Intellectual capital and organizational results on companies that applied for the Uruguayan National Quality Award

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Purpose

The relationships between the different components of intellectual capital and its impact on the management results and financial results of Uruguayan companies are analyzed.

Design/methodology/approach

This study analyzed 84 companies that applied for the Uruguayan National Quality Award (PNC). PNC´s dimensions were grouped according to the intellectual capital components. A structural model was developed showing the relationships between the components of intellectual capital and organizational results. Using the data of the PNC´s evaluations, the model was tested employing structural equation modeling based on partial least squares (PLS).

Findings

The proposed model explains 74% of the variance of financial results, which are mainly explained by the management results. Human capital has an indirect impact on the results, acting directly on the structural and relational capitals. Structural and relational capitals have a direct impact the management results. Findings of similar studies, in other industries and countries, are confirmed. The significance that has the management of intangible resources on the achievement of sustainable business results over the long term is validated.

Practical Implications

Reveals some of the management elements that managers should focus on to improve organizational results.

Research limitations/implications

This investigation is important for both theory and practice. With respect to theory, it contributes to consolidate the Intellectual Capital View, confirming its importance for organizational performance. It also contributes to the linkage of the Total Quality Management and Intellectual Capital management. And presents a methodology that can be applied to extend this research to other countries. Regarding practice, the study reveals important management areas and elements that managers should focus on to increase the probability of obtaining good sustainable organizational results.

Originality/value

Is the first empirical study on the relationship between the components of intellectual capital and their impact on organizational results, made with Uruguayan companies. It uses a very reliable measurement methodology, not used before in similar investigations, that could be applied in other countries for similar works. This work makes a link between Total Quality Management and Intellectual Capital Management that can help to integrate its management.

Key words: intellectual capital, quality management systems, organizational results.

INTRODUCTION

The Resource Based View states that the competitive capacity and sustained success of a company greatly depend on the way it manages its resources and capabilities, especially the intangible resources (Werneffelt, 1984; Barney, 1991, 1999; Edvinsson and Malone, 1997; Bontis, 1998; Lev, 2001; Kaplan and Norton, 2004; among others). Intellectual capital groups those intangible resources that provide value to the organization because are aligned with the strategy (Barney, 1991; Grant, 1991; Stewart, 1997, CIC, 1998). Therefore, development and proper management of intellectual capital should be reflected on organizational results.

Direct impact of certain intangible resources –like customer satisfaction, staff training and motivation, organizational culture and process management- on organizational performance has been widely documented. However, there are fewer studies researching the interaction between the different components of intellectual capital and how they, as a whole, influence organizational results. These studies confirm that intellectual capital has a positive influence on organizational performance (Bontis, 1998; Wang *et al*., 2005; Cabrita, 2005; Chen *et al*., 2004, Ciavolino and Dahlgaard, 2009, Miles 2011, González *et a*l., 2012, Algorta *et al.*, 2014).

If cause-effect relationships between intellectual capital components can be understood, organizational performance could be improved by further developing and strengthening those highest-impact causal chains. This knowledge can enhance existing management tools, such as the strategic maps and the Balanced Scorecard, that many organizations use to implement their strategies (Kaplan y Norton, 2004).

The understanding that the development of certain intangible resources anticipates organizational results, even though in an indirect way, will prevent management to eliminate or reduce the investment in these elements during periods of financial crisis, increasing more the negative effects on firm's performance. Studies like the one conducted by Kadvejian *et al.* (2004) and Miles (2012) confirm that companies, during periods of financial crisis, stop investing on the development of certain intangible resources, such as human capital. This causes companies to jeopardize their future given the loss of competitive capabilities.

In turn, the Total Quality Management (TQM) is in agreement with the Resource Based View (Barney, 1991; Werneffelt, 1984) and the Intellectual Capital View (Edvinsson y Malone, 1997; Bontis, 1998; Andriessen, 2004; Reed *et al*., 2006) in regard to the fact that competitive competences and sustainable organizational performance are essentially based on the effective management of intangible resources. Total Quality Management proclaims that processes are the vehicle used by an organization to harnesses and releases the capabilities of its people to produce results. Hence, for an organization to achieve excellence in key performance results, leadership must be in place to produce policies, strategies and actions routed through its people, partnerships, resources and processes (EFQM, 2015). In other words, quality models postulate management of intangible resources as a key factor to achieve sustainable results. Following this line of thought, Zhao and Bryar (2001) state that approaches combining knowledge management philosophies with Total Quality Management principles are essential to achieve competitive advantage.

The Continual Improvement Model of Uruguay (MMC acronym in Spanish) is the tool employed to evaluate companies that apply for the Uruguayan National Quality Award. Seven areas are assessed: senior management leadership, strategy and planning, people development, external customer approach,

information and analysis, processes management and impact on society and environment. These seven areas are evaluated regarding achievement, improvement and impact on the organizational performance. In addition, each of these management areas consists of several key elements that are assessed to measure their rate of progress. These key elements can be grouped according to intellectual capital categories (human, structural and relational) and employ the assessment scores to examine the relationships between the intellectual capital components and their impact on organizational performance.

In short, there is an ample theoretical consensus regarding on how intellectual capital components interact and how they positively impact on organizational results. Even though there are empirical studies that show this impact in some industries and regions, with the objective of consolidating the theory, it is important to corroborate these interactions in a variety of industries, diverse geographical regions and different time periods. This is one of the main objective of this paper. This paper shows how the intellectual capital influence the organizational results of firms from a variety of different industries, and in different time periods, by analyzing the Uruguayan companies that applied for the National Quality Award between 1996 and 2013.

INTELLECTUAL CAPITAL AND QUALITY MANAGEMENT SYSTEMS

While there is no single definition for the concept intellectual capital, in general, this expression is used to designate the set of intangible resources that are aligned with the organizational strategy and have the capacity to generate value for the organization.

It is widely accepted that the three basic components of intellectual capital are: human capital, structural capital and relational capital. CIC (2003) states that these capitals represent the accumulated wealth generated by the values, knowledge, skills and talents of people (human intelligence); the values, culture, routines, protocols, procedures, systems, and intellectual property of the organization (organizational intelligence) and the relationships and shared activities with external stakeholders (competitive and social intelligence).

Although it is true that each of the intellectual capital components can independently impact organizational performance, there are interactions among them, and it is the type and quality of these interactions that ultimately determines it´s influence on the overall business results. These interactions and their impact on business performance have been studied, among other, by Bontis (1998), Bontis and Fitz-enz (2002), Cabrita (2005), Wang *et al.* (2005), Ciavolino and Dahlgaard, (2009) and Miles (2011).

During the last decades, quality management systems have been implemented all around the world, in all types of organizations. Many have adopted the criteria established by the international standards ISO 9000, and/or the excellence models, such as the EFQM (Europe), the Malcolm Baldrige (United States), the Ibero-American Model of Excellence in Management from the FUNDIBEQ or the Uruguay Continual Improvement Model (MMC). These management models postulate, as stated in the ISO 9004:2009, that "sustainable success in an organization is attained through its capacity to satisfy the needs and expectations of its customers and other stakeholders in the long term and in a balanced way". These management models propose that the organization identifies its stakeholders and maintain a balanced response to their needs and expectations, focusing on process continuous improvement to ensure value creation for all of them.

These quality management systems, not only contribute to the explicitation of the organizational knowledge by providing a framework to structure and to document it, but also have a positive impact on: a) the organizational culture, by encouraging a culture based on continuous improvement, promoting cooperative leadership styles, trust and involvement, b) on the personnel; by properly managing their competences and creating a work environment that reinforces improvement, human development and the achievement of the organizational goals, c) on the style of relationships; by promoting win-win relationships with suppliers, the satisfaction of the needs and expectations of all the stakeholders in a balanced manner, and encouraging the sharing of knowledge.

Consequently, organizations that implement and maintain management systems according to these models, not only make an effort to document knowledge (generate structural capital), but also perform a number of activities that strengthen other intangible resources such as teamwork, sense of belonging and engagement, personal competences, trust, cooperative leadership, among others, thus impacting on all components of intellectual capital. We can say that organizations that implement quality management systems develop the proper capacity to manage intangible resources and, as a result, their intellectual capital is increased and improved (Miles, 2007).

In turn, Lim et al. (1999) point out that the success of the implementation of a Total Quality Management (TQM) strategy depends on the intellectual capital of the organization. Leadership skills and values, staff competencies and involvement, management of organizational culture and processes, relationships with customers, suppliers and society -all of them intellectual capital elements- are key factors for a successful TQM implementation. Fernández and Fernández (1996) state that quality management systems provide methods that promote the development and growth of organizational knowledge. Thus, quality management can be considered as a process where knowledge is the primary input and intellectual capital the primary output (Zaho and Bryar,2001). This synergy is shown in many studies, among them, Martín-Castilla and Rodríguez-Ruiz (2008) relate the different elements of the EFQM excellence model with the intellectual capital components, and Heng (2001) illustrates the existing synergy between the requirements of the ISO 9000 and the management of knowledge and of intellectual capital.

Therefore, ISO 9000 quality standards and excellence models can be considered as good frameworks for the management of intellectual capital and knowledge.

CONTINUAL IMPROVEMENT MODEL OF URUGUAY (MMC)

Over the past 25 years, the Continual Improvement Model of Uruguay (MMC)(www.inacal.org.uy) is the standard used in the country to assess the organizations that postulate to the Uruguayan National Quality Award. Based on similar excellence models, such as the Malcolm Baldrige used in the United States or the ones applied in Mexico and Brazil, the MMC proposes a series of principles and elements or enablers that companies can use to implement their quality management systems with the objective of achieving excellence, through the balanced satisfaction of the needs of all stakeholders.

These elements, enablers or things an organization needs to do to develop and implement its strategy and to attain the desired results, are grouped in seven management areas: senior management leadership, planning, people development, external customer approach, information and analysis, process management and impact on society and environment. If the organization manages with excellence these elements it will achieve outstanding results.

The MMC distinguishes two results categories. The referred as "management results", comprising the ones related to customer satisfaction, the quality of the processes of production of goods and services, and development and engagement of people. The other category are the financial results.

Even though solid financial results are required for the long-term success of any organization, they are not sufficient to ensure it. If the organization is not able to satisfy other stakeholders –customers, suppliers, staff, and society at large- it is not likely to survive in the long run. To a large extent, the financial results are the consequence, or the reward, of having a balanced management process that achieves good results for all stakeholders (Gonzalez *et al.*, 2009; Algorta *et al*., 2004, ISO 9004. 2009).

When an organization applies for the Uruguayan National Quality Award, the content being assessed in each of the seven management areas of the MMC is (INACAL, 2016):

1. Senior management leadership: the commitment and participation of the upper management in the implementation of the quality systems, and how the quality values are incorporated into the organization's management system.
2. Planning: the ability of the organization to develop and implement plans that consider the needs of customers and other stakeholders, and the efficiency and productivity of their operations. The planning must consider both, the competitiveness and the social responsibility of the organization.
3. People development: the scope and depth with which the organization develops, stimulates, and engages the workforce to participate in the quality improvement process. The effort to create and maintain a work environment that fosters high performance, involvement and growth of both, people and organization, is evaluated.
4. Customer focus: the organizational capacity on those key factors required to maintain and engage their customers, as well as to build customer relationship for long-term and expand the customer base. It seeks evidence of mechanisms that capture and anticipate customer requirements, expectations and desires. It is also evaluated the measurement systems that the organization employs to adequately assess the results of the efforts taken to satisfy customer requirements and expectations.
5. Information and analysis: how effective the organization selects, gathers, analyzes, manages, and improves its data, information and knowledge for decision making leading to higher productivity, better market position and sustain the continuous improvement process. It seeks proofs that the organization has in place mechanisms to select, collect, align, and integrate the necessary data and information, to adequately distribute it, and ensure it is properly used in decision making.
6. Process management: the processes and systems employed by the organization to ensure quality of its key products and services are evaluated.
7. Impact on society and environment: the organization´s impacts on the society and on the environment, are assessed. The activities developed to reduce and mitigate these impacts are evaluated. Emphasis is placed on the ethical behavior and social responsibility.

In addition to assess the seven management areas, the results of the organization are examined. It is diagnosed if the mechanisms, systems and procedures in place are fulfilling the purpose for which they

were established and if they are generating tangible improvements in the key aspects for competitiveness and success of the organization.

As it can be deduced from the description of the different management areas of the MMC, the main parameters that are evaluated refer to the management of intangible resource. Consequently, the different elements evaluated can be regrouped according to intellectual capital categories. This regrouping makes it possible to use the information gathered from the National Quality Award assessments to analyze the relationships between the intellectual capital components and their impact on the organizational performance.

REGROUPING OF THE MMC ELEMENTS ACCORDING TO INTELLECTUAL CAPITAL CATEGORIES

The following criteria were considered to regroup the MMC elements according to the intellectual capital categories:

- ✓ The elements evaluated in the senior management leadership area are exclusively linked to the leaders. For example, how leaders conceive and understand the organization and its overall management, what is the general knowledge and understanding of the leaders with respect to the key factors for the organization´s success, and how leaders communicates within and outside the organization. As a methodological decision for the regrouping, all these elements are included in the human capital even though, some elements could also have been related to the structural capital, through values and culture, or to relational capital thorough the way the leaders relates with the stakeholders.
- ✓ The elements of the areas: planning and information and analysis are group all together. Mainly because there is no planning without information and, in turn, information must be employed to control and monitor the plans. This construct is considered as one of the dimension that make up the structural capital.
- ✓ The elements of people development are considered as human capital indicators. Even though recognition and quality of life in the work place could be considered part of the structural capital, it was decided to keep them as human capital elements given their influence in people´s motivation and engagement.
- ✓ The elements related to promotion and dissemination of the quality culture among the stakeholders are included in the relational capital.
- ✓ The preservation of the ecosystems, of the area 7, evaluates in what degree the organization acts and what processes are in operation, to conserve the environment or natural resources. Also, this point is related with the environmental management systems, such as ISO 14000, or environmentally responsible management processes. For these reasons these elements are included in the structural capital.

The elements of the MMC arranged according to the intellectual capital categories are displayed in Table I.

Main Construct CI	First-order Construct	Elements of the MMC	MMC Nº	Indicator
Human Capital		Leadership by example	1.1	L1
		Quality Values	1.2	L2
		Education and Training	3.1	E1
		Involvement	3.2	E2
		Performance recognition	3.3	E3
		Quality of life at work	3.4	E4
Structural Capital (second order)	Planning and monitoring	Strategic planning	2.1	P1
		Operational planning	2.2	P2
		information about products, services and processes	5.1	I1
		Analysis and review of the organization's strategic performance	5.2	I2
	Processes	Design and control of processes	6.1	01
		Supporting processes	6.2	02
		Documentation	6.5	05
		Preservation of ecosystems	7.2	S2
Relational Capital (second order)	Customers	Knowledge about the market and external customers	4.1	C1
		Indicators employed to measure customer satisfaction	4.2	C2
		Service standards	4.3	C3
	Suppliers	Suppliers	6.4	04
	Society	Promotion and disclosure of the quality culture among the stakeholders	7.1	S1
Management Results		Results from external customer satisfaction	8.1	R1
		Results from production processes, support areas and suppliers	8.2	R2
		Results from workforce development programs	8.3	R3
Financial Results		Product market performance	8.4	R4
		Financial performance	8.5	R5
Note: second order constructs are the cause of the first order components.				

Table I: Intellectual capital construct´s indicators

STRUCTURAL MODEL OF INTELLECTUAL CAPITAL

Algorta *et al*. (2014) demonstrated that an organization that focus only on some of the management areas of the MMC, for example, on process management or human resource management, will not attain sustained success. All the MMC elements work in a systemic manner. It is required a balanced management of all these elements to ensure superior business performance. This fact agrees with the postulates of Total Quality Management, which hold that a high-performance business is one that has an

optimal and balanced management of all the "enablers" (EFQM, 2015). The same is transferable to intellectual capital, since the management of the elements of the MMC basically refers to the management of intangibles resources.

It is well recognized that the intellectual capital components interact to create value. Several researchers have found empirical evidence of these interactions and how the intellectual capital components reinforce each other (Dierickx and Cool, 1989; Roos and Roos, 1997; Roos *et al*., 1997; Teece *et al*., 1997; Bontis, 1998; Carmeli and Tishler, 2004; Pike *et al*., 2005; Miles, 2011).

To understand the impact of intellectual capital on the results of the organization, the impact produced by its components individually and produced by the aggregation of the components must be analyzed. Therefore, an organization that wants to create sustainable value must manage these components in a combined and balanced manner. This is in accordance with the "strategy maps" methodology of Kaplan and Norton (2004) which postulates the existence of cause-effect relationships between four perspectives: organizational results, customers, processes, and learning and growth. Three of these perspectives essentially correspond to the categories of intellectual capital. Organizational results are attained from the systematic and balanced management of these perspectives.

Human capital is the basic component of intellectual capital and indirectly affects the results of the organization through its impact on the other components. In the strategic maps this is represented by the relationship between the learning and growth perspective with that of internal processes and client. The people, with the right motivation and skills, are who achieve processes of high quality, better services and long lasting relationships with customers. Consequently, improving and increasing human capital in the organization will produce a positive impact in the other intellectual capital components, which, in turn, will have a positive effect on the organizational performance.

Two elements in which the company has no direct control are customer expectations and the perceived value by the customers. The way to increase customer satisfaction is by increasing the quality perceived by them (Zeithaml *et al.,* 1988; Fornell *et al*., 1996, 1982). The perceived quality can be increased by effectively managing the relationships with customers (relational capital) and the processes that build the value proposition (structural capital). Besides, the way in which processes are managed greatly determines the style of relationships with customers.

It is appropriate to make a distinction between management results (quality of processes, product or service, customer satisfaction and loyalty, and people development) and financial results. In this regard, some relations that are important to consider are: financial results are determined by management results (Miles, 2011; Gonzalez *et al.* 2012, Algorta *el al*., 2014); customer satisfaction leads to improved financial performance (Ittner and Larcker, 1998; Banker *et a*l., 2000); and higher quality processes lead to superior financial results (Powell, 1995; Hardie, 1998).

On basis of the previous concepts and the proven relations between the components of intellectual capital and organizational results in researches like that of Bontis (1998); Chen *et al*. (2004); Wang *et a*l. (2005); Cabrita (2005) and Miles (2011), we have developed the structural model featured on figure 1.

In the proposed model, human capital was conceptualized as a first-order construct and the structural and relational capital were modeled as second-order constructs formed by other first-order constructs. The first order constructs: planning and processes are modeled as dimensions of structural capital. The

dimensions of relational capital are the first order constructs: relationships with customers, suppliers, and society.

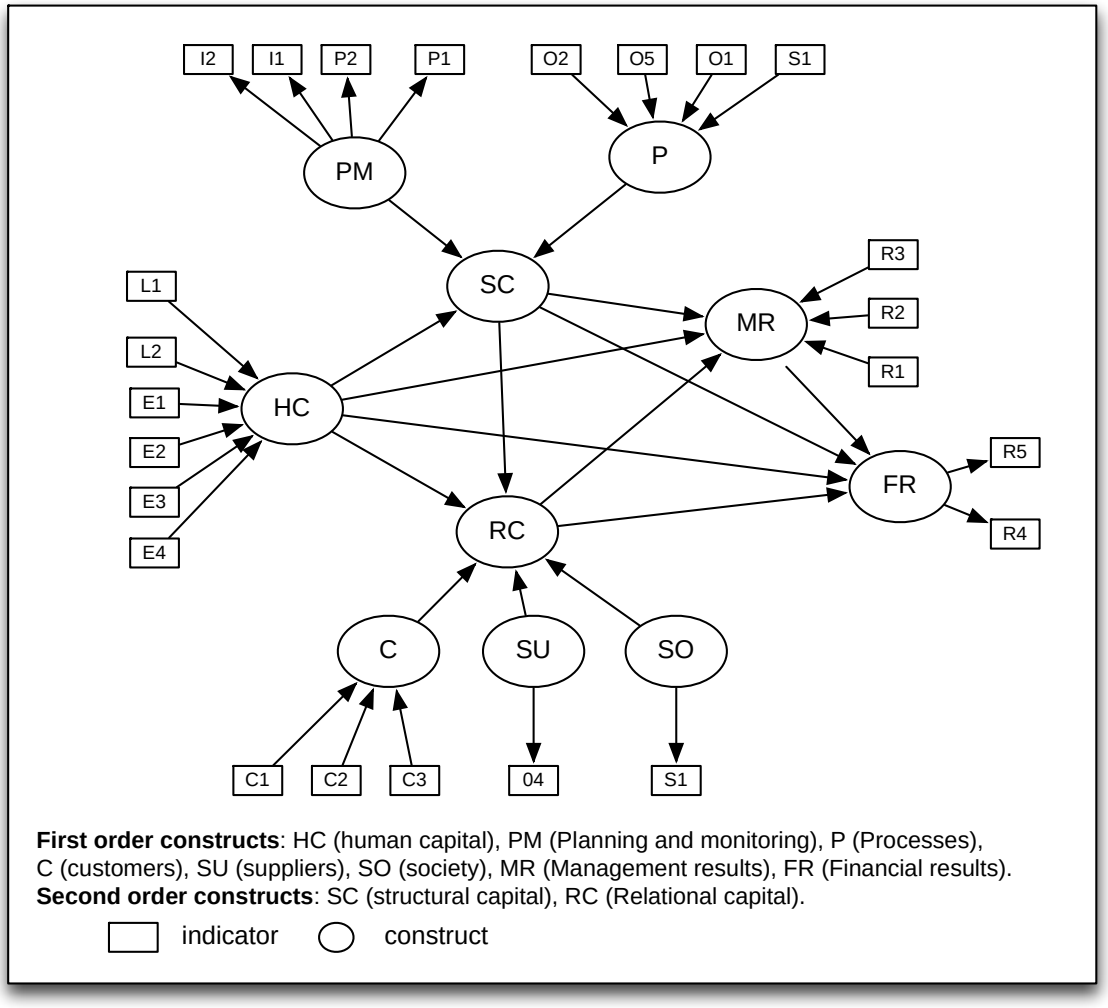

Figure 1: Structural model: intellectual capital components and organizational results

In the proposed model, human capital was conceptualized as a first-order construct and the structural and relational capital were modeled as second-order constructs formed by other first-order constructs. The first order constructs: planning and processes are modeled as dimensions of structural capital. The dimensions of relational capital are the first order constructs: relationships with customers, suppliers, and society.

The constructs can be modeled as reflective or formative, depending on how is the relationship between the latent variable and its indicators.

To determine if a construct is reflective or not, the following question can be made: "assuming that all indicators have the same direction: does the increase of one indicator implies that the rest of indicators will change in similar manner? If the answer is yes, then the construct is a reflective one (Chin, 1998).

Based on this criterion, the constructs: “financial results” and “planning and monitoring” were modeled as reflective constructs. The others where modeled as formative.

The first-order construct: processes, customers, suppliers, society, management performance and human capital, are all modeled as formative constructs. Second order constructs: structural capital and relational capital, are modeled as molar constructs.

EVALUATION PROCESS OF THE URUGUAYAN NATIONAL QUALITY AWARD - DATA FOR RESEARCH

To provide a background on how the data was compiled for testing the model, a brief description of the Uruguayan National Quality Award evaluation process is given next.

The first step for a company to apply for the Uruguayan National Quality Award is to submit a self-assessment report describing how each of the MMC areas are managed and what are the results achieved. A team of evaluators analyze the report and assigns a score of 0 to 100 to each element according to the degree of progress (in total 24 elements in all the MMC management areas are assessed).

The evaluation considers whether the processes and systems developed by the organization have the appropriate theoretical approach, if they are appropriately implemented and if results are being achieved in line with expectations, with positive and satisfactory trends in relation to those of other equivalent organizations.

To minimize the differences in scores due to the subjectivity inherent to the evaluation procedure, the following steps are taken: conducting workshops for discussion-calibration among the evaluators; the application, during the assessment process, of an evaluation guide (used to assign the scores) and the integration of the evaluation teams with at least four experts from different fields, professions, and belonging to different organizations.

First, each evaluator individually analyzes and assigns a score to each element. Following, the team gets together and reviews the different scores and assigns, based on consensus, a final score to each element. Afterwards, an on-site visit is performed to verify “in situ” the veracity of the recorded by the organization in the self-assessment report. After the visit, the final scores are established. As a final step, before confirming the scores, a group of experts (judges) reviews the evaluations of all the different groups of evaluators to determine if there are any important biases which can influence the final scores.

The advantages of this assessment method are many: a) the MMC model points out in a precise manner the aspects of the management system that shall be evaluated, b) the evaluation process is done by multidisciplinary teams of 4 to 5 experts duly trained for the task, c) the evaluation is “objective” and it is based on evidence presented in the self-assessment report which is later verified during the visit to the organization, and d) the scores are verified by a council of judges, thus removing the risk of biases and homogenizing the evaluations of the different groups.

Consequently, this evaluation methodology can be placed between two systems, one based on objective indicators and one based on opinions and individual perceptions. Without achieving the total objectivity of a “physical” measurement, this methodology grants higher objectivity than just the opinion and perceptions given by a person in an interview or in a survey.

Therefore, this measuring instrument is suitable for measuring the constructs proposed in the MMC.

The data used for the statistical analysis are the scores that come from the evaluations carried out by the teams of evaluators of the companies that applied to the Uruguayan National Quality Award between

1996 and 2013. Although these data are confidential, they could be accessed due to an agreement established between the Knowledge Management Program of the Universidad Católica del Uruguay and the National Quality Institute of Uruguay (INACAL)

RESEARCH DESIGN

The goal of this research is to examine the relationships between the different components of intellectual capital and their impact on the results of the organization. Specifically, this study addresses three research questions: first, do significant relationships exists between the different intellectual capital components? second, how do the intellectual capital components relate to the organizational results? and third, which components have a direct impact on the organizational results, and which ones have an indirect impact and are mediated by other components of the intellectual capital?

To address these questions, a structural model of the relations between the intellectual capital components and organizational results was developed, and tested employing structural equation modeling based on partial least squares (PLS). Structural equation modeling constitutes a second generation of multivariate analysis (Fornell, 1982) which combines multiple regression concerns (by examining dependency relationships) and factor analysis (by representing unobserved variables by means of multiple observed measures), to estimate a set of dependency relationships which are all simultaneously interrelated. Structural equation models allow us to analyze the relationships between latent variables, such as the intellectual capital components than cannot be measure directly and which are observed through their relation to measurable indicators (such as MMC elements). This technique is well adapted to the analysis of the proposed intellectual capital model.

When applying SEM, two approaches can be used: the covariance-based approach and the partial least squares (PLS) approach. In the first case, the aim is to determine the matrix of model parameters in such a way that the resulting covariance matrix predicted by the theoretical model is as close as possible to the sample covariance matrix (Haenlein and Kaplan, 2004). This approach is mainly used for confirmatory analysis.

PLS is a widely-used technique, designed to reflect the theoretical and empirical conditions of social sciences, where situations with not well established theories and little available information are common (Wold, 1979). Its aim is to obtain values of the latent variables for predictive purposes (Chin, 1998). In addition, PLS is a powerful analysis method due to its minimum requirements regarding measurement scales, sample sizes and residual distributions (Chin *et al*., 2003). As Wold (1979) states, PLS is mainly oriented for predictive causal analysis in highly complex situations (models containing large numbers of variables, indicators and associations) but with limited theoretical knowledge. It is an appropriate technique for prediction and exploratory analysis, when we have a less solid theory and scarce information as our case.

This methodology has been used in similar studies, which analyze the structure of intellectual capital, by Bontis (1998), Bontis *et al*. (2000), and Fitz.enz Bontis (2002), Wang *et al*. (2005), Cabrita (2005) and Miles (2011), among others.

Sample characteristics

This study considered the large companies that applied for the Uruguayan National Quality Award (PNC) between 1996 and 2013. 84 companies where selected, given that they had all the information complete (Table II).

It is important to note that this is not a representative sample of all the companies that apply the total management principles and implement the MMC. It is only representative of those firms that apply this excellence model and postulate to the Uruguayan National Quality Award. There may be companies that apply the MMC, with very good results, and do not submitted for the award. There may also be companies that, despite applying the MMC, do not obtain good results and that, consequently, not postulate the National Quality Award. Therefore, the results of this research will be applicable to companies in the sample and the generalization of their findings to other enterprises should be made carefully.

Sector	number	%
Private, industrial and agricultural	26	31%
Private, service and commercial	35	41%
Public.	23	27%
Total	84	100%

Table II. Companies of the sample, number and sector.

The sample size required when using PLS is that which would support the most complex multiple regression of the model. For this regression to be identified the following should be observed: (a) the formative construct with the largest number of indicators (i.e. the largest measurement equation) or (b) the dependent latent variable with the largest number of independent latent variables influencing it (i.e. the largest structural equation). Using a regression heuristic of 10 cases per predictor, the sample size requirement would be 10 times either (a) or (b), whichever the greater (Barclay *et al*., 1995; Chin and Newsted, 1999, Hair *et al.* 1999).

In our case, the formative construct with the largest number of indicators is human capital, with 6. And the dependent variable with the largest number of independent variables influencing it is financial results, with 4 (see figure 1). Therefore, according to the rule previously exposed, the minimum sample size required is 60.

Statistical analysis of the model

With PLS the model is analyzed and interpreted in two stages: first, the assessment of the reliability and validity of the measurement model and second the assessment of the structural model. This sequence ensures that the constructs measures are valid and reliable before drawing any conclusions about the relationships among constructs (Barclay *et al*., 1995).

The statistical treatment was done using the PLS-Graph Version 3.00 build 1130 software developed by Wynne W. Chin.

First stage: Measurement Model evaluation

In this first stage, the capacity of the indicators to correctly measure the corresponding constructs is evaluated. Reflective and formative constructs have different requirements; thus, they must be analyzed separately.

Reflective constructs analysis

In this study, "planning and monitoring" and "financial results" were modeled as reflective constructs. The characteristics that should be evaluated for this type of construct are: individual item reliability, construct reliability, convergent validity, and discriminant validity.

The individual item reliability, refers to the extent to which an indicator really measures the latent variable to which it has been connected. It is assessed by examining the loadings (λ) or simple correlations of the measures (or indicators) with their respective constructs. As shown in Table 3, all the values observed were over 0.707 which implies more shared variance between the construct and its measures than error variance (Barclay *et al.,* 1995; Carmines and Zeller, 1979). Since loadings are correlations, this means that more than 50% of the variance in the observed variable is shared with the construct. With these values the indicators can be accepted as part of the constructs.

Construct reliability, or internal consistency, refers to the extent to which all the indicators are measuring the same latent variable. If this is true, all the indicators making up the construct should be highly correlated. For these assessment, two indexes can be used: a) Cronbach's alpha and b) composite reliability (Werts *et al*, 1974). Nunnally (1978) suggests a value of 0.7 as a modest level of reliability in early stages of research. In our case, all values exceed this minimum suggested value.

Convergent validity refers to the degree to which the measures that theoretically should be related, are in fact related. Convergent validity is assessed using the average variance extracted (AVE), developed by Fornell and Larcker (1981), that provides the amount of variance that a latent variable capture from its indicators, relative to the amount due to the measurement error. The authors suggest an average variance extracted over 0.5, meaning that over 50% of variance of the construct is due to its own indicators. Results are shown in table III.

Discriminant validity refers to the extent to which a given construct differentiates from others, that is, the extent to which the constructs of the model really measure different things. For this to be true, a construct should share more variance with its measures than it shares with other constructs of the model. The discriminant validity was assessed using the average variance extracted (AVE) and following Fornell and Larcker (1981) methodology of comparing the AVE of each construct with the variance shared between the construct and the other constructs of the model. For adequate discriminant validity, the AVE for each construct should be greater than its shared variance with any other construct (the squared correlations between two constructs). Results are shown in Table IV.

Construct and Indicator	Loading	α - Cronbach	Composite reliability	AVE
Planning and monitoring		0.921	0.945	0.812
P1	0.887			
P2	0.873			
I1	0.908			
I2	0.935			
Financial results		0.818	0.918	0.849
R4	0.921			
R5	0.922			

Table III: Reflective constructs evaluation – Part I

Reflective Construct	AVE	Square correlations among constructs							
		Human	Process	Customer	Supplier	Society	Management Results	Financial Results	Planning - Monitoring
Planning - Monitoring	0.812	0.806	0.746	0.634	0.466	0.510	0.771	0.557	--
Financial Results	0.849	0.482	0.511	0.581	0.226	0.376	0.743	--	0.557
Notes: For discriminant validity, the square correlations among constructs should be smaller than the AVE of the corresponding reflective construct									

Table IV. Reflective constructs evaluation – Part II discriminant validity

Formative Construct Analysis

It is required to analyze collinearity of the indicators for first-order formative constructs and molar second-order constructs. This is due to the fact that the solutions to formative models are based on multivariate regressions, contrary to reflective constructs which are based on simple regressions. High multicollinearity between formative indicators of a construct would produce unstable estimates and makes it difficult to isolate the individual effects of the indicators on a specific construct. The results from the multicollinearity test are displayed in Table V. In all the cases the VIF (variance inflation factor) and the condition index are between the established values to rule out a significant multicollinearity. (VIF<5, IC<30) (Hair et al. 1999).

Formative construct	Maximum VIF	Maximum Condition Index
Human	4,577	21,580
Process	3,284	12,179
Customer	3,027	12,644
Management Results	3,712	12,482

Table V. Analysis of formative construct multicollinearity

Second stage: Structural Model Assessment

Once the quality of the measurement model has been guaranteed, the structural model should then be assessed. This refers to the strength of the relations between the latent variables and to the predictive power achieved by the model.

To assess the strength of the relations between constructs, path coefficient should be examined. They should be interpreted in the same way as the β coefficients in traditional regression.

To assess the stability of the model and the statistical significance of the indicators and path coefficients, a nonparametric technique is used. A bootstrap resampling method was used generate "t" values for each relationship represented in the model. A Student t distribution with n-1 degrees of freedom ("n" being the number of subsamples analyzed: 500 in our case) is then used for assessing the "t" values and standard errors obtained (Chin, 1998; Efron and Tibshirani, 1993). Given that the relationships signs were specified in the model, a one-tailed Student t distribution was employed, with the following values: $p<0.001$, $t=3,107$; $p<0.01$, $t=2,335$; $p<0.05$, $t=1,648$.

A measure of the predictive power achieved by a PLS model is provided by the R^2 value of endogenous constructs (Barclay et al., 1995). These values should be interpreted in the same manner as the R^2 obtained from a multiple regression analysis. Consequently, R^2 values indicate the amount of variance in the constructs which is explained by the model.

Falk and Miller (1992) state that the amount of variance explained (R^2) of an endogenous construct should be equal or superior to 0.10. Although lower values of R^2 could be statistically significant, they provide very little information and therefore, the predictive power of the relation analyzed is very low.

Estimation of path coefficient and of the explained variance of endogenous constructs

The PLS-graph software cannot handle second-order constructs. When a model contains first and second order constructs, the analysis is performed in two steps. First, the model considering only the first order constructs is analyzed and their scores al computed. Following, the model with the second order constructs is analyzed using as indicators the scores of the corresponding first-order constructs calculated in the first step.

The path coefficients, with their degree of significance, and the explained variance (R^2) of the constructs are shown in Table VI.

Endogenous constructs	R^2	Q2	Predictor construct			
			Human	Structural	Relational	Management Results
Structural	0.74	0.61	0.861***			
Relational	0.81	0.55	0.624***	0.303**		
Management Results	0.83	0.66	0.245	0.390***	0.32*	
Financial Results	0.75	0.61	-0.150	0.081	0.195	0.754***
*** p<0.001; ** p<0.01; * p<0.05 (based on $t_{499,}$ one-tailed test)						

Table VI. Path coefficients, explained variance R^2 and Stone-Geisser predictive relevance Q^2

Path coefficients indicate to what extent the predictor variables contribute to the explained variance of the endogenous variables (R2), and they should be interpreted in a similar fashion to the coefficients

obtained on linear regressions analyses. Chin (1998) recommends that to be considered significant, the standardized path coefficients should reach values at least of 0.2, and ideally over 0.3. In our case, all the significant path coefficients satisfy this condition (Table VI).

It can be observed from Table VI that the relationships between the intellectual capital components and the financial results are not significant. Also, are not significant the relationships between human capital and management results. These means that the influence of the intellectual capital components on the financial results is not direct; they influence them through the management results.

In Table VII we can observe the values for the indicators of the formative constructs and the first order constructs. Non-significant indicators are: "leadership by example" (E1) and "quality of life" (E4) and the first-order constructs: "processes" and "suppliers".

construct	**indicator**	**weight**	**standard error**	**Statistic t**
Human capital	L1 (Leadership by example)	-0.1505	0.1377	1.0943
	E1 (Education and Training)	0.2072	0.1392	1.687*
	E2 (Involvement)	0.2536	0.1485	1.708*
	L2 (Organizational values)	0.7032	0.1608	4.2268 ***
	E3 (Performance and recognition)	0.4313	0.1304	3.3077***
	E4 (Quality of life in the work place)	0.1251	0.067	0.9061
Structural capital	Planning and monitoring	0.9056	0.0922	10.0467 ***
	Process	0.1145	0.1045	1.0955
Relational Capital	Customers	0.7214	0.1162	6.1868***
	Suppliers	0.1409	0.0988	1.4115
	Society	0.2691	0.1075	2.5028**
Management Results	R1 (customer satisfaction)	0.5374	0.1145	4.6944***
	R2 (process)	0.3553	0.1066	3.3320***
	R3 (people)	0.1709	0.0851	2.0090*
*** p<0.001; ** p<0.01; * p<0.05 (based on $t_{499,}$ one-tailed test)				

Table VII: Formative constructs values: indicators and first order construct scores.

Model predictive power

One of the measurements of the predictive power of a model is the R^2 value for dependent latent variables (table 6). This value indicates the amount of variance of the dependent construct explained by the model. The average explained variance of this model is 62, 6%. Thus, the model has an appropriate predictive power as all the explained variances exceeds the 0.1 required value suggested by Falk and Miller (1992). Another measurement employed to evaluate the predictive power of a model is the Stone-Geisser's Q^2 value (Geisser, 1974; Stone, 1974). The predictive relevance Q^2 is used to assess how well the model reproduces the observed values. As suggested by Chin (1998), Q^2 values greater than zero indicates that the model has predictive relevance, while if it is less than zero indicates that the model lacks predictive relevance. As shown in Table VI, this model has Q^2 values greater than zero for all the endogenous constructs, thus asserting the predictive relevance of the model.

Explained variance in endogenous constructs

Falk and Miller (1992) point out that a reasonable index of variance explained in an endogenous construct by another latent variable is given by the absolute value of the result of multiplying the path coefficient by the corresponding correlation coefficient between the two variables. The total variance explained by the construct management results is 0.83, which is composed of structural capital, which explain 0.46, and by the relational capital that explain the 0.38. In turn, the variance of relational capital (0.81) is explained, for the most part, by human capital (0.54) and to a lesser extent by structural capital (0.27).

The Influence of predictor latent variables

Changes in R^2 of an endogenous variable help to determine if a particular independent latent variable has influence on the construct analyzed. To determine this, the "effect size f^2 " can be used (Chin, 2010). The "effect size f^2" considers the R^2 of the latent dependent variable when the predictor variable is used (complete R^2) or omitted (R^2 excluded) in the structural model. As recommended by Cohen (1988) and Chin (1998), the f^2 values of 0.02, 0.15 and 0.35 can be viewed as indication of whether a predictor latent variable respectively has a small, medium or large effect on the dependent variable.

	Management results			**Financial results**		
	R^2	f^2	impact	R^2	f^2	impact
Complete	0.82			0.75		
Human	0.80	0.07	Small	0.74	0.003	null
Structural	0.74	0.34	Ample	0.74	-0.001	null
Relational	0.76	0.28	Medium	0.74	-0.001	null

Table VIII: influence of predictor variables on organizational results

Structural capital has the strongest influence on management results, followed by the relational and lastly by human capital, as can be seen from Table VIII. This conclusion is in accordance with what can be observed on the structural model, given that human capital has an indirect effect on management results. In addition, there is not a significant impact of the intellectual capital components on the financial performance, confirming that the financial results are consequence of the management results.

DISCUSSION, IMPLICATIONS AND LIMITATIONS

The objective of this paper was to investigate the interaction between the components of intellectual capital and their impact on organizational results. The companies evaluated in this study were those that applied for the National Quality Award of Uruguay between 1996 and 2013.

The findings are similar, in terms of significant relationships and their strengths, to those of studies conducted in other countries and industries, contributing to the consolidation of the Intellectual Capital Based View stated by Reed *et al*. (2006). Most important, this study confirms the significance that has management of intangible resources on the achievement of sustainable business results over the long term, and promotes the integrated approach of Total Quality Management and Intellectual Capital Management.

The analysis has shown that the components of intellectual capital have a direct and an indirect impact on the organizational results. The proposed model explains the 75% of the variance in the financial results and the 83% variance in the management results (human development, process management and customer relationship management). The study also validates that financial results are largely the consequence of management results. Which confirms that satisfied customers, better prepared staff, and properly managed process lead to better financial results.

As in other studies, it is confirmed that the impact of human capital on the business results is not direct, but it is mediated by other components of the intellectual capital (Bontis, 1998, Wang *et al*. 2005, Cabrita, 2005, Miles, 2011). Human capital directly and significantly influences structural capital and relational capital. As Yaseen *et al*. (2016) states, "it is valid to suggest that human capital indirectly and significantly influences competitive advantage as it is embedded in the relational capital". The relational capital is also influenced by structural capital, even though in a smaller degree than the one exerted by human capital (the explained variance of the relational capital (81%) is mostly due to human capital (54%) and to a lesser extent to structural capital (27%)). It has been shown that relational capital, as well as structural capital, influence indirectly financial results, but influence directly the management results.

It has been shown that the human capital is in the origin of organizational performance. However, human capital needs quality processes, systems and suitable relationships to have an effective and efficient impact on financial results; it has no significant direct impact on them. These findings are in accordance with the postulates of Total Quality Management, and the Resource Based View.

The study shows that organizational values and employee recognition are key leadership elements that have the greatest significant impact to the organizational performance. The perceived quality can be increased by effectively managing the relationships with customers (relational capital) and the value-added processes (structural capital). The way in which processes are managed greatly determines how the relationships with customers are. Planning and monitoring and relationship with customers are key influential elements of the financial results of the organization.

Finally, this study confirms the synergy between intellectual capital management and total quality management. The data collected to evaluate the organizations from TQM perspective was used to analyze them from the intellectual capital perspective, exhibiting results consistent with other empirical studies previously conducted in this area.

Management implications

This study presents some contributions for the managers of organizations.

First, it shows that a good quality management system also serves to manage intangible resources and intellectual capital, which are the elements that explain about 80% of the value of the company.

On the other hand, it indicates which are the management areas and the elements in which managers must put focus to improve the organizational results. For example, it indicates that, while the development of human capital is important, it will not have the desired impact on business results if structural capital is not strengthened, especially planning and monitoring, or relational capital is enhanced by improving customer relationships. In addition, it demonstrates the importance of values and recognition for the development of human capital, that are often neglected to address more "practical" things.

Finally, while it is obvious, and it is widely demonstrated, that good financial results depend on the achievement of good management results, that is: of satisfied clients, of personnel involved and of efficient processes, many managers "forget" this and, with a short-term mentality, focus directly on financial results, without giving due importance to others. This work is yet another demonstration more that management results predict financial results. It is a further contribution to help convince managers that for improving financial results they should focus on improving management results.

Implication for future research

Total quality management, whether using ISO 9000 standards or excellence models, is an increasingly widespread practice in organizations of all types, sectors and countries. On the other hand, while it is widely demonstrated that intangible resources and intellectual capital contribute to generate about 80% of the value of companies, their systematic management is not so widespread in organizations. It is worthwhile to continue with researches, such as the one developed in this work, that link quality management with the management of intellectual capital, to generate knowledge that allows an integrated management of the same in organizations.

In addition, as in most countries exists the national quality awards, that are evaluated in similar way to the MMC presented in this paper, the same methodology could be applied and similar studies could be carried out. This will contribute to the consolidation of the Intellectual Capital View, detecting and differentiating those conclusions which can be generalized and those which depend on the characteristics of the industries or the countries.

Limitations

This study has several limitations that should be kept in mind when interpreting the results.

First, the data used are from evaluations to companies performed at different times over a long period of time (1996-2013). This study does not consider the different context (macroeconomic and social) in which the companies were when presented their self-assessment report and were evaluated. No doubt the context influences how organizations are managed and is a factor that could influence the results of this study.

Second, the indicators used in this study to measure the components of intellectual capital, were not specifically designed for that purpose. We used the indicators of the MMC, created to measure the quality management system. This can produce that some important dimensions of the intellectual capital components are ignored.

Also, the choice of a multi-sectorial sample, although enables to reach to more global conclusions, could adversely affect the quality of the results obtained, especially because the great heterogeneity of the sectors considered.

However, the findings are similar in terms of meaningful relationships and their forces, to studies in other countries and industries. This allows us to accept, temporarily, while the study findings apply to more companies and / or companies of different size and industry.

Another limitation to consider is related to the notion of causality. The technique used is oriented to prediction rather than the determination of causality; PLS is a method for estimating the probability of an event based on the information available on other events. Therefore, we can say that the relationships found are predict the results, but they don't cause them.

Finally, the sample analyzed is not representative of the enterprises, not even of the ones that use el Uruguayan Excellence Model (MMC). It only analyzes those that have postulated to the Uruguayan National Quality Award. So, the generalization of the conclusions of this study must be made with care.

Concluding, this investigation is important for both theory and practice. With respect to theory, it contributes to consolidate the Intellectual Capital View, confirming its importance for organizational performance. It also contributes to the linkage of the Total Quality Management and Intellectual Capital management. And presents a methodology that can be applied to extend this research to other countries.

Regarding practice, the study reveals important management areas and elements that managers should focus on to increase the probability of obtaining good sustainable organizational results.

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