Assessment of the impact of intellectual capital on the generation of value in companies of the Sinergia Academia-EmpresaMypymes network in Mexico, based on the Skandia Navigator Model

Valoración del impacto del capital intelectual en la generación de valor en empresas de la red Sinergia Academia-Empresa Mypymes de México, con base en el Modelo del Navegador Skandia

PEÑA-MONTES DE OCA, Adriana Isela†*, MACÍAS-BRAMBILA, Hasem Rubén, LÓPEZ-LAGUNA, Ana Bertha and GONZÁLEZ-DEL CASTILLO, Edgardo Emanuel

Universidad Tecnológica de Jalisco, Cuerpo Académico: Responsabilidad Social, Sustentabilidad y Desarrollo Integral para Pymes

ID 1st Author: Adriana Isela, Peña-Montes De Oca / ORC ID: 0000-0001-8220-3108, CVU CONACYT ID: 70757

ID 1st Coauthor: Hasem Rubén, Macías-Brambila / ORC ID: 0000-0002-6540-7464, CVU CONACYT ID: 902812

ID 2nd Coauthor: Ana Bertha, López-Laguna / CVU CONACYT ID: 847437

ID 3rd Coauthor: Edgardo Emanuel, González-Del Castillo / ORC ID: 0000 0002-2503-689X, CVU CONACYT ID: 916620

DOI: 10.35429/JM.2019.5.3.17.23

Received July 11, 2019; Accepted November 25, 2019

Abstract

This paper analyzes the impact of intellectual capital considered as the new paradigm of competitiveness (Bueno, 2008, Villegas-González, Hernández-Calzada and Salazar-Hernández, 2017), through the implementation of a comprehensive web system for Academic Management and Linking of the Collaborative Thematic Network, on the companies in the Sinergia network Academia-Empresa MyPymes de México, from the area of influence of the Technological Universities, integrated by the Academic Bodies: UTBB-CA-1 Information Technologies for the technological development of Bahía de Banderas and the UTJAL-CA-2 Social Responsibility, Sustainability and Integral Development for SMEs of the Technological University of Jalisco, same that served as coordinator of the Thematic Network of Academic Collaboration. Basis in the Skandia on companies of the Sinergia Academia Empresa network of MyPymes in Mexico, based on the Skandia Navigator Model, which is tropicalized, assessing relationships between pairs of variables, through cross-checking or contingency tests, followed by discriminant analysis; to finally recognize the relationship between the variables "How many employees of your company are satisfied with work?" and "What is the rate of satisfaction of your customers?", as the one that has the best association to promote the generation of value.

Intellectual capital, human capital, value creation

Resumen

En la presente investigación se analiza el impacto del capital intelectual; considerado como el nuevo paradigma de la competitividad (Bueno, 2008; Villegas-González, Hernández-Calzada y Salazar-Hernández, 2017), mediante la implementación de un sistema web integral para la Gestión Académica y Vinculación de la Red Temática de Colaboración, sobre las empresas de la red Sinergia Academia-Empresa MyPymes de México, de la zona de influencia de las Universidades Tecnológicas, integradas por los Cuerpos Académicos: UTBB-CA-1 Tecnologías de la Información para el desarrollo tecnológico de Bahía de Banderas y el UTJAL-CA-2 Responsabilidad Social, Sustentabilidad y Desarrollo Integral para PyMES de la Universidad Tecnológica de Jalisco, mismo que se desempeñó como coordinador de la Red Temática de Colaboración Académica. Base en el Modelo del Navegador de Skandia, tropicalizado, valorándose las relaciones entre pares de variables, mediante pruebas cruzadas o de contingencia, seguido de análisis discriminante; para finalmente reconocer a la relación entre las variables ¿Cuántos empleados de su empresa están satisfechos laboralmente? y ¿Cuál es el índice de satisfacción de sus clientes?, como aquella que posee la mejor asociación para promover la generación de valor.

Capital intelectual, capital humano, creación de valor

Citation: PEÑA-MONTES DE OCA, Adriana Isela, MACÍAS-BRAMBILA, Hasem Rubén, LÓPEZ-LAGUNA, Ana Bertha and GONZÁLEZ-DEL CASTILLO, Edgardo Emanuel. Assessment of the impact of intellectual capital on the generation of value in companies of the Sinergia Academia-EmpresaMypymes network in Mexico, based on the Skandia Navigator Model. Journal-Microeconomics. 2019. 3-5:17-23

* Correspondence to Author (email: adriana-isela@utj.edu.mx)

† Researcher contributing first author.

Introduction

For Porter (1990), competitiveness depends on the quality of the interactions that the company establishes, among others the economic environment, the efficiency of the value chain, infrastructure and human capital. The intellectual capital is an innate characteristic of the company, generated in the course of time as a consequence of knowledge, experiences, attitudes, decision making and culture. Such actions translate into value creation and competitive advantage. (Hidalgo-Gallardo and García-Meca, 2009) In the present investigation the capabilities in companies of the network Mypymes Academy-Company Synergy of Mexico are analyzed, based on the Skandia Navigator Model, tropicalized. The main interest is to contribute to the academic discussion, however previous literature has obtained confused results regarding the identification of factors that allow the assessment of the impact of intellectual capital in the generation of value in companies and the findings of an exploratory investigation.

The article includes background of the concept of intellectual capital, followed by the analysis of the impact of intellectual capital through the implementation of a web system for the Academic Management and Linking of the Collaborative Thematic Network on the companies of Sinergia Academia-Empresa, MyPymes de México Network of the area of influence of the Technological Universities and its close relationship with the advantage competitive, the use of databases as well as the main findings, assessing the relationships between pairs of variables, through cross-tests or contingency, followed by discriminant analysis.

Theoretical framework

The term intellectual capital is attributed to the Canadian economist John Kenneth Galbraith, in 1969; but it is not until the mid 90's when the definition is reached as such (Edvinsson and Malone, 1998), known as intangible resources and capacities or knowledge assets (Cañibano et al., 1999). European Commission (2006) states that it is the combination of intangible resources and activities that allows an organization to transform a set of material.

Financial and human resources into a system capable of creating value and innovation Intellectual capital has become the strategic factor of the new paradigm of competitiveness (Bueno, 2008, Monagas, 2012, Díaz, by Liz and Rivero, 2009, Villegas-González, Hernández-Calzada and Salazar-Hernández, 2017) In intellectual capital three interrelated components are recognized: Human Capital: Competences of each of the individuals of the organization; (Subramaniam and Youndt, 2005; Herrera et al, 2010) Structural Capital: Technological capital (production processes, process reengineering, research and development) and Capital relative to Infrastructure (organizational culture, information systems, etc.).

Al-Khalil (2014) states that organizational capital supports the activities of technological innovation. Relational Capital: Relationships with the environment (suppliers, customers, associations, etc.). Zerenler (2008) and Wincent (2010) discuss relationships with suppliers and their positive influence on the innovation process. In the literature reviewed, a variety of models were found, both qualitative and quantitative; they can be classified as direct and related depending on the depth with which they approach the subject (Lissarrague, Simaro and Tonelli, 2009, Sveiby, 2010, Yepes, 2010).

Among the most widespread direct models we find the Dolphin Navigator System (Skandia), the Intellect Model (Euroforum Escorial University Institute and the consulting firm KPMG), Nova Model (Valencian Knowledge and Innovation Management Club), among others (Benavides, 2012). Navigator, also known as the Skandia Model due to its implantation in the Swedish insurer, is in fact the first model that defines the intellectual capital in an organization, makes a proposal for its measurement and its management (Figure 1)

Figure 1 Skandia Navigator of Intellectual Capital
 Source: Edvinsson and Malone (1997)

The Navigator is structured according to "focus areas"; financial approach, customer focus, process approach, renewal and development approach and human focus.

According to Huerta-Bortolotti (2011), SMEs have had three stages of evolution: 1st. In the 50's and 60's during the validity of the import substitution model. 2nd. In a context of a closed economy and a reduced internal market, important achievements were achieved, but also with some limitations in terms of equipment, organization, training and information; 3rd. In the 90's, availability of external financing and internal economic stability, although obstacles must be overcome in terms of the legal regulatory framework.

Aguilera, Hernández and Colin (2014) highlight how intellectual capital and the control of production processes have a positive influence on the growth of competitiveness of SMEs. Soler and Celesino (2011) point out that the intellectual capital in companies such as Dell, Microsoft, Intel, Coca-Cola among others, represent more than 50% of total market value. For the present work we will use the definition proposed by Mention (2012): "Intellectual capital is a set of internal and external resources (human, process, technology) that organizations mobilize and articulate, through activities, with other resources (financial and tangible) in order to generate more resources, which may be of a tangible, intangible or financial nature, in their search to achieve a greater competitive advantage".

Metodology

In this research, the impact factors of intellectual capital are valued in the generation of value in companies of the Sinergia Academia-Empresa network of Mypymes de México, based on the Skandia Navigation Model. The research is cross-sectional, it seeks to establish relationships in correlation and cause-effect terms; therefore, the design used is non-experimental, quantitative, transversal and correlational (Hernández, Fernández and Baptista, 2010). The scope of the research is exploratory, because it provides an approach to the phenomenon of study.

The questionnaire was used: "Skandia Navigator Model" tropicalized and through the implementation of a comprehensive Web system for Academic Management and Linkage for the Thematic Collaboration Network, evidence for Mypymes Academy-Company Synergy of Mexico, from the Influence of the Technological Universities, integrated by the Academic Bodies (CA's) UTBB-CA-1 Information Technologies for the Technological Development of the Banderas Bay, Nayarit of the Technological University of Bahía de Banderas and the UTJAL-CA-2 Social Responsibility, Sustainability and Integral Development for SMEs of the Technological University of Jalisco, which was the coordinator of the Thematic Network of Academic Collaboration (RTCA).

The questionnaire consists of 141 questions, distributed in five sections: I) Financial focus. Constitutes the past and is integrated by the annual accounts, II) Customer focus. It captures the new reality of efficient and sensible company-client relationships, III) Process approach. Relating to the role of technology as a tool to sustain the company and create value, IV) Renewal and development approach. Capture the opportunities that define the future of the company, V) Human focus. Employee competence.

There are four scales: nominal and ordinal, intervals and scales of proportion, quotient or ratio (Coronado-Padilla, 2007). The variables selected to build the indicators are usually found in different measures and scales, which makes it necessary to standardize them so that they can be comparable (Hernández, Fernández and Baptista, 2009, Schuschny and Soto, 2009).

Verify the normality and homoscedasticity of the variables, analysis of correspondences of two or more categorical variables, whose boxes contain some measure of correspondence between their rows and their columns that correspond to the categories of variables. The correspondence measure can be an indication of similarity, affinity, confusion, association or interaction between rows and columns. The most common type is the double-entry contingency table or cross-tabulation of two categorical variables, where the boxes contain frequencies.

Subsequently, the discriminant analysis method was used which variables contribute to discriminate between two or more groups that are observed in practice and the variable or group of variables is used to predict the belonging of a new observation.

Suppose that if there are n entities for which k explanatory variables are known, and it is observed that n_1 of them belongs to a group (1) and n_2 to another group (2), where: $n_1 + n_2 = n$; it is possible to construct a linear function of the k variables that can be used to predict whether a new observation belongs to a group or another with a certain probability.The general linear functionisdefined as follows:

$$Z = \lambda_0 + \sum_{i=1}^K \lambda_i \chi_i$$

The function of the discriminant analysis from the point of view of the analysis of variance is to answer the question of whether two or more groups are significantly different from each other with respect to the average of a particular variable. It should be kept in mind that if the mean of a variable is significantly different in several groups, it can be said that this variable discriminates between groups.

Results

Through the support of data analysis tools in Excel, through descriptive statistics analysis, the recognition of the variables with the grates impact in terms of competitiveness for human value was made, among which stand out, the number of *satisfies employees, the satisfaction index of their clients*, among others.

From the base Skandia indicator surveys in the section Focus on renovation and development, in companies of the Mexican Chamber of the Construction Industry, the number of employees has an average of 21.84 and standard deviation of 7.0, a condition that allow the conclusion of a decentralized distribution with high variability.

In the comparison with the data obtained by the UTBB in companies of Management and development of services, it shows an average of 12.94 and a standard deviation of 16.5, a condition of grater instability in relation to that obtained in UTJ, it shows an average of 9.66 and a standard deviation of 2.08, a condition of grater stability.

Regarding Intellectual Capital, the distribution is normal for the two localities, centered and with little variability, as shown in Table No. 1 for the evaluation of the model, it was used as a recognition of the significant relationships, the technique of crossed or contingency tables, considering as covariables the approach of process, of renovation and development, efficiency of intellectual capital among others, how many employees are satisfied in relationship with the satisfaction index of its clients.

Parámetro	UTJ	UTBB
Mean	93.93	89.8
Median	95	98
Mode	100	100
Srandard deviation	7.2	18.8

Table 1 Descriptive Statistic

The relationships between the variables were tested with the software SPSS verion 22 placing the independent variable in columns and the dependent one in rows, with the purpose of identifying the factors thar favour the generation of value in the companies, finding a significant relationship between the variable between how many employees of your company are satisfied and the satisfaction rate of your customers.

93.6% of the data from the sample corresponding of the UTJ were considered in the analysis. The Chi-square test is 0.005, so it is possible to reject the null hypothesis and declare that there is a dependency relationship between the variable, as shown below.

Table No. 2 Evaluation between “How many employees of your company are working satisfied and “What is the satisfaction index of your clients? _UTJ

	Valor	gl	Asymptotic sig. (2 caras)
Pearson's chi-square	120.654 a	84	0.005
Likelihood reason	66.906	84	0.914
Linear by linear association	0.053	1	0.817
# valid cases	44		

a. 105 casillas (100.=%) han esperado un recuento menor que 5. El recuento mínimo esperado es 0.02

Table 2 Prueba Chi-cuadrado

The results strengthen the idea that the human resource has the capacity to generate value by possessing complex multidimensional competences (knowledge, skills, experiences, creativity, etc.) that can be translated into competitive advantages, economic gains and social benefits (Benavides, 2012), breaking with the paradigm that the human resource is only a resource.

The Wilks Lambda test confirms what was found in the Chi-square test, with a value of significance less than 0.005

Function test	Lambda de Wilks	Chi-cuadrado	gl	Sig
1	0.000	370.458	20	0.000

Working in parallel, the analysis was made to UTBB obtaining the following results:

97% of the data in the sample were considered in the analysis. The Chi-square test is 0.005, so it is possible to reject the null hypothesis and declare that there is a dependency relationship between the variables, as shown below:

Table No. 3 Evaluation between "How many employees of your company are satisfied with your job and" What is the rate of satisfaction of your clients "_UTBB

	Valor	gl	Asymptotic sig. (2 caras)
Pearson's chi-square	150.024 ^a	105	0.003
Likelihood reason	71.846	105	0.994
Linear by linear association	4.969	1	0.026
# valid cases	32		

a. 128 casillas (100.0%) han esperado un recuento menor que 5. El recuento mínimo esperado es 0.03

Tabla 3 Pruebas de Chi-cuadrado

In the Chi-square test, the value of 0.003 confirms the relationship between the variables in the Renewal and development focus section, specifically: "How many employees of your company are satisfied with the job" in relation to the variable in the section Coefficient of efficiency intellectual capital, with the indicator, "What is the satisfaction index of its customers". In addition, discriminant analysis was carried out, observing in the test of equality of means of the groups, that the value of significance is greater than 0.05; therefore it was

not possible to identify a predictive model for our case, in any of the areas of influence.

Conclusions

The importance of the study lies in the recognition of the impact of intellectual capital, the variables that by their association favor the generation of value in SMEs.

The variables in the Focus on renewal and development section, specifically: "How many employees of your company are satisfied with the job" in relation to the variable in the Approach to the Coefficient of Intellectual Capital Efficiency section, with the indicator, "What is the satisfaction index of its clients "are the variables with the greatest association to promote the generation of value; result that corresponds to what is referred to in the Holistic Model of Ramboll (Bligaard, 1997).

The association variables are debatable, due to the small sample size, other variables of the Process Approach, such as: "What is the proportion of the personnel that makes use of computer technology", which in the discriminant analysis has a classification value equal to 0.028 demonstrating its differential capacity between the groups, however it is not visualized in the Chi-square test.

In addition, it is important to note that the article has treated the qualitative variables as nominal, without considering that there may be a relationship of order between the different responses, the ordinal classification could be taken into account in such a way as to improve the adjustment of the observed values , so that it is possible to make predictions and face new challenges.

Finally, in the industrial sector, there are few companies that stated in their financial statements; amount of salary and wages earned; basic element in the application of the methodology, (Gómez, León and Leiton, 2012, Berzkalne and Zelgalve, 2014); consequently, the size of the original sample is reduced to a percentage; thus, it is essential to ask whether the association variables would be confirmed as significant in a larger sample.

References

- Aguilera, L. Hernández, O. y Colin, M. 2014. La relación entre capital intelectual y la empresa PYME manufacturera. Cuaderbisdek CIMBAGE, vol. 16, pp. 87-109.
- Al-Khalil, S.S., Dahiyat, S.E. y Al-dalahmh, M.A: (2014). Intellectual capital development and its effect on technical innovation in Banks operating in Jordan. *Journal of Management Research*, 6 (1), pp. 211-238.
- Benavides, L. E. (2012). Medición, valoración y determinación del impacto del Capital Intelectual en la generación de valor en la empresa. *Tendencias, Revista de la Facultad de Ciencias Económicas y Administrativas*, XIII (1), 100-115.
- Berzkalne, I y Zelgalve, E. (2014) Intellectual capital and company value. *Procedia Social and Behavioral Sciences* vol 110 pp. 887-896
- Bligaard Pedersen, Flemming (1997): *Holistic Operation. A holistically oriented and value-based cooperation with tangible business results*, Ramboll Publication, Dinamarca
- Bueno, E., Salmador, M. y Merino, C. (2008). Génesis, concepto y desarrollo del capital intelectual en la economía del conocimiento: Una reflexión sobre el Modelo Intellectus y sus aplicaciones. *Estudios de Economía Aplicada*, 26(2), 43-63
- Cañibano, L., García-AyusiCovarsi, M. y Sánchez M.P. (1999): "La relevancia de los intangibles para la valoración y la gestión de empresas: Revisión de la literatura", *Revista Española de Financiación y Contabilidad*, No. 100, extraordinario, pp. 17-88
- Coronado Padilla, J. (2007) Escalas de medición, julio diciembre, 2(2) Bogotá D.C. pp 104-125.
- Díaz, M., de Liz, Y. y Rivero, S. (2009) El factor humano como elemento dinamizador del proceso empresarial en la gestión de la información y conocimiento. *ACIMED*, 20 (5), 42-55
- Edvinson, (1997) "Developing Intellectual Capital at Skandia
- Edvinson, L. y Malone, M. (1998). *El Capital Intelectual: Cómo identificar y calcular el valor inexplorado de los recursos intangibles de su empresa*. (2nd ed., pp. 30-48). Bogota: Norma.
- European Commission (2006) *Reporting Intellectual Capital to Augment Research Development and Innovation in SMEs (RICARDIS)*. Próxima publicación.
- Gómez, J.E., León, C.E. y Leiton, K.J. (2012). Does the use foreign currency derivatives affect firms' market value? Evidence from Colombia. *Emerging Markets Finance and Trade*, vol. 48 (4) pp. 50-66
- Hernández S.D., Fernández, C.c: y Baptista, P. (2010). *Metodología de la investigación* (5ª. ed.), México: Mc Graw-Hill.
- Herrera, L. Muñoz M.F., y Nieto, M. (2010). Mobility of public researchers, scientific knowledge transfer, and the firm's innovation process. *Journal of Business Research*, 63(5), pp. 510-518
- Hidalgo Gallardo R.L. and García Meca E. (2008) Divulgación de información sobre el capital intelectual de empresas nacionales que cotizan en la Bolsa Mexicana de Valores. *Contaduría y Administración* (229), 105-131
- Huerta Bortolotti, (2011) *Las MYPYMES en la globalización, procesos y estrategias para su internacionalización*. (Tesis) Universidad Autónoma de Querétaro Facultad de Contaduría y Administración División de Estudios de Posgrado, Santiago de Querétaro.
- Lissarrague, M.A., Simaro, Simaro, J.D., y Tonelli, O.E., (2009) Una propuesta de gestión del capital intelectual para PYMES. *Revista del Instituto Nacional de Costos* Vol 5 julio-diciembre. Buenos Aires
- Mention, A.L. (2012), Intellectual capital, innovation and performance: a systematic review of the literatura. *Business and Economic Research*, 2 (1), pp. 1-37.
- Mehri, M., Umar, M. S., Saeidi, P., Hekmat, R. K. y Naslmosavi, S. (2013). Intellectual capital and firm performance of high intangible intensive industries: Malaysia evidence. *Asian Social Science*, 9(9), 146.

Monagas-Docasal, M. (2012) El capital intelectual y la gestión del conocimiento. *Ingeniería Industrial*, 33(2), 142-150

Porter M.E, (1990). *The Competitive Advantage of Nation*. New York: Free Press

Schuschny, A. Soto H. (2009) *Guía metodológica, diseño de indicadores compuestos de desarrollo sostenible*, Santiago de Chile CEPAL.

Soler, L.E., y Celestino, D.J., (2007) Evaluating the scope of IC in firms' value. *Journal of Intellectual Capital*, Vol. 8 (3) pp. 470-493.

Subramaniam, M. Youndt, M.A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), pp. 450-463.

Sveiby, K-E. (2010). *Methods for measuring intangible assets*. Recuperado de internet www.sveiby.com

Villegas-González, E., Hernández-Calzada, L.A. y Salazar-Hernández, B.C. (2017) La medición del capital intelectual y su impacto en el rendimiento financiero en empresas del sector industrial en México. *Contaduría y Administración* Vol. 62 (1) pp. 184-206.

Wincent, J., Anokhin, S y Ortqvist, D. (2010). Does network board capital matter? A study of innovative performance in strategic SME networks. *Journal of Business Research*, 63(3), pp. 265-275.

Yepes, B.M. (2010) *El constructo psicosocial de la Calidad de los Procesos y Recursos Humanos. Desarrollo Teórico y validación empírica*. Barcelona, España.

Zerenler, M., Hasiloglu, S.B., y Sezgin, M. (2008). Intellectual capital and innovation performance: empirical evidence in the Turkish Automotive Supplier. *Journal of Technology Management and Innovation*, 3 (4), pp.- 31-40.