Article **Journal-Public Economy**
June, 2019 Vol.3 No.4 27-42

Factors for measuring knowledge management and intellectual capital in the public sector of Jalisco

Factores para la medición de la gestión del conocimiento y del capital intelectual en el sector público Jalisciense

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DOI: 10.35429/JPE.2019.4.3.27.42 Received march 20, 2019; Accepted June 13, 2019

Abstract

In the public sector, stresses the importance of Knowledge Management and Intellectual Capital, as raw material in the generation and provision of services to citizens, depending on existing needs, as well as in the modernization of public administration. In this sense, the objectives of the present research are focused on identifying the necessary factors for the measurement of Knowledge Management and Intellectual Capital in the public sector of Jalisco, as well as explaining the behavior of the variables under study. For this, the scales of Rodriguez-Ponce (2007) and Chahal and Baskhi (2015) were used with six dimensions or factors, appropriate to the Mexican public context. With a cross-sectional study and a non-probabilistic sampling for convenience of 52 employees of middle managers and directors of the public sector of social assistance from Jalisco, who voluntarily accepted to participate, the results were obtained that allowed validating the instrument with necessary dimensions or factors in the explanation of the variables under study, by means of descriptive statistics and statistical tests of reliability, normality tests and correlations between elements by factor.

Knowledge management, Intellectual capital, Public sector

Resumen

En el sector público, destaca la importancia de la Gestión del Conocimiento y el Capital Intelectual, como materia prima en la generación y prestación de servicios a la ciudadanía, en función de las necesidades existentes, así como en la modernización de la administración pública. En este sentido, los objetivos de la presente investigación se concentran en identificar los factores necesarios para la medición de la Gestión del Conocimiento y el Capital Intelectual en el sector público de Jalisco, así como en explicar el comportamiento de las variables en estudio. Para ello, se utilizaron las escalas de Rodríguez-Ponce (2007) y de Chahal y Baskhi (2015) con seis dimensiones o factores, adecuadas al contexto público mexicano. Con un estudio de corte transversal y un muestreo no probabilístico por conveniencia de 52 empleados de mandos medios y directores del sector público de asistencia social jalisciense, quienes de manera voluntaria aceptaron participar, se obtuvieron los resultados que permitieron validar el instrumento con dimensiones o factores necesarios en la explicación de las variables en estudio, mediante estadística descriptiva y pruebas estadísticas de confiabilidad, pruebas de normalidad y correlaciones entre elementos por factor.

Gestión del conocimiento, Capital intellectual, Sector público

Citation: HUERTA-CHÁVEZ, Irma Alicia & CASTRO-VALENCIA, Alberto Merced. Journal-Public Economy. Factors for measuring knowledge management and intellectual capital in the public sector of Jalisco. 2019. 3-4: 27-42

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Introduction

The public sector has a great responsibility focused on the fulfillment of institutional objectives, which implies responding effectively to the demands of citizens (Sarmiento and Román, 2011; and Rossi, Citro and Bisogno, 2016). In addition, it is important to understand how knowledge management and intellectual capital behave in this sector, since the knowledge generated by public servants is a determining factor for the continuous improvement of services and proper management, allows meet organizational objectives and improve decision making.

In this sense, the public sector stands out for producing and consuming more knowledge, as a basis for intellectual capital, knowledge management being necessary in the generation of programs for the common good of citizens (Oviedo-García, Castellanos-Verdugo, Riquelme-Miranda and García, 2014; Iyikal and Celebi, 2016; and Pérez, Romero and Mora, 2016). Likewise, the new knowledge economy pays special attention to the public sector, since it invites you to have better practices for the modernization of the sector; and face the challenges of retirement and transfer of knowledge workers in public agencies (OECD, 2003; and Sánchez, González and Ortiz, 2010).

Additionally, the existence of few studies on knowledge management in developing countries is highlighted (Syed-Ikhsan and Rowland, 2004), as is the case in Mexico. To this, it is added that research in the intellectual capital of the public sector has also been neglected, even when the generation of knowledge marks international competition (Bontis, 1998); and it is important for the improvement of the management and the control of processes that achieve a real benefit for the citizens (Guthrie and Dumay, 2015).

For its part, the theory of intellectual capital is fragmented, that is, there are several studies which are not related to each other (Massaro, Dumay and Garlatti, 2015), so it represents a real challenge for the public sector, develop research into respect (Tapia, 2016). Likewise, there is a need to have strategies to recognize, measure and evaluate intangible assets for the generation of competitive advantages (Muñoz, 2019).

However, the public sector, in addition to facing the challenges of the new knowledge economy (OECD, 2003; and Sánchez, González and Ortiz, 2010), this sector operates in a context of restricted resources and progressive demands of citizens (Agus, Barker and Kandampully, 2007; and Jääskeläinen and Lönnqvist, 2009). Due to the above, it is extremely necessary for the latter to manage knowledge, that is, properly manage intangible assets, intellectual capital, in order to have competitive advantages to respond in a timely manner to the demands of citizens (Sarmiento and Román, 2011; and Rossi, Citro and Bisogno, 2016).

Regarding intangible assets, it is important to consider them as differentiating elements that create value, directly affecting productivity and the satisfaction of the various stakeholders in the institutions (Muñoz, 2019). Therefore, now the efforts of the institutions must be oriented to change and innovation, emphasizing in giving due importance to the assets that provide value, such as knowledge, skills or attitudes, to name a few (Morales, Jacobo and Leyva, 2018), that is, to its intellectual capital. Likewise, it should be noted that the image and reputation of the institutions have not been so relevant, although they are positioning elements that must be taken care of (Trillo and Peces, 2019).

Based on the above, the problem is formulated based on the following question: what are the necessary factors for the measurement of knowledge management and intellectual capital in the public sector of Jalisco?

Therefore, in the present study, it is proposed to evaluate the variables of knowledge management and intellectual capital, which include six dimensions or factors. Three for the first variable: create knowledge, share knowledge and apply knowledge; and the following three for the second variable: human capital, structural capital and relational capital.

The technique used is quantitative, including descriptive statistics, statistical reliability tests, normality tests and correlations between elements by factor.

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This technique represents an added value in relation to the other techniques, by having statistical data that support the explanation of the phenomenon under study, through empirical evidence, through a valid and reliable instrument that ensures the explanation of the behavior of the variables in study, knowledge management and intellectual capital in a specific context, the public sector.

The central hypothesis of the present, focuses on the knowledge management and intellectual capital in the public sector are explained by six factors, which results in reliability levels above 0.5 in the two variables, being:

– H0: The reliability level of Cronbach's Alpha is less than 0.5.
– Ha: The reliability level of Cronbach's Alpha is greater than 0.5.

This article is composed of 8 main sections. In section 1. Introduction, the topic under study is explained in general, as well as the importance, the technique to be used, the main hypothesis and the problem itself, as well as the generalities to be discussed during the article. In section 2. Theoretical framework, it is possible to observe the theory of knowledge management and intellectual capital, including the proposed theoretical model subject to verification in future research. In section 3. Method, the type and design of research, the conceptual and operational description of both dependent and independent variables, in addition to sociodemographic variables, measuring instruments, participants, procedure and data analysis are included. . In section 4.

Results and discussion, the descriptive results for each factor, the normality tests, the correlations between each element and the calculation of Cronbach's Alpha of the two variables under study are detailed. In section 5. Annexes, the items of the instrument are shown. In section 6. Acknowledgments, informants are mentioned for their participation. In section 7. Conclusions and recommendations, the main findings and future work are explained. In section 8. References, the authors are shown as a result of the review of the state of the art and with direct contribution to this study.

Theoretical framework

Knowledge management

The main pioneers in the theory of knowledge management are Nonaka (1994) and Nonaka and Takeuchi (1995), who propose a paradigm to manage the dynamics of aspects of the processes for the creation of organizational knowledge. The central theme is that organizational knowledge is created through a continuous dialogue between tacit and explicit knowledge.

Knowledge is generated by interaction in four ways, that is, it raises the conversion of knowledge as follows: (1) from tacit knowledge to tacit knowledge, (2) from explicit knowledge to explicit knowledge, (3) from tacit knowledge to knowledge explicit, and (4) from explicit knowledge to tacit knowledge (Nonaka, 1994; and Nonaka and Takeuchi, 1995). This is given from one individual to another, from an individual to a group and between groups. In addition, new knowledge is developed by individuals, being the main role of organizations to articulate and amplify it, as the most important resource for international competitiveness (Nonaka, 1994; and Nonaka and Takeuchi, 1995).

In this same sense, Nonaka (1994) and Nonaka and Takeuchi (1995), present a design of an organizational model based on the process of creating organizational knowledge, with the central requirement of providing the organization with a strategic capacity to acquire, create, exploit and accumulate new knowledge continuously and repeatedly in a circular process, being a dynamic cycle of knowledge.

Knowledge can be classified into two types, which apply in any organization: explicit and tacit. The first is a type of knowledge that can be captured written in documents or in databases; Explicit knowledge is formal and systematic, which can be easily communicated and shared according to Nonaka (1994) and Garzón and Fisher (2009 and 2010), a definition also supported by Guchait, Namasivayam and Lei (2011). Additionally, both tacit knowledge and explicit knowledge exist in individuals, groups, organizational and inter-organizational domains (Kong, 2008).

ISSN 2524-2016

While the second type, that is, tacit knowledge, refers to knowledge that is nonverbal, or even nonverbal, intuitive, non articulated and therefore is not easily expressed and formulated (Kong, 2008).

It is important to recognize Nonaka and Takeuchi (1995), who, in their knowledge creation model supported him in the dynamic interaction between customers, suppliers and the company, and assumed that the company can integrate products, markets and mental models to create knowledge.

In the contribution of Bontis (1998) who affirms that the creation of knowledge on the part of organizations has been practically neglected in administration studies, although Nonaka and Takeuchi (1995) are convinced that this process has been the most important resource for international competitiveness for some time.

According to Rodríguez-Ponce (2007), on whom the present research is based, this author points out that knowledge management includes identifying and sharing information to achieve organizational goals. Likewise, the knowledge management process consists of three stages: create, share and apply knowledge.

The first stage, for the proposed model (see figure 1) is to create knowledge, which includes exploring, combining and discovering new knowledge through doing, which arises from the interactions of individuals in the same organization (Predaja-Grates, E. Rodríguez-Ponce and Rodríguez Ponce, 2009; and Rodríguez-Ponce and Pedraja-Rejas, 2009).

The second stage consists in sharing knowledge, where the individuals within the organization transmit their knowledge among themselves, which increases synergistically (Predaja-Rejas, E. Rodríguez-Ponce and Rodríguez Ponce, 2009; and Rodríguez-Ponce and Pedraja-Rejas, 2009). On the other hand, Pérez and Cortés (2010), emphasize the definition of sharing knowledge, such as that ability of the organization to publicize and integrate knowledge to meet the objectives.

The third stage consists in applying knowledge, which is the transformation of knowledge into a result of value for the institution and involves the creation of new products, services or ideas (Predaja-Rejas, E. Rodríguez-Ponce and Rodríguez Ponce, 2009 ; and Rodríguez-Ponce and Pedraja-Rejas, 2009).

On the other hand, it is important to emphasize that the theory of knowledge management, occurs as a result of the evolution of management theories, implies that administrators modify their thinking, because they can be conceived as managers of knowledge of talent human, recognizing the employee as a key factor in the organization, so that their knowledge and talent add to the human capital of the company (Liquidano, 2006).

Additionally, Bañegil and Sanguino (2008) suggest that knowledge management is the creative and operative way to create and share knowledge among the members of the organization and other interest groups. However, the study of intellectual capital is a way of conceptualizing knowledge and its management (Kong and Prior, 2008).

Regarding knowledge management, it should be noted that its main objective is to capture, store, maintain and deliver useful knowledge in a meaningful way to anyone who needs it at any place and time within an organization (Sánchez, González and Ortiz, 2010) .

According to Garzón and Fisher (2009 and 2010) they define tacit knowledge as coming from an individual or social action that creates knowledge and determines know-how difficult to imitate. Therefore, it is transcendental to understand the chain of knowledge, which is defined as the ability to acquire and apply knowledge according to Tseng (2012).

Likewise, it is emphasized that knowledge is a key organizational resource that allows both the public and private sectors to improve and achieve activities and objectives (Whyte and Zyngier, 2014). In addition, knowledge has been defined as the information possessed in people's minds, or is understood as the experience and understanding of the individual, or as a form of high-value information that is ready to apply to decisions and actions (Chang and Lin, 2015).

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In this same order of ideas, knowledge management can be defined as the process of capturing, storing, exchanging and using knowledge. In addition, it can be defined as a systemic and organizational specification of the process to acquire, organize and communicate the tacit and explicit knowledge of employees (Chang and Lin, 2015).

It is noteworthy that we currently live in a knowledge society, in which knowledge management is a complex and multifaceted phenomenon, under a controversial concept whose expression, although widely used, presents different emphases, approaches and interfaces, which deserve an analysis. (Rezende, Correia and Gomes, 2017).

Therefore, knowledge management should focus on training for institutions, with a view to making them more flexible and incorporating staff, in order to improve their performance, since it includes the field of learning and innovation in employee training, by providing tools for personal development (Arciniegas and Ramírez, 2018).

However, the management of adequate knowledge brings favorable aspects, while inadequate leads to unfavorable aspects, which are mentioned immediately, according to Arciniegas and Ramírez (2018). The positive aspects allow institutions to own:

– "Rational culture of the organization.
– Management strategy with vision of the future.
– Effective management of the organization.
– Goal of being a learning organization.
– Audit, training, registration and use of tattoo knowledge.
– Modern computer technology "(pp. 162-164).

While unfavorable aspects are manifested in:

– "Bad planning and work organization.
– Accumulation of Power by managers.
– Badly organized structure.
– Lack of personal incentives and participation.
– Absence of teamwork.
– Lack of Leadership for knowledge management "(pp. 164-165).

Finally, the implementation of knowledge management, implies adding all the members of the institution so that it is correctly given with favorable results (Arciniegas and Ramírez, 2018).

Intellectual capital

It should be noted that the term intellectual capital for the first time was published by John Kenneth Galbraith (cited by Edvinsson and Sullivan, 1996; and Shih, Chang and Lin, 2010), referring to intellectual action not pure intellect, where this capital tends to Being dynamic, not like other capitals in organizations, is like a form of knowledge, intellect and activity of intellectual capacity, which uses knowledge to create value.

Among the main models, the one proposed by Edvinsson and Sullivan (1996) stands out, which includes: human capital, structural capital, complementary commercial assets and intellectual property, integrating the creation of value. In this knowledge business model, there are two fundamental resources to create value: innovation and complementary business assets.

Petrash (1996), on the other hand, states that intellectual capital and knowledge management are important when creating value for customers, shareholders and employees. This author coincides with Leif Edvinsson of Skandia, Hubert Saint Onge of Canadian Imperial Bank of Commerce; and Patrick Sullivan of Intellectual Capital Management, since intellectual capital is equal to the sum of human capital, organizational capital and client (relational) capital. Human capital is the knowledge that each individual has and generates; organizational capital is that knowledge that has been captured and institutionalized with the structure, processes, and culture of an organization; and the client's capital is the perception of the value obtained by a client resulting from the receipt of goods and / or services. Thus, Petrash (1996), proposes the intellectual asset management model, which is embodied in the Dow company.

In this same order of ideas, Bontis (1998) in its intellectual capital model integrates three components. Human capital is the first and defines it as that which individuals possess, as tacit knowledge, understood as the skills necessary for their performance, four factors integrate it: genetic inheritance, education, experience, and attitudes about life and business , from this capital comes innovation and strategic renewal (Bontis, 1998). The next component is structural capital, which provides support for the performance of workers, since it allows knowledge to flow, includes elements such as efficiency, timely transactions, innovation procedures and accessibility to information to internalize knowledge ; it is the set of knowledge that remains in an organization at the end of the day after the individuals within the organization have left (Bontis, 1998; Kong, 2010). The third component is customer capital, which refers specifically to customer knowledge, marketing channels, and relationships with them (Bontis, 1998), also known as customer relationship capital, in the case of public sector, users, social capital and stakeholders (Sánchez, González and Ortiz, 2010).

However, Bontis, Chua and Richardson (2000), state that researchers have generally identified three main dimensions of intellectual capital: human capital, structural capital and client capital. Human capital represents the individual knowledge of employees; Structural capital represents the store of non-human knowledge in organizations that includes databases, organizational graphics, process manuals, strategies, routines and anything that the company classifies as valuable material; and the client's capital, includes relations with them and the marketing channels.

On the part of Chen, Zhu and Yuan (2004), they propose a new model that they call the structure of intellectual capital, it is composed of human capital, structural capital, innovation capital and client capital. Human capital refers to employee factors such as knowledge, skills, abilities and attitudes with customers that contribute to the performance and profits of companies. Structural capital deals with the mechanisms and structure of the company that helps employees to have maximum intellectual performance and in the performance of the organization.

Innovation capital is an effect of human capital and structural capital, so innovation can only occur with excellent employees, reasonable regulations, culture and techniques, and this can give impetus to the growth of customer capital. The last dimension of client capital (relational) is understood as the organization's ability to transform customer requirements into market value and improve the organization's performance.

On the other hand, Bossi (2006) identifies eight differences in the management of intellectual capital in the public sector. There is little stimulation in implementing new ways of managing, innovations are very slow, and for this sector intellectual capital will have to focus on customer service and quality of service; the objectives, services and resources are intangible; social and environmental responsibility must be a priority for the public sector; there is less opportunity for the manager to maneuver, since there is more control and transparency; there is less haste to quantify; and reporting to citizens.

According to Arango, Pérez and Gil (2008), intellectual capital defines it as the accumulated of intangible assets that are generated by the management of knowledge within the organization, which, although not counted in the financial statements of the organization , create present or future value for the fulfillment of different social objectives in a strategic way. In the case of public administrations, intellectual capital allows the country to increase its competence within the knowledge society, therefore, Sweden stands out in being more competitive for research by Leif Edvinsson; and Edvinsson and Malone with the Skandia Navigator (Arango, Pérez and Gil, 2008).

In this same context, Gogan (2014a), affirms that intellectual capital is a key factor for the profitability of companies. In addition, Gogan (2014b), proposes a model for the measurement of intellectual capital, with the objective that it is relevant for the end user, provides useful information for management, is operational and manageable, is easy to understand, and refers to the cognitive areas of the strategic operating system.

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On the other hand, Whyte and Zyngier (2014), affirm the importance of intellectual capital and its intensification with the emergence of innovation as a key determinant of competitiveness and changing patterns of interpersonal interaction and the creation of networks in society. Additionally, Wang, Hou and Cullinane (2015), demonstrate the importance of human resource management in the performance of organizations in China.

In this same sense, for intellectual capital it is extremely necessary to resume, according to Sidharta and Affandi (2016), the Resource-Based View Theory of the RBV (Resource-based view) or theory of resources and capabilities of a company. This theory shows several competitive advantages derived from the alignment of skills and motivation with the organizational system, structure and processes that achieve organizational level capabilities; since there are no two identical organizations (Kong, 2008).

On the other hand, Rezende, Correia and Gomes (2017), carry out a study that demonstrates how the typical resources of knowledge management and intellectual capital interact directly in the creation of value. Likewise, from the theoretical perspective of a resource-based vision, what generates value to the organization, in addition to its intangible resources, are the capacities derived from management, and can intervene to achieve effective organizational results (Fierro, Martínez and García-Contreras, 2018).

However, intellectual capital stands out for the objective of its creation, which focuses on the measurement of intangible assets in a clearer way (Peña, Moreno, Améstica, and Da Silva, 2019); Its definition includes a set of resources both strategic and intangible, integrated by knowledge to create value and consists of three capitals: human, structural and relational (Trillo and Peces, 2019).

Theoretical model

The particular theoretical model of the present investigation is shown in Figure 1. Where you can see how the Intellectual Capital (CAI) variable is measured through Human Capital (CAH), Structural Capital (CAE) and Relational Capital (CAR).

In addition, its relationship with the variable Knowledge Management (GEC) is measured, which is measured with the dimensions of Creating Knowledge (CRC), Sharing Knowledge (COC) and Applying Knowledge (APC) in the institutions of the public sector in Jalisco. The relationship is subject to verification in subsequent studies, it is only proposed as theoretical support.

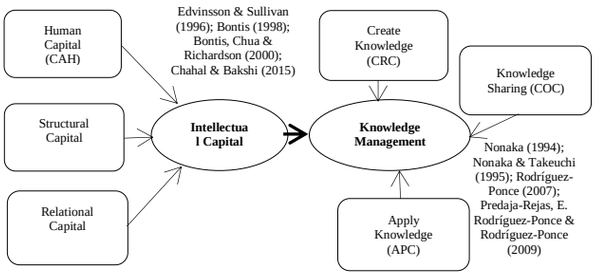

Figure 1 Particular theoretical model, subject to verification.
Source: Own elaboration (2019)

Method

Type and design of research

This research is carried out considering the quantitative approach, of a non-experimental type with cross-section (Hernández, Fernández and Baptista, 2014; and Bernal, 2016).

Variables

Dependent variable: Knowledge Management (GEC)

Conceptual definition: It is defined as the main role of organizations that consists in articulating and amplifying the new knowledge developed by individuals (Nonaka, 1994; Nonaka and Takeuchi, 1995); It implies generating, absorbing, transmitting and using knowledge in a knowledge society, which is the result of a technological information society to carry only what can be valuable for the organization (Zambrano-Vargas and Suárez-Pineda, 2017).

Operational definition: Organizational process that consists of creating, sharing and applying knowledge in institutions to achieve its objectives. It is measured with the Rodríguez-Ponce instrument (2007) in a full 10-item version that evaluates three dimensions, which has been used in confirmatory studies by Pedraja-Rejas and Rodríguez-Ponce (2008);

Predaja-Rejas, E. Rodríguez-Ponce and Rodríguez-Ponce (2009); Rodríguez-Ponce, Pedraja-Rejas, Delgado and Rodríguez-Ponce (2010); Rodríguez-Ponce (2016); and Araneda-Guirriman, Rodríguez-Ponce, Pedraja-Rejas, Baltazar-Martínez and Soria-Lazcano (2017).

Independent variable: Intellectual Capital (CAI)

Conceptual definition: Accumulated intangible assets that are generated by the management of knowledge within the organization, which although not counted in the financial statements of the organization, create present or future value for the fulfillment of different social objectives in a strategic way (Arango, Pérez and Gil, 2008); it is a form of knowledge, intellect and activity of intellectual capacity, which is used to create value (Shih, Chang and Lin, 2010; and Edvinsson and Sullivan, 1996).

Operational definition: Intangible assets of the organization based on knowledge composed of human capital, structural capital and relational capital, which increase organizational performance and create value. It is measured with the instrument of Chahal and Bakshi (2015) in a full 36-item version that evaluates three dimensions, which has been used in the confirmatory study of Chahal and Bakshi (2016).

Sociodemographic Variables

The measured sociodemographic variables correspond to an individualized measurement scale for each: sex, age, and schooling.

Measurement tools

Knowledge Management (GEC) is measured with the Rodríguez-Ponce instrument (2007) in a full 10-item version that evaluates three dimensions: Create Knowledge (CRC), Share Knowledge (COC) and Apply Knowledge (APC), in Likert scale from 1 to 5, with 5 being the highest rating. While Intellectual Capital (CAI), is measured with the instrument of Chahal and Bakshi (2015) in a complete version of 36 items that evaluates three dimensions: Human Capital (CAH), Structural Capital (CAE) and Relational Capital (CAR). The options for informants focus on the Likert scale from 1 to 5, with 5 being the highest rating.

Participants (sample characteristics)

52 middle managers and executives of the public sector of the state of Jalisco, who were selected by the type of non-probabilistic sampling for convenience (Hernández, Fernández and Baptista, 2014; and Bernal, 2016). The characteristics of the selected sample are detailed below (see table 1).

Sociodemographic Variables	Sample Profile
Age	Mean = 42 years
Gender	Male = 26.90%; Female = 73.10%
Scholarship	High school = 1.90%; Bachelor's degree = 78.80%; Mastery = 19.20%
Work variables	
Position	Average controls = 88.50%; Management controls = 11.50%

Table 1 Sample characteristics
Source: Own Elaboration (2019)

Process

The method used for data collection is electronically when sending the link of the questionnaire to the informants' emails, the questionnaire consists of 46 reagents in Likert scale from 1 to 5, with 5 being the maximum score to be obtained.

Analysis of data

Statistical tests of reliability and validity of the instrument were performed, as well as descriptive statistics, normality tests and correlations between elements. The data is processed with the statistical software SPSS (Statistical Package for the Social Sciences) version 25.

Results and Discussion

Descriptive results

The results with higher average values of the Knowledge Management variable, identified in the sample are presented in the processing and integration of the information obtained; in the system of information exploration and important information findings. While lower average values were reflected in the exchange and transfer of knowledge among managers, as well as in the interaction for knowledge creation. The standard deviation was less than 2 (see Table 2).

	Indicators	Mean	Standard deviation	Minimum	Maximum
CRC1	Information exploration system	3.25	0.813	2	5
CRC2	Processing and integration of information obtained	3.40	0.913	2	5
CRC3	System of important information findings	3.25	0.947	2	5
CRC4	Creation of new knowledge	3.08	1.169	1	5
CRC5	Interaction for knowledge creation	3.06	1.127	1	5
COC1	Knowledge exchange between managers	3.02	1.129	1	5
COC2	Knowledge transfer between managers	3.04	1.066	1	5
COC3	Managers' knowledge shared with each other	3.15	1.144	1	5
APC1	Application of knowledge by managers	3.08	1.064	1	5
APC2	Decision making by managers based on knowledge application	3.13	1.172	1	5

Table 2 Descriptive statistics of the Knowledge Management (GEC) variable
Source: Own Elaboration (2019)

For the variable of Intellectual Capital, in the specific case of the Human Capital dimension, the highest average values are presented in employees dedicated to their work, in the happiness of the staff for working in the organization and in the skills of the employees to perform in the institution; while the lowest scores are presented in happy employees, motivation to share new ideas and in continuous employee training. The standard deviation was between 1 and 2 (see Table 3).

	Indicators	Mean	Standard deviation	Minimum	Maximum
CAH1	Continuous employee training	2.83	1.024	1	5
CAH2	Employee Education	3.00	1.066	1	5
CAH3	Employee Skills	3.21	1.054	1	5
CAH4	Employee Creativity	3.12	1.078	1	5
CAH5	Employees with new ideas	3.00	1.103	1	5
CAH6	Motivation to share new ideas	2.67	1.200	1	5
CAH7	Employees with innovative ideas	3.12	1.166	1	5
CAH8	Happy employees	2.33	1.248	1	5
CAH9	Employee Satisfaction	2.62	1.255	1	5
CAH10	Problem resolution	3.17	1.167	1	5
CAH11	Happiness of the staff for working in the organization	3.31	1.094	1	5
CAH12	Availability of additional effort	3.13	1.189	1	5
CAH13	Dedicated employees	3.37	1.067	1	5

Table 3 Descriptive statistics of Human Capital dimension (CAH) as part of the Intellectual Capital variable (CAI).
Source: Own elaboration (2019)

In the Structural Capital variable, the highest average values are shown in the indicators of computer use, the contribution of software to service quality and support systems; while the lowest values are presented in the taking of initiatives, support for innovative ideas and in the development of new products and services. The standard deviation was less than 2 (see Table 4).

	Indicators	Mean	Standard deviation	Minimum	Maximum
CAE1	Pleasant atmosphere	3.23	1.131	1	5
CAE2	Communication between staff	2.94	1.211	1	5
CAE3	Knowledge supported	3.00	1.066	1	5
CAE4	Development of new products and services	2.87	1.048	1	5
CAE5	Support in innovative ideas	2.65	1.136	1	5
CAE6	Service Quality Improvement	2.88	1.060	1	5
CAE7	Structures and systems	3.04	1.137	1	5
CAE8	Accessibility to information	3.17	1.004	1	5
CAE9	Processes	3.04	1.084	1	5
CAE10	Culture	3.10	1.071	1	5
CAE11	Computer use	4.17	0.834	1	5
CAE12	Latest Technology Integration	3.27	1.122	1	5
CAE13	Software contribution to service quality	3.44	1.037	1	5
CAE14	Support systems	3.38	1.105	1	5
CAE15	Trained employees	3.00	1.048	1	5
CAE16	Initiative taking	2.62	1.140	1	5

Table 4 Descriptive statistics of Structural Capital (CAE) dimension as part of the Intellectual Capital (CAI) variable
Source: Own elaboration (2019)

However, for the dimension of Relational Capital, the highest average values are presented in cooperation in solving problems, updating customer data and interactions; while the lowest average values obtained were presented in the clients' knowledge and shared comments of the clients, as well as in their opinion. The standard deviation was less than 2 (see Table 5).

	Indicators	Mean	Standard deviation	Minimum	Maximum
CAR1	Customer data update	3.58	0.957	1	5
CAR2	Customer knowledge	3.15	1.127	1	5
CAR3	Customer feedback	3.21	1.109	1	5
CAR4	Customer Feedback	3.17	1.200	1	5
CAR5	Interactions	3.54	1.163	1	5
CAR6	Cooperation in problem solving	3.65	1.064	2	5
CAR7	Customer Base Improvement	3.52	1.057	1	5

Table 5 Descriptive statistics of the Relational Capital (CAR) dimension as part of the Intellectual Capital (CAI) variable
Source: Own elaboration (2019)

Normality tests

In order to confirm that the behavior of the data is within the normality curve, using quantitative methods, kurtosis and asymmetry were calculated, with these calculations it was found that the values are within the normality parameters, that is to say , when calculating the kurtosis and asymmetry, values between +1 to -1 were obtained (see tables 6, 7, 8, 9, 10 and 11).

Item	Asymmetry		Kurtosis	
	Statistical	Standard error	Statistical	Standard error
CRC1	0.176	0.388	-0.147	0.759
CRC2	-0.134	0.388	-0.366	0.759
CRC3	-0.172	0.388	-0.491	0.759
CRC4	-0.028	0.388	-0.962	0.759
CRC5	-0.155	0.388	-0.995	0.759

Table 6 Asymmetry and kurtosis calculations of the Create Knowledge (CRC) dimension
Source: Own Elaboration (2019)

Item	Asymmetry		Kurtosis	
	Statistical	Standard error		Statistical
COC1	0.003	0.388	-0.880	0.759
COC2	-0.121	0.388	-0.821	0.759
COC3	-0.29	0.388	-0.885	0.759

Table 7 Asymmetry and kurtosis calculations of the Knowledge Sharing (COC) dimension
Source: Own Elaboration (2019)

Item	Asymmetry		Kurtosis	
	Statistical	Standard error		Statistical
APC1	-0.203	0.388	-0.814	0.759
APC2	-0.3	0.388	-0.544	0.759

Table 8 Asymmetry and kurtosis calculations of the Apply Knowledge (APC) dimension
Source: Own Elaboration (2019)

Item	**Asymmetry**		**Kurtosis**	
	Statistical	Standard error		Statistical
CAH1	0.133	0.388	-0.785	0.759
CAH2	-0.067	0.388	-0.229	0.759
CAH3	0.077	0.388	-0.481	0.759
CAH4	0.048	0.388	-0.220	0.759
CAH5	0.101	0.388	-0.405	0.759
CAH6	0.208	0.388	-1.117	0.759
CAH7	-0.679	0.388	0.215	0.759
CAH8	0.024	0.388	-0.779	0.759
CAH9	-0.41	0.388	-0.703	0.759
CAH10	-0.352	0.388	-0.567	0.759
CAH11	-0.159	0.388	-0.473	0.759
CAH12	-0.214	0.388	-0.605	0.759
CAH13	-0.141	0.388	-0.613	0.759

Table 9 Calculations of asymmetry and kurtosis of the Human Capital dimension (CAH)
Source: Own Elaboration (2019)

Item	Asymmetry		Kurtosis	
	Statistical	Standard error		Statistical
CAE1	-0.636	0.388	0.928	0.759
CAE2	0.186	0.388	-0.905	0.759
CAE3	-0.029	0.388	-0.686	0.759
CAE4	0.121	0.388	-0.520	0.759
CAE5	-0.03	0.388	-0.699	0.759
CAE6	0.107	0.388	-1.117	0.759
CAE7	-0.345	0.388	-0.420	0.759
CAE8	0.031	0.388	-0.341	0.759
CAE9	-0.436	0.388	-0.190	0.759
CAE10	-0.045	0.388	-0.441	0.759
CAE11	-0.442	0.388	-0.590	0.759
CAE12	-0.776	0.388	0.492	0.759
CAE13	-0.767	0.388	1.275	0.759
CAE14	-0.656	0.388	0.892	0.759
CAE15	0.059	0.388	-0.680	0.759
CAE16	0.237	0.388	-1.149	0.759

Table 10 Calculations of asymmetry and kurtosis of the Structural Capital dimension (CAE)
Source: Own Elaboration (2019)

Item	Asymmetry		Kurtosis	
	Statistical	Standard error		Statistical
CAR1	-0.292	0.388	-0.243	0.759
CAR2	-0.61	0.388	0.651	0.759
CAR3	-0.154	0.388	-0.264	0.759
CAR4	-0.012	0.388	-0.455	0.759
CAR5	-0.472	0.388	-0.258	0.759
CAR6	-0.468	0.388	-0.139	0.759
CAR7	-0.69	0.388	0.418	0.759

Table 11 Asymmetry and kurtosis calculations of the Relational Capital (CAR) dimension
Source: Own Elaboration (2019)

With the results obtained, it is possible to affirm that the distribution of the data obtained complies with the assumption of normality, given that they have parameters of +1.96 to -1.96 corresponding to an error level of 0.05 (Hair, Tatham, and Black, 1999).

Correlations

Due to the scope of the present investigation, in the matrices of correlations between elements, it can be observed how they correlate with each other, thereby ensuring that each element effectively contributes to the factor, since most of the values were greater than 0.5 (see Table 12, 13, 14, 15, 16 and 17). The results obtained show favorable correlations between the dimensions of the Knowledge Management (GEC) variable, which includes Creating Knowledge (CRC), Sharing Knowledge (COC) and Applying Knowledge (APC). Also, in the Intellectual Capital (CAI) variable, there are acceptable correlations in the Human Capital (CAH), Structural Capital (CAE) and Relational Capital (CAR) dimensions.

ISSN 2524-2016

Specifically, in the dimension related to Create Knowledge (CRC), it is possible to affirm that the elements correlate with each other since they present values greater than 0.5; except for item CRC1 that presented a correlation of 0.4 and 0.3 with items CRC4 and CRC5, respectively; same as the item CRC2 whose value obtained was 0.4 with respect to CRC4, so special attention should be paid to item CRC5 because it has the lowest correlation, which refers to the interaction that must exist in the creation of knowledge (see Table 12).

	CRC1	CRC2	CRC3	CRC4	CRC5
CRC1	1.000				
CRC2	0.668	1.000			
CRC3	0.734	0.677	1.000		
CRC4	0.451	0.468	0.588	1.000	
CRC5	0.395	0.510	0.614	0.762	1.000

Table 12 Correlation matrix between elements of the Create Knowledge (CRC) dimension
Source: Own Elaboration (2019)

In the case of the Knowledge Sharing (COC) dimension, each of its elements is correlated by presenting values greater than 0.5 (see Table 13).

	COC1	COC2	COC3
COC1	1.000		
COC2	0.907	1.000	
COC3	0.849	0.876	1.000

Table 13 Correlation matrix between elements of the Knowledge Sharing (COC) dimension
Source: Own Elaboration (2019)

Regarding the dimension of Apply Knowledge (APC), all its elements are correlated with values greater than 0.5 (see Table 14).

	APC1	APC2
APC1	1.000	
APC2	0.762	1.000

Table 14 Correlation matrix between elements of the Apply Knowledge (APC) dimension
Source: Own Elaboration (2019)

The Human Capital dimension (CAH), mostly presents values greater than 0.5 in the correlation between its elements. However, CAH5 has a correlation of 0.4 with respect to CAH1; CAH10 also has values less than 0.5 with CAH2 and CAH6; Similarly CAH11 has values less than 0.5 with respect to CAH1, CAH5, CAH6, CAH7, CAH8, CAH9 and CAH10; CAH12 has values less than 0.5 in the correlation with CAH1, CAH8, CAH9 and CAH10; and finally, CAH13 has values less than 0.5 in the correlation with CAH1, CAH2, CAH6 and CAH7.

These results generally show acceptable values, despite this, the item that presented the most correlations with values below 0.5, refers to the CAH11 with which the happiness of the staff is evaluated by working in the organization (see Table 15).

	CAH1	CAH2	CAH3	CAH4	CAH5	CAH6	CAH7	CAH8	CAH9	CAH10	CAH11	CAH12	CAH13
CAH1	1.000												
CAH2	0.783	1.000											
CAH3	0.760	0.817	1.000										
CAH4	0.519	0.697	0.727	1.000									
CAH5	0.434	0.549	0.685	0.838	1.000								
CAH6	0.606	0.705	0.762	0.736	0.770	1.000							
CAH7	0.501	0.594	0.612	0.634	0.723	0.703	1.000						
CAH8	0.656	0.639	0.649	0.559	0.553	0.705	0.573	1.000					
CAH9	0.577	0.595	0.595	0.523	0.517	0.637	0.586	0.911	1.000				
CAH10	0.533	0.495	0.629	0.563	0.587	0.468	0.516	0.686	0.676	1.000			
CAH11	0.493	0.525	0.696	0.533	0.631	0.425	0.283	0.455	0.406	0.454	1.000		
CAH12	0.389	0.503	0.595	0.555	0.635	0.645	0.534	0.466	0.419	0.349	0.574	1.000	
CAH13	0.378	0.327	0.520	0.519	0.537	0.482	0.405	0.507	0.528	0.544	0.528	0.587	1.000

Table 15 Correlation matrix between elements of the Human Capital dimension (CAH)
Source: Own Elaboration (2019)

Now, regarding the dimension of Structural Capital (CAE), it can be seen that most of the correlations of its elements show values greater than 0.5. However, there are some minor correlations to this value. The CAE7 has a correlation value of less than 0.5 with respect to CAE2; also, CAE11 and CAE12, also present values below 0.5 in the correlations with CAE1, CAE2, CAE3, CAE4, CAE5, CAE6, CAE7, CAE8, CAE9 and CAE10; on the other hand, the item CAE13 shows values lower than the parameter indicated in the correlations with CAE1, CAE2, CAE3, CAE4, CAE6, CAE7, CAE8 and CAE10; similarly CAE14 with CAE1, CAE2, CAE4, CAE6, CAE7, CAE8 and CAE11; also, CAE15 has correlations of less than 0.5 with CAE7 and CAE11; and finally CAE16 has a lower value than the parameter in its correlation with CAE11.

In this sense, the items or elements that presented the greatest amount of correlations with values below 0.5 were CAE11 and CAE12, the first refers to the use of computers in the performance of the work and the second refers to the integration of the latest technology. In this regard, the questions will have to be rephrased so that it is effectively questioned in such a way that the informants understand the question and it is possible that they correlate with the other items or elements to reinforce the explanation of the dimension or factor related to Structural Capital (see Table 16).

	CAE1	CAE2	CAE3	CAE4	CAE5	CAE6	CAE7	CAE8	CAE9	CAE10	CAE11	CAE12	CAE13	CAE14	CAE15	CAE16
CAE1	1.000															
CAE2	0.748	1.000														
CAE3	0.763	0.801	1.000													
CAE4	0.727	0.725	0.823	1.000												
CAE5	0.564	0.624	0.713	0.798	1.000											
CAE6	0.702	0.745	0.809	0.791	0.859	1.000										
CAE7	0.601	0.482	0.583	0.575	0.582	0.710	1.000									
CAE8	0.642	0.523	0.668	0.548	0.604	0.769	0.691	1.000								
CAE9	0.696	0.709	0.796	0.757	0.784	0.811	0.658	0.709	1.000							
CAE10	0.713	0.650	0.693	0.774	0.754	0.744	0.525	0.526	0.788	1.000						
CAE11	0.242	0.300	0.311	0.309	0.300	0.323	0.279	0.326	0.475	0.279	1.000					
CAE12	0.121	0.257	0.294	0.295	0.468	0.419	0.215	0.420	0.425	0.250	0.687	1.000				
CAE13	0.266	0.317	0.397	0.432	0.506	0.402	0.259	0.422	0.536	0.398	0.723	0.862	1.000			
CAE14	0.374	0.405	0.535	0.481	0.500	0.442	0.186	0.488	0.651	0.506	0.489	0.550	0.760	1.000		
CAE15	0.547	0.515	0.588	0.647	0.511	0.625	0.407	0.608	0.648	0.519	0.287	0.513	0.556	0.646	1.000	
CAE16	0.624	0.674	0.703	0.746	0.774	0.786	0.503	0.667	0.700	0.642	0.273	0.554	0.506	0.580	0.792	1.000

Table 16 Correlation matrix between elements of the Structural Capital dimension (CAE)
Source: Own Elaboration (2019)

Finally, Relational Capital (CAR) shows that some of the elements are correlated by presenting values greater than 0.5. However, element CAR1 is correlated at 0.3 with CAR6 and CAR7; likewise, the CAR2 correlates in 0.4 with the CAR1. In this regard, the item with the highest number of correlations with values below 0.5 is CAR1, which refers to the updating of customer data (see Table 17).

	CAR1	CAR2	CAR3	CAR4	CAR5	CAR6	CAR7
CAR1	1.000						
CAR2	0.448	1.000					
CAR3	0.565	0.777	1.000				
CAR4	0.583	0.709	0.750	1.000			
CAR5	0.510	0.585	0.500	0.559	1.000		
CAR6	0.368	0.669	0.527	0.548	0.845	1.000	
CAR7	0.336	0.739	0.592	0.568	0.667	0.575	1.000

Table 17 Correlation matrix between elements of the Relational Capital (CAR) dimension
Source: Own Elaboration (2019)

Regarding the reliability of the instrument built on the Likert scale, it is possible to affirm that the values obtained in Cronbach's Alpha, that is, in relation to its internal consistency, are adequate, given that they present values greater than 0.7 (Cronbach, 1951; Nunnaly, 1978; Hair, Anderson, Tatham and Black, 1999), considered as an excellent level of reliability (see Table 18). These results are consistent with those obtained by Araneda-Guirriman, Rodríguez-Ponce, Pedraja-Rejas, Baltazar-Martínez and Soria-Lazcano (2017) and Chahal and Bakshi (2016).

Variable: Knowledge Management	Variable: Intellectual capital	Cronbach's alpha parameter
.952	.976	$\alpha = > .7$

Table 18 Calculation of Cronbach's Alpha of Knowledge Management (GEC) and Intellectual Capital (CAI)
Source: Own Elaboration (2019)

Annexes

The 46 items of the instrument applied in this study are shown below (see Table 19).

	Items
CRC1	The institution has an efficient internal and external information exploration system.
CRC2	The information obtained from various sources is efficiently processed and integrated within the organization.
CRC3	The institution has a system that allows you to identify important findings for your work from both internal and external sources.
CRC4	The directors of the institution create new knowledge considering the system of exploration, detection of findings and integration of information.
CRC5	The managers of the institution interact with each other favoring the creation of knowledge.
COC1	The managers of the organization exchange knowledge with each other.
COC2	The managers of the organization transfer knowledge to each other.
COC3	The directors of the institution share knowledge with each other.
APC1	The directors of the institution apply the knowledge generated and shared.
APC2	Managers make decisions based on the application of previously generated knowledge.
CAH1	Staff training is continuous.
CAH2	The staff is highly polite.
CAH3	Staff skills improve.
CAH4	The staff is creative and bright.
CAH5	The staff proposes new ideas.
CAH6	There is motivation to share new ideas.
CAH7	The staff has innovative ideas.
CAH8	The managers make the staff happy.
CAH9	The director makes the staff satisfied.
CAH10	Managers help solve problems.
CAH11	The staff is happy to work in the institution.
CAH12	The staff is willing to give additional efforts.
CAH13	The staff is dedicated to work.
CAE1	The atmosphere in this institution is pleasant.
CAE2	Managers and staff communicate well.
CAE3	The increase in knowledge is well supported.
CAE4	The institution develops new products and services.
CAE5	There is great support for innovative ideas.
CAE6	The institution improves the quality of service.
CAE7	There is information on structures and systems.
CAE8	There is easy access to information.
CAE9	The processes develop unique capabilities.
CAE10	The culture is supportive and comfortable.
CAE11	Computers are used for operations.
CAE12	The latest in information technology software is integrated.
CAE13	Information technology software contributes to the quality of service.
CAE14	The systems support innovation.
CAE15	The staff is highly empowered.
CAE16	There is stimulation to take initiatives.
CAR1	User data is updated.
CAR2	Meetings with the user are given continuously.
CAR3	User opinion is valued.
CAR4	User comments are shared at the institution.
CAR5	Interactions improve competition.
CAR6	Cooperation helps solve the problem.
CAR7	The user registry of the institution is improving.

Table 19 Items for the measurement of Knowledge Management (GEC) and Intellectual Capital (CAI)
Source: Own elaboration (2019), based on Rodríguez-Ponce (2007) and Chahal and Bakshi (2015)

Acknowledgments

Thanks to the coordination level staff, department heads and executives of the Jalisco public sector who participated in this study, by voluntarily responding to the instrument, in order to have its validity and reliability, for the explanation of the variables studied.

Conclusions and recommendations

After the theoretical review of the state of the art, it is possible to conclude that knowledge management and intellectual capital are an inseparable binomial and of utmost importance for the improvement of the public sector, given that good management will depend on the generation of intellectual capital that affects in a beneficial way in the citizenship, with best practices for modernization and the fulfillment of the objectives for which each public institution has its origin.

This research has a specific contribution to the theory of administration essentially to the subject of knowledge management and intellectual capital of the public sector, because with the results obtained both in the theoretical review and in the empirical test it was possible to make the proposal of a theoretical model, which integrates the factors or dimensions necessary to measure the behavior of the variables under study, which is subject to verification.

In the proposed model, Knowledge Management (GEC) is explained through the factors of Creating Knowledge (CRC), Sharing Knowledge (COC) and Applying Knowledge (APC); while for Intellectual Capital (CAI) it can be explained with the factors of Human Capital (CAH), Structural Capital (CAE) and Relational Capital (CAR). The foregoing corroborates the central hypothesis, which states that the variables studied are measured with six factors or dimensions, which results in levels of reliability of the instrument greater than 0.5 with the calculation of Cronbach's Alpha.

Due to the above, the null hypothesis is rejected, where the level of reliability of Cronbach's Alpha is less than 0.5; and the alternative hypothesis is accepted, where the level of reliability of Cronbach's Alpha is greater than 0.5.

The main limitations of the research focus on the selection of the sample, since it was a sampling for convenience and in a specific sector, so it is not possible to generalize results, since it is necessary to determine a larger and statistically representative sample. In addition, the statistical analysis was limited to the use of descriptive statistics, normality tests, correlation matrices and the Cronbach's Alpha test;

Therefore, it is suggested to carry out different tests as a requirement to apply the Exploratory Factor Analysis (AFE) and the Confirmatory Factor Analysis (AFC), as well as to apply the Structural Equation Modeling (MEE).

It is important to emphasize that the results of the present investigation reflect the pilot data, so in future investigations it is necessary to incorporate new items and variables, as well as to incorporate new informants, because in this investigation only middle managers and managers were added leaving aside the operational staff, who finally is the one who gives the citizen the face in the work of the public sector.

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