Intellectual capital, impact factor on competitiveness: manufacturing industry SMEs in Mexico

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Summary

Purpose – *The main purpose of this paper is to analyse the impact of the intellectual capital (IC) on the competitiveness in the manufacturing small- and medium-sized enterprises (SMEs) in Mexico.*

Design/methodology/approach – *The approach of this investigation is developing a theoretical construct to determine the correlation between IC and competitiveness and find the most relevant factors that impact it, where IC is independent variable and the competitiveness is dependant variable. Using the Likert scale to determine the degree of agreement or disagreement, the survey was applied to 420 SMEs. The results were analysed using confirmatory factor analysis, Cronbach's alpha and subsequently structural equation models.*

Findings – *The results show that the IC dimensions – the information obtained, IC developed and learning and feedback – have an effect on the competitiveness of SMEs. The paper presents the theoretical validation of the factors that impact on IC and competitiveness and hence they are the key elements that impact mostly on each analysed variable.*

Practical implications – *The results obtained measure the level of correlation between the variables in the study, helping to design strategies for the key factors needed to integrate the IC and to develop competitive synergies in the manufacturing SMEs.*

Originality/value – *This study shows the effects of the IC that are directly impacting the competitiveness of SMEs so that each factor of the dependent and independent variables should be analysed separately to propose improvements in implementing IC to seek higher level of competitiveness.*

Keywords *Competitiveness, Intellectual capital, Manufacturing industries*

Paper type *Research paper*

1. Introduction

The information will be significant for manufacturing small- and medium-sized enterprises (SMEs), as the research will serve as an incentive to carry out the purposes of intellectual capital (IC) development and its impact on competitiveness.

Generating and maintaining companies, small and medium, is an important part of the national economy, generating 52 per cent of GDP and 72 per cent of employment in the country (Banamex, 2013), some important figures that we should not let pass unnoticed; therefore, it is important to take actions that optimize and support SMEs.

Through this study, we intend to make an approach analysing the situation of intellectual capital (IC) from internal and external technical activities of manufacturing companies and the tools used to identify difficulties and benefits to develop it.

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1.1 Objective

To analyse the relationship between intellectual capital and competitiveness in the manufacturing industry SMEs of Guadalajara, Mexico.

1.2 Research question

RQ1. How intellectual capital influences the competitiveness in SMEs of Guadalajara?

2. Literature review

IC has always been present in business, but it was not until the 1990s when it began to have more relevance in the organizations. According to Brooking (1997), IC is not new, and it has been present from the time the first seller established a good relationship with a client.

IC is difficult to define because of its invisible nature and dynamics. The term IC is often a term synonymous with intellectual property assets, intangible assets or knowledge assets (Roos, 2001). IC could be considered as intellectual material that has been formalized, captured and leveraged to produce a good of greater value (Klein and Prusak, 1994), and IC assets are created through activities ranging from the acquisition of new knowledge (learning) and inventions to create valuable relationships (Wiig, 1997).

Several models have emerged looking to manage, measure and control IC of a company. Among them are the Skandia Intellectual Capital Model (Edvinsson, 1997); Intangible Asset Monitor (Sveiby, 1997); and Balanced Scorecard (Kaplan and Norton, 1996). Although each takes a somewhat different approach, the concept underlying the design incorporated is quite similar; Stewart (1997) defines IC as intellectual material, knowledge, information, intellectual property; experience that can be used to create value and wealth is the product of knowledge. Bradley (2003) states that IC is the ability to transform knowledge and other intangible assets in wealth-producing resources for business and nations, and IC is defined as knowledge that can be converted into a value for organizations (Bodgdam *et al.*, 2011; Lopez-Gamero *et al.*, 2011).

Some definitions of IC are rooted to the elements of the "intellectual capital", for example, focusing on people, intellectual property, infrastructure and market (Brooking, 1997), the knowledge, experience, organizational technology and relationships with customers by the organization (Edvinsson, 1997), the sum of the knowledge of the members of the organization and its conversion into brands, products and processes (Roos *et al.*, 2005), patents, processes, management skills, technologies and information about former customers and suppliers experience. (Stewart, 1997).

The IC comprises structural and human capital. Human capital represents the collective capabilities of the workforce of a company to meet and address customer, market issues and operational concerns (quality, productivity, technical support, etc.) Structural capital consists of customer or market and organizational capital. Customer capital represents the value of relationships with customers, suppliers, industry associations and markets (Punniyamoorthy and Raj, 2007), and organizational capital represents philosophy and systems for maintaining organizational capacity focuses; therefore, organizational capital consists of capital and process innovation, reflecting the long-term ability of a company to create intellectual properties (Schiuma and Lerro, 2008) and deals with capital process.

According to Fasil and Osada (2011), the IC has been recognized as a strategic area for strengthening practices total quality management and promote the value of a company's brand and image. Despite recent difficulties in the definition and evaluation of IC, efforts to identify key performance indicators for IC have been ongoing in the organizational and national levels (Lonnqvist *et al.*, 2009).

2.1 Information search

Disclosure of human capital can be considered as the business information disclosed about the knowledge of its workforce, skills and motivation. Relevant communication channels voluntarily disclose it. However, external reports focus primarily on financial data. Consequently, like other intangible resources, human capital is not considered properly outside the financial implications (Canibano *et al.*, 2000). Moreover, human capital cannot be activated as an asset. As a result, a large part of the resources of the company does not appear in the balance sheet (Hand and Lev, 2003). Thus, several scholars have called for greater disclosure of information on human capital and other intangible resources.

Innovation is a multifaceted expression used in the strategic and operational levels of the company, covering business processes, products and services, competitive intelligence, trade policy, policy formulation and understanding of customers. As innovation is the power and added value, it also covers a variety of research perspectives informed by theories of economics, sociology and psychology. In particular, this review identifies the theory of strong linkage with the IC innovation, implying that the relationship is very positive. From the early stages of development of IC technology and management, innovation has been identified as the main determinant of competitiveness (Petty and Guthrie, 2000).

2.2 Knowledge development

A particular feature of the basic concept of Drucker (1993) is that value creation based on knowledge is almost exclusively because of a particular type of people whom he calls knowledge workers, denoting persons shapely and skilled. Based on this division, which is reproduced hereafter work in IC, Drucker recommends creating organizational structures focused on the management of the first group, always aligning their possible contributions to the desired organizational results in the complexity and IC considered a condition to knowledge productive.

According to Zea and Martinez (2011):

> Knowledge is the basis of IC is the most important component of intangibles and the main source of resources innovation systems in the process of creating value for organizations and obtaining competitive advantage.

Knowledge is handled as analysed and organized information (Lahaba and Santos, 2001; Ortiz de Urbina Criado, 2003), being the idea that because knowledge exchanges occur under a network structure, connections or links should be assumed to be other actions that make IC (Nahapiet and Ghoshal, 1998).

Different IC researchers agree that knowledge is the aspect that generates current sustainable competitive advantage; however, there is no such clarity between the theoretical and practical implementation (Kaufmann and Schneider, 2004).

2.3 Learning and feedback

Knowledge management (KM) is focused on the acquisition, analysis, implementation and reuse of knowledge in the organization, with the aim of improving the quality in business processes, lowering cost and generating competitive advantages. The competency management systems focus on the scope of the employee lifecycle in the organization, from the beginning of the relationship in recruitment processes until final disengagement thereof (Urquiza, 2009).

The relationship between IC and KM is vital for an organization, because of the similarities and complementarity, Intelectual Capital Management (ICM) and KM should be linked to provide added value and should be made to work together by aligning the processes of KM with individual elements of CI. The reason for this linkage is competitive IC if used correctly and exploited, becomes the central resource for sustainable competitiveness, success and viability (Wiig, 1999).

Holland (2003) identifies the role of the central structural capital of human and value creation of the company, but recognizes the problems of retention and ownership of human capital. The views of Drucker (1994), Porter (1990) and Prahalad and Hamel (1990) also suggest that in a competitive environment, structural capital of a company is the key to increasing its value.

2.4 Competitiveness

There are various definitions of what is competitiveness, but most of them you can see have mentioned that competitiveness should basically be a relationship between government, society and business to generate economic growth.

Competitiveness is the product of a society of complex and dynamic interaction between government, companies, intermediary institutions and society organizational capacity. The competitiveness of the economy relies on goal-directed actions, articulated in four-level system and is based on a multidimensional conductor concept (Esser *et al.*, 1996) and considers the competitiveness as the ability to achieve rapid and sustained economic growth (Garelli, 2000) and the capabilities of the economy of a country to create added value continuously (Fouquin, 1986) as the share of exports of a nation in foreign markets.

Competitiveness is a multidimensional concept that involves different aspects, comparative advantages, competitive advantages, business strategies and results, among others (Waheeduzzaman, 2011), showing (Porter, 1990) that prosperity is not inherited, but is created and is dependent on the ability to innovate and improve the industry.

Schilling and Martinez (2008) suggest that the issue of competitiveness becomes more relevant in terms of determining what those factors on which it is necessary to articulate the business success to achieve a competitive position in a given market and what to do to maintain or improve that position which is a central theme in the direction of the company, while the Competitiveness Mexican Institute (2015), known by its acronym in Spanish as IMCO, defines competitiveness as the ability to attract and retain investment (IMCO, 2015).

According to Aragon and Rubio (2006), the competitive success of a company has resources and capabilities, enabling it to achieve a favourable competitive position to maintain and enhance its position in the market and get superior performance. The lack of competitiveness can have negative consequences, which may affect the financial condition of SMEs and lead to bankruptcy (Madrid *et al.*, 2009).

Vermeulen (2004) comments that innovation generates sustainable competitive advantage over the time and is a key player for economic growth. Freel and Robson (2004) distinguishes innovative companies with reference to the intensity of product innovation, which is measured as the proportion of the number of new products introduced to the total of goods, and it is necessary to implement and monitor cost accounting systems, analyse financial economic situation and attempt, as far as possible, to use their own sources of financing (Birley and Westhead, 1994).

The technological advancement is a guarantee of competitiveness in business; Arribas (2003) note that SMEs should develop rapid, simple, transparent and practical innovation technology, commenting (Tseng and Goo, 2005) that competitive success of an organization relates to the ways in which tangible and intangible resources are managed. The intangible asset or IC includes structural human capital and clients. It plays an important role in the competitiveness of a company and can increase profits (Hazlina and Zubaidah, 2008).

The innovate constant exists because they know the market needs are changing and they look forward to penetrate it; therefore, innovation is an essential factor for competitiveness, but it is also important to include internal factors such as technology and management and external factors such as market structure and product position in the market.

3. Methodology

The surveys were applied in 420 SMEs of the manufacturing industry in Guadalajara, Mexico, during March to June 2014.

The questionnaire was designed considering the competitiveness as dependent variable and IC as independent variable, and the results were analysed using confirmatory factor analysis (CFA), Cronbach's alpha and, subsequently, structural equation models (SEM).

Similarly, to measure the level of competitiveness, the three factors proposed by Buckley *et al*. (1988) were considered: *financial performance*, *costs reduction* and *technology use*; all of these were measured by a scale of six items. All the items of the three factors are built by a level Likert type of five positions, with 1 = completely in disagreement to 5 = completely agree as limits.

To assess the reliability and validity of scales measuring of the level of IC and business competitiveness, CFA with the method of maximum likelihood and EQS (6.1) software (Bentler, 2005; Brown, 2006; Byrne, 2006) were used.

Rates of statistical adjustment that were considered were the normed fit index, non-normed fit index, comparative factor index (CFI) and root mean square error of approximation (Bentler and Bonnet, 1980; Byrne, 1989; Bentler, 1990; Hair *et al*., 1995; Chau, 1997; Heck, 1998).

There are seven hypotheses that will contribute to this research:

H1. Higher level of new information, higher level of intellectual capital.

H2. Higher level of knowledge development, higher level of intellectual capital.

H3. Higher level of learning and feedback, higher level of intellectual capital.

H4. Higher level of financial performance, higher level of business competitiveness.

H5. Higher level of cost reduction, greater level of business competitiveness.

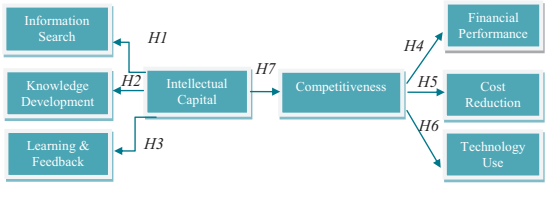
H6. Higher level of technology use, greater level of business competitiveness.

H7. Higher level of intellectual capital development, higher level of business competitiveness.

According to Hernández Sampieri *et al*. (2015), correlational research variables are associated with a predictable pattern for a group or population. Correlated studies measure two or more variables to verify whether they are related to the same subject and then the correlation (Campos and Sosa, 2011) is analysed.

The surveys were applied in 420 SMEs manufacturers in Guadalajara, Mexico, from March to July 2013, and the number of employees was from 11 to 250, simple random sampling was used and the universe was 2,847 SMEs; the construct is shown in the Figure 1.

Figure 1 Theoretical model relating intellectual capital and competitiveness



Source: own

4. Analyses and discussion

Table I shows that the Cronbach's alpha and the composite reliability index (CRI) exceed the value 0.60, as recommended by Fornell and Larcker (1981) and Schumacker and Lomax (2011), this is shown in bold. The variance extracted index (VEI) was calculated for the variables of the model, resulting in a higher value of 0.50 (Fornell and Larcker, 1981; Kline, 2011; Albright and Winston, 2015).

And for evidence of convergent validity, the results with the CFA indicated that all item-related factors are significant ($p < 0.001$) and the size of all standardized factor loadings are greater than 0.60 (Bagozzi and Yi, 1988).

Related to the evidence of the discriminant validity, measurement of the scale of the business competitiveness level was through two ways which you can see in more detail in Table II. First, at the range of 95 per cent of confidentiality, none of the individual elements of the correlation factors matrix contains the value 1.0 (Anderson and Gerbing, 1988).

Table I Consistency internal and convergent validity of the theoretical model

Variable	*Indicator*	*Factor loading*	*Robust t-value*	*Cronbach's alpha*	*CRI*
Information search	CIB1	0.603	1.000*	0.646	**0.695**
	CIB2	0.607	10.938		
	CIB3	0.595	11.829		
	CIB4	0.606	10.779		
Knowledge development	CIC1	0.601	1.000*	0.740	**0.872**
	CIC2	0.598	11.402		
	CIC3	0.694	12.694		
	CIC4	0.608	9.825		
	CIC5	0.647	11.943		
Learning and feedback	CIA4	0.610	1.000*	0.654	**0.703**
	CIA5	0.617	12.382		
	CIA6	0.610	12.548		
	CIA8	0.603	12.131		
Financial performance	FP1	0.611	1.000*	0.682	**0.702**
	FP2	0.615	9.191		
	FP3	0.602	8.222		
	FP4	0.608	8.398		
Cost reduction	PC3	0.757	1.000*	0.571	**0.628**
	PC4	0.592	5.016		
Technology use	TE1	0.682	1.000*	0.795	**0.798**
	TE2	0.673	17.606		
	TE3	0.651	16.289		
	TE4	0.589	14.807		
	TE5	0.593	14.547		
	TE6	0.59	13.165		

Note: *Constrained parameters to that value in the identification process; ***$p < 0.001$; S-BX^2 (df = 260) = 393.0910 ($p < 0.0000$); NFI = 0.864; NNFI = 0.941; CFI = 0.948; RMSEA = 0.032

Table II Discriminant validity of the theoretical model measurement

Variables	*Information search*	*Knowledge development*	*Learning and feedback*	*Financial performance*	*Cost reduction*	*Technology use*
Information search	**0.505**	0.389	0.487	0.239	0.125	0.435
Knowledge development	0.281, 0.497	**0.498**	0.404	0.235	0.213	0.321
Learning and feedback	0.359, 0.615	0.296, 0.512	**0.492**	0.248	0.195	0.429
Financial performance	0.149, 0.329	0.155, 0.315	0.160, 0.336	**0.501**	0.087	0.261
Cost reduction	0.029, 0.221	0.123, 0.303	0.099, 0.291	0.099, 0.183	**0.502**	0.232
Technology use	0.315, 0.555	0.225, 0.417	0.313, 0.545	0.169, 0.353	0.124, 0.340	**0.602**

Second, the variance extracted between each pair of factors is higher than its corresponding VEI, more than 0.500 (Fornell and Larcker, 1981), we consider "Knowledge development" and "Learning and feedback" to be very close to 0.500, as it's shown in bold. Therefore, based on these criteria, one can conclude that the different measurements made on the scale show enough evidence of reliability and convergent and discriminant validity (Table II).

The hypotheses were tested in the theoretical model of innovation and business competitiveness, using the SEM using EQS software (6.1) (Bentler, 2005; Byrne, 2006; Brown, 2006).

The nomological validity of the theoretical model was analysed through the performance of the chi-square test, in which the theoretical model was compared with the measurement model, and no significant differences were found (Anderson and Gerbing, 1988; Hatcher, 1994). The results of this analysis are presented in Table III.

The Table III shows the results obtained by the SEM, with regard to the *H1*, the results obtained, $\beta = 0.341$, $p < 0.001$, indicate that searching information has significant effects with the IC in manufacturing firms. As for *H2*, the results obtained, $\beta = 0.308$, $p < 0.001$, suggest that knowledge development also has significant effects in the IC. The results obtained from *H3*, $\beta = 0.326$, $p < 0.001$, suggest that the learning and feedback also have significant effects in the manufacturing firms.

Related to competitiveness, in *H4*, the results obtained, $\beta = 0.335$, $p < 0.001$, indicate that the financial performance has significant effects on the competitiveness level. In *H5*, the results obtained, $\beta = 0.424$, $p < 0.001$), suggest that cost reduction also has significant effects on business competitiveness. The results obtained in *H6*, $\beta = 0.447$, $p < 0.001$, suggest that the technology use also has significant effects on business competitiveness.

Finally, the results obtained in *H7*, $\beta = 0.601$, $p < 0.001$, present that the IC has significant effects on business competitiveness.

This research had shown that SME's manufacturing in Guadalajara has a good correlation between the dependent variable competitiveness with the independent variable IC, and the results expressed in this study appear to be consistent with the relation of factors technology use, costs and financial performance with the variable competitiveness, and also the factors information search, knowledge development and learning and feedback are related with the variable IC (Aragón and Rubio, 2006; Ortiz de Urbina Criado, 2003).

Table III Results of the theoretical model of business competitiveness

Hypothesis	*Structural relationship*	*Standardized coefficient*	*Robust t-value*
H1. Higher level of new information, increase the level of intellectual capital	Information search → intellectual capital	0.341***	11.182
H2. Higher level of knowledge development, increase the level of intellectual capital	Knowledge development → intellectual capital	0.308***	11.466
H3. Higher level of learning and feedback, increase the level of intellectual capital	Learning and feedback → intellectual capital	0.326***	12.354
H4. Higher level of financial performance, greater level of business competitiveness	Financial performance → competitiveness	0.335***	8.31
H5. Higher level of cost reduction, greater level of business competitiveness	Cost reduction → competitiveness	0.424***	5.016
H6. Higher level of technology use, greater level of business competitiveness	Technology use → competitiveness	0.447***	15.283
H7. Greater level of intellectual capital development, greater level of business competitiveness	Intellectual capital → competitiveness	0.601***	18.773

Notes: ***$p < 0.001$; S-BX2 (df = 243) = 367.3889; $p = 0.000$; NFI = 0.873; NNFI = 0.941; CFI = 0.952; RMSEA = 0.032

These SMEs are in a transformation process of administrative schemes, with a more cognitive and sustainable system, being conscious to create and generate new information, increasing knowledge development and learning and feedback knowledge in all the organization (Lopez-Gamero *et al.*, 2011; Lahaba and Santos, 2001).

5. Limitations

The first limitation was the sampled companies from 20 to 250 workers, excluding the companies from 1 to 10 workers, which represents an important quantity of the total manufacturing SMEs. For future studies, it is important to consider these companies to analyse the effects of IC in business competitiveness.

The second limitation is that the questionnaire was applied to directors or CEOs, and the results could differ in functional managers. Therefore, in future studies, it could be important to consider the opinion of customers and suppliers to analyse the results obtained.

Finally, it is important to go beyond the technical results and discuss in greater depth: what effects should in SME manufacturing if a more quantitative scale is used to measure the business competitiveness? What results would be obtained in SME manufacturing if applied a more sophisticated model for the measurement of business competitiveness? Which specific activities of the financial performance, the reduction of costs and the use of technology mostly affect business competitiveness? These and other questions that may arise can be answered in future research.

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