efficiency and operational results of the modern organization depend fundamentally on its intellectual capacities. Consequently, there is great interest in the implementation of knowledge management as a determinant of the capacity for innovation and competitive advantages.

For higher-level educational institutions, whether public or private, this evidence is relevant, hence their efforts to implement strategies aimed at managing relevant knowledge that allow them to boost their innovation capacity and provide competitive advantages in a highly globalized market and competitive. As in the productive activities of goods and services, in educational organizations knowledge is recognized as the most important resource for competitive advantage and innovation, hence these organizations focus their attention on knowledge management, an intangible asset that improves innovation capacity.

Experience indicates that the knowledge management strategy in education has a positive impact on innovation and performance through an increase in innovation capacity. Beyond this, in education there is a positive and significant relationship between knowledge management and organizational innovation, as well as between organizational innovation and sustainable competitive advantage.

Material and methods

This research was based on a descriptive and confirmatory quantitative approach; The purpose was to confirm the existence of a positive relationship between knowledge management capacity (CGC) and innovation capacity (CIN) in the higher level educational organizations studied. For this, the CGC was considered as the independent variable and the CIN as the dependent variable. Once the research problem had been established and the CGC and CIN variables were theoretically grounded, we proceeded to study the relationship between both constructs. Descriptive, exploratory factorial and confirmatory statistical analysis tools were used in the process. In the modeling and testing of established hypotheses, a structural equation analysis (SEM) was applied, which is more appropriate for this type of analysis (Herrero, 2010). The main purpose was to explain the covariances or correlations observed between a set of variables measured through a set of latent variables or factors. (Bollen, 1989).

Design

The universe of study consisted of 77 higher education institutions in the southeast of Mexico. 8,603 administrative workers, managers and teachers work there. In determining the sample size, probabilistic cluster sampling was applied, with a sampling error of 5%, a confidence level of 95% and a variance of p = .50, q = .50. A sample size of 441 employees was obtained, of which 73.7% worked in public universities and the remaining 26.3% in private institutions. In the gathering of field information, a structured questionnaire was applied, designed from the objectives of the research. Based on the findings of the bibliographic review, the CGC and CIN variables were operationalized. The instrument was made up of 88 items on a Likert scale. To measure CGC, the scale produced by Nguyen (2010) was used, while the scale of Al-Husseini and Elbeltagi (2012) was used to measure CIN. The reliability of the items was evaluated by estimating Cronbach's alpha coefficient, according to the scale proposed by Nunnelly (1978): less than 0.6 (low); between 0.61 and 0.70 (adequate); between 0.71 to 0.80 (good); greater than 0.80 (high). For the validation of the construct, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used, according to the criteria of Hair, Gómez, Cano and Frances (2006). Finally, in the processing and analysis of the data, the SPSS program (version 21) was used, as well as

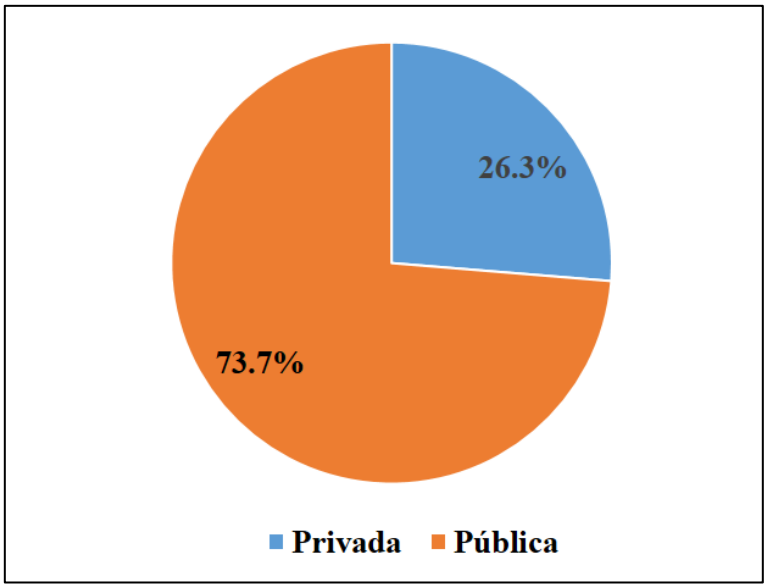
analysis of structural equations in the study of causal relationships between the data obtained, for which the statistical package was used AMOSS (versión 20).

Results

Descriptive

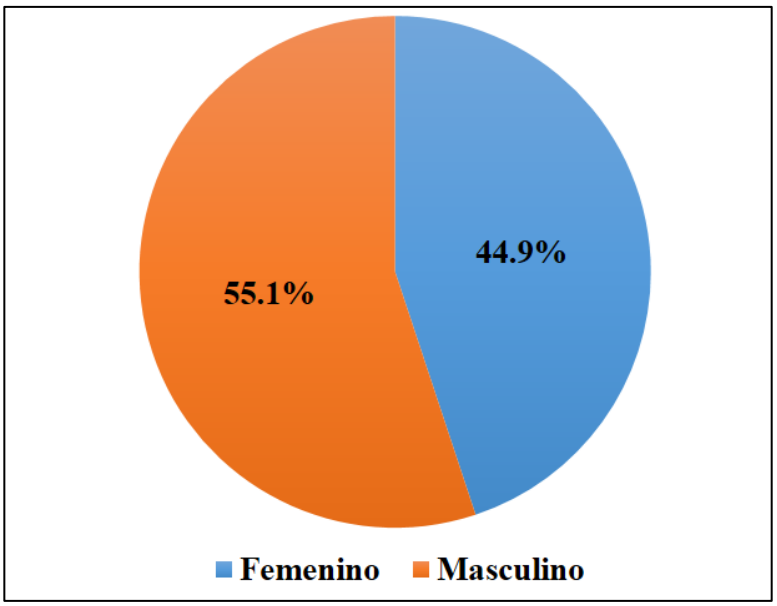
The analysis of the relationship between the CGC and the CIN was carried out in 77 higher education institutions in southeastern Mexico, of which almost 74% are public and the remaining 26% are private capital (figure 1). applied to a representative sample of 441 workers, of which 55.1% were men and 44.9% women (figure 2).

Figura 1. Datos descriptivos. Tipo de institución



Fuente: Elaboración propia

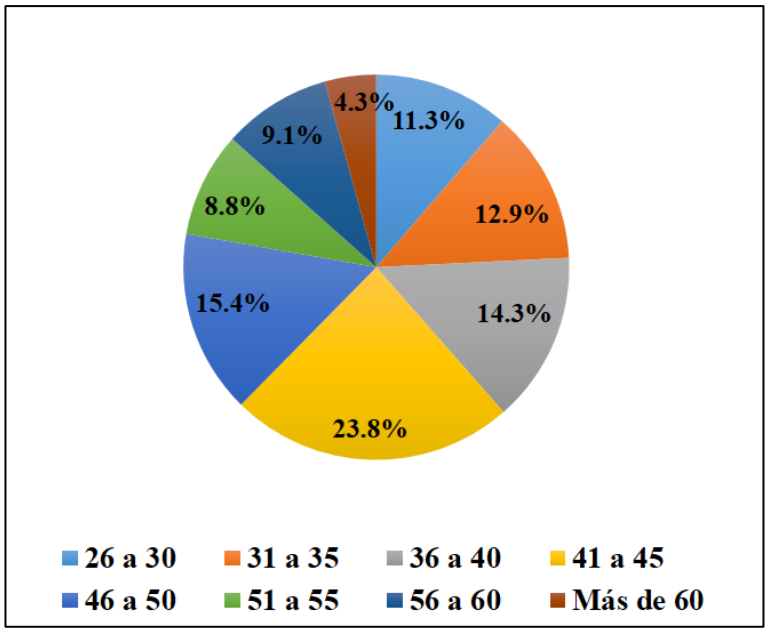
Figura 2. Trabajadores según sexo



Fuente: Elaboración propia

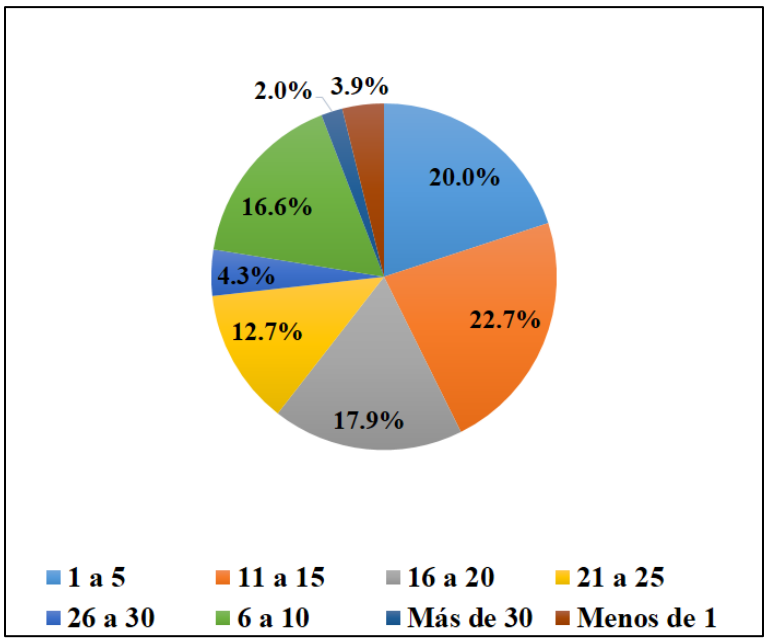
The average age range of the workers was between 41 and 45 years (figure 3), with an average working seniority of 11 to 15 years (figure 4).

Figura 3. Datos descriptivos (edad)



Fuente: Elaboración propia

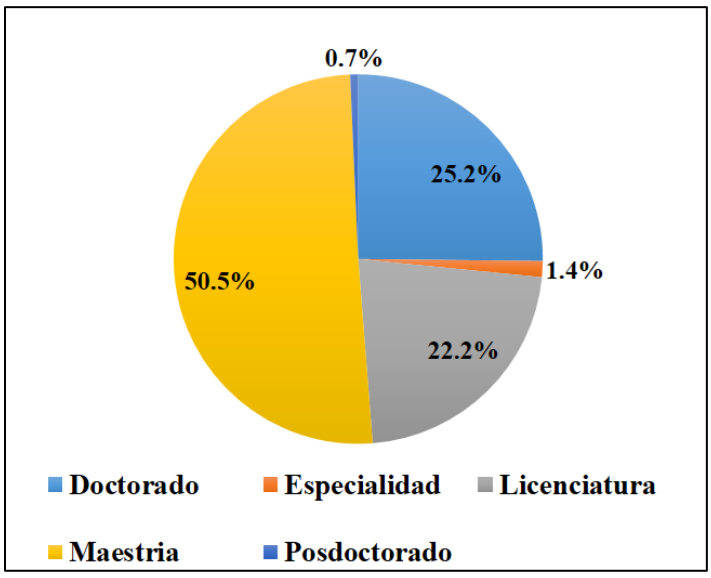
Figura 4. Datos descriptivos (antigüedad)



Fuente: Elaboración propia

The average level of studies was master's, with 50.5% of the total. In this regard, it is noted that 25.5% of the interviewees had a doctorate, and 1.4% with various specialties. Also, 22.4% had undergraduate studies (figure 5).

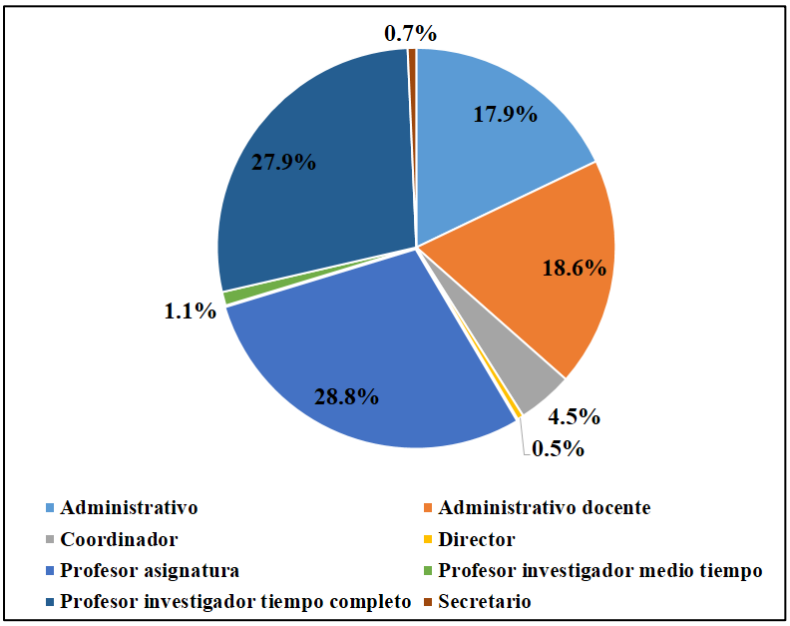
Figura 5. Datos descriptivos (nivel de estudios)



Fuente: Elaboración propia

At the time of the interview, the workers had mainly been performing the teaching function (almost 57% held the position of full-time and subject research professor). The administrative and administrative teaching activities also stand out with almost 37% of the total. In lower order of importance are the managerial functions, which occupied the remaining 6% (figure 6).

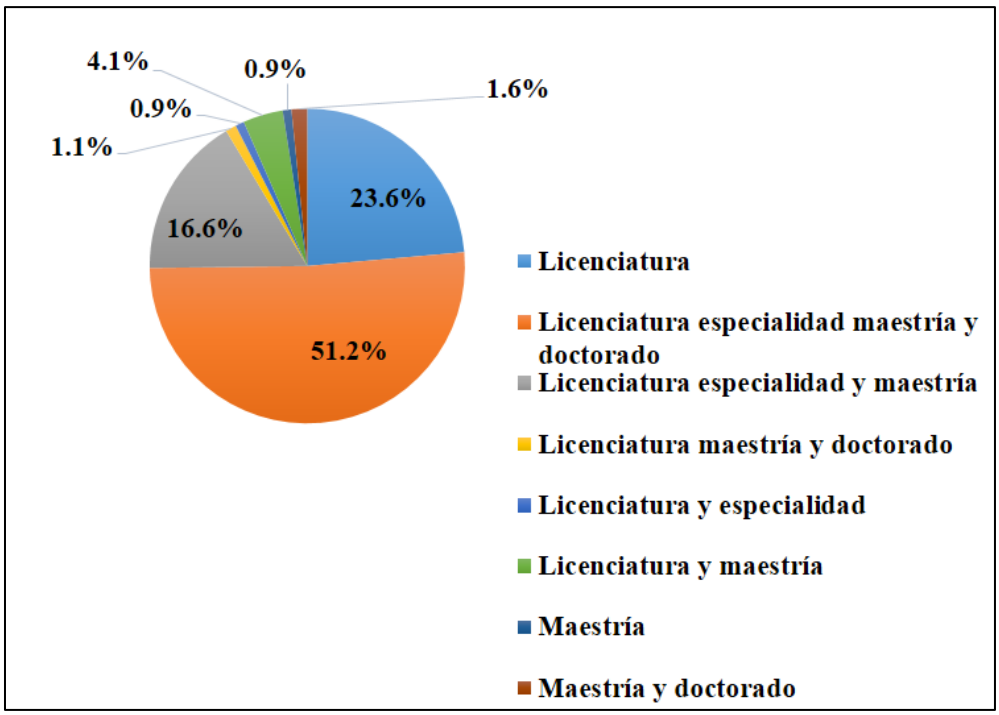
Figura 6. Distribución de la muestra por cargo de las IES públicas y privadas



Fuente: Elaboración propia

The educational institutions investigated preferably taught a wide range of studies. Specifically, more than 51% offered bachelor's degrees, various specialties, masters and doctorates, and in just over 41% the offer focused on bachelor's, specialty, and master's degrees (Figure 7).

Figura 7. Datos decriptivos (nivel educativo que imparte la institución)



Fuente: Elaboración propia

Confirmatory

As mentioned, the analysis developed considered the CGC as an independent variable, which was composed of the CEGC and CPGC constructs, since it was validated that both were one-dimensional and related. Regarding CIN, it was determined as a dependent variable, since its unidimensionality was also considered. The results of the SEM carried out yielded a correlation coefficient of 0.921 between both variables. Likewise, the estimated relationship (1.267), the standardized one (.96) and the p-value (0.000), provide evidence of the existence of a positive relationship between them. Therefore, it can be affirmed that the CGC positively influences the CIN of the higher-level educational institutions studied.

These results derived from empirical evidence agree with those reached by Nonaka and Takeuchi (1995) in their research on the creation of organizational knowledge and its influence on the capacity for innovation in educational organizations. These authors demonstrate that knowledge is the main requirement for innovation and competitive advantage of the institution. Specifically, in these organizations, the knowledge management capacity (CGC) based on the vision of resources and capacities (VRC) and the knowledge-

based approach (EBC) constitutes a strategic resource capable of generating innovation and sustainable competitive advantages. (Grant, 1996). In this way, the introduction of knowledge management programs in the educational organization has a positive effect on the generation of innovation, since it promotes the development of institutional skills, such as the acquisition of knowledge and the conversion, dissemination and internal application of the accumulated knowledge (Palacios et al., 2009). In summary, in higher-level educational organizations, knowledge management should be understood as an institutional mechanism capable of stimulating the generation of tacit and explicit knowledge that is disseminated through the organization and its environment, which is directly reflected in its capacity for innovation and competitive advantage.

Regarding the relationship between the CEGC and the CPGC within educational institutions, sufficient evidence was found to confirm that the CEGC positively determines the CPGC. This is supported by empirical evidence, which shows that the general activities of the organization included in the CEGC are mechanisms that decisively influence the creation of knowledge, as well as its protection and exchange, a conclusion coinciding with Leey Choi (2003) and Nguyen (2010). Likewise, the dimension of the CEGC that most influences the CPGC is the organizational culture, which has a direct and significant relationship on the application of knowledge and indirectly with the acquisition and protection of knowledge. In the same way, the organizational structure also has an indirect relationship on the conversion and application of knowledge.

Discussion

The theoretical review carried out, as well as the empirical evidence derived from the research, show that KM contributes in a decisive way for educational organizations to apply knowledge efficiently and effectively and to better consolidate their innovation processes. It was also confirmed that there is a positive and significant relationship between the CGC and the organizational CIN, and between organizational innovation and sustainable competitive advantage. Thus, the results agree with the conclusions of Nonaka and Takeuchi (1995), who conceive knowledge as a strategic resource of the organization, as well as for innovation and sustainable competitive advantage (Grant, 1996). Likewise, the implementation of QA programs in the organization has a positive effect not only on innovation, but also helps to develop skills for the acquisition of knowledge, as well as its conversion, dissemination and

internal application (Palacios et al. ., 2009). In this sense, CG should be understood as an institutional mechanism capable of stimulating the coordination of tacit and explicit knowledge that is disseminated throughout the organization and its environment. Therefore, the CGC is strongly linked to the CIN within educational organizations (Palacios et al., 2009).

Findings from empirical research on the positive and significant influence of CGC on CIN in educational institutions coincide with preliminary studies by Noruzy, Dalfard, Azhdari, Nazari-Shirkouhi and Rezazadeh (2012) and Nouri, Mousavi and Soltan (2016). The results also show that innovation requires knowledge creation activities at the organizational level (Shu et al., 2012); other results show that the application of knowledge has a mediating effect on innovation (Li, Liu, Wang, Li and Guo, 2009). The CG strategy has a positive impact on the innovation and performance of the organization, through an increase in the CIN (López and Meroño, 2011). The creation and acquisition of knowledge is a determining factor in innovative performance (Zhang, Shu, Jiang and Malter, 2010), and the combination of knowledge directly impacts product and process innovation (Shu *et al*., 2012).

Regarding the CEGC analysis, it was observed that the results coincide with Gold et al. (2001) and Lee and Choi (2003), who indicate the existence of a direct relationship between the culture of knowledge and technology, and indirectly with the human resources of the organization. Regarding the organizational structure as a source of encouragement to QA within educational organizations, the analysis carried out indicates the presence of an indirect relationship with the acquisition, conversion and application of knowledge, a result compatible with the findings of Nonaka and Takeuchi (1995) , Wang and Ahmed (2003) and Nguyen (2010). Regarding technology, Gold et al. (2001) also find that this represents a transcendental element of the structural dimension necessary for the creation of new knowledge, since it allows to overcome the communication barriers present in the educational organization. Likewise, Gold et al. (2001) and Allameh, Zare and Davoodi (2011) find that information technology determines access to knowledge within the educational organization, and therefore, it must invest in the appropriate technological infrastructure that supports its developed scientific activities.

Regarding the finding that within the structure of the educational organizations analyzed, human resources facilitate the process of knowledge exchange between their various areas, this is compatible with Bharadwaj, Chauhan and Raman (2015), who find that

a structure Flexible allows the formation of collaborative work teams. Likewise, Lee and Choi (2003) argue that human capital is the key in the creation of organizational knowledge. For this reason, for Nguyen (2010) the continuous development of the skills and competencies of the organization's workers is essential.

Regarding organizational culture, the analysis showed that it is directly related to the application of knowledge and indirectly to its acquisition and protection, which coincides with Gold et al. (2001), who find that the greatest obstacle to an effective QA is the absence of organizational culture. Likewise, with respect to information technologies (IT), the analysis established the existence of a direct relationship between them and the acquisition of knowledge, a finding that coincides with the results of Lee and Choi (2003), who argue that IT impacts positively in knowledge, facilitating the acquisition, storage and exchange of knowledge on a large scale, thus contributing to the process of knowledge creation. These results are also compatible with Hsu (2014) and Bharadwaj et al. (2015), who affirm that IT is a key factor in knowledge management.

Regarding the CPGC, understood as the capacity of educational organizations to create new knowledge, the analysis shows the existence of a direct and significant relationship, a result compatible with that achieved by Nonaka and Takeuchi (1995). For their part, Lee and Suh (2003) found that knowledge management processes are aimed at making existing knowledge useful for the organization.

Finally, regarding the CIN in educational institutions, the results of the study indicate a direct and significant relationship between the CGC and the CIN of educational products and processes, data that are consistent with that reported by Shu et al. (2012) and Al-Husseini and Elbeltagi (2012), who demonstrate that the ability of an organization to combine and use different types of knowledge is essential to achieve effective innovation processes. Likewise, empirical evidence of a direct relationship between the organizational structure and the innovation of educational processes was found, findings compatible with those indicated by Dilnutt (2000), who finds that the organizational structure directly influences the management of knowledge and innovation within the organization. In this regard, Nonaka and Takeuchi (1995) establish that certain types of structure facilitate the exchange and generation of knowledge, as well as the promotion of innovation.

Conclusions

In a more open, interconnected and competitive world, knowledge has become a key factor for the economic and social development of all countries. Therefore, knowledge, especially structured knowledge, is considered a key resource for organizations, and its management and transfer constitutes a basic principle for its administration. In this sense, the results of this research show that higher education institutions that manage knowledge use the resources they have in a more efficient way, are more innovative and perform better. In the same way, the innovation capacity of these educational organizations is closely related to the intellectual assets and knowledge they possess. Likewise, there is a positive and significant relationship between its capacity to generate knowledge and its capacity for innovation, and this capacity for innovation drives its sustainable competitive advantage. All these empirical evidences are widely supported in the theoretical review carried out.

In summary, the implementation of knowledge generation programs in higher-level educational organizations has a positive effect not only on their capacity for innovation, but also contributes to developing skills for the acquisition of knowledge, as well as its conversion , diffusion and internal application. In this sense, knowledge management must be understood as an institutional mechanism capable of stimulating the generation of tacit and explicit knowledge that is disseminated throughout the organization and its environment. Therefore, the capacity to generate knowledge is strongly linked to the capacity for innovation within higher-level educational institutions.

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