

# **IMPROVING FIRMS' PERFORMANCE BY MANAGING INTANGIBLE RESOURCES THROUGH TQM: EXPERIENCE OF COMPANIES IMPLEMENTING THE URUGUAYAN QUALITY MODEL**

**John Miles Touya**

**Natalia Mandirola**

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## **ABSTRACT**

### **Purpose**

Although there is significant theoretical and empirical consensus regarding the importance of intangible resources (intellectual capital) on business performance, firms tend to underestimate them and pay little attention to their systematic management. The purpose of this paper is to demonstrate that companies, when successfully implementing TQM, are simultaneously managing their intangible resources efficiently, which positively impacts business results.

### **Design/methodology/approach**

The data from the assessments of 84 companies that applied for the Uruguayan National Quality Award were used to test a model relating the intangible resources implicit in the Uruguayan Quality Model and evaluate their impact on business results (both financial and non-financial). Structural equation modeling based on partial least squares (PLS) was used for the analysis.

### **Findings**

In firms that implement TQM, the significant relationships between intangible resources and their effect on business results are similar to those found in studies specifically focusing on intellectual capital. This suggests that TQM is an effective way to manage these resources. For the companies analyzed, the intangible resources implicit in the Uruguayan Quality Model explain 75% of the variance in financial results and 83% in non-financial results (process, people, and customers). The study also validates that financial results are largely a consequence of non-financial results.

### **Practical Implications**

The findings provide managers with insight into the importance of intangible resources for financial performance and demonstrate that TQM offers an integrated and systematic approach to managing quality and intellectual capital, which positively impacts business results.

### **Originality/value**

This paper presents an integrated view of intangible resource management and TQM, confirming their positive impact on business results. It uses a highly reliable measurement methodology not previously used in similar studies, which could be applied to other research endeavors.

**Keywords:** TQM, Quality Award, Intellectual Capital, Business Results, Intangible Resources

**JEL codes:** M10, M11

## INTRODUCTION

While economic analyses have traditionally focused on the role of physical capital in the production process, there is increasing recognition of the importance of intangible investments as a vital factor for productivity, growth, and living standards. Intangible resources (intellectual capital) are at the heart of what makes firms competitive; they are vital for productivity and economic growth (Thum-Thyssen et al., 2017). In the last three decades, the Resource-Based View and the Intellectual Capital View have acknowledged that the competitive capacity and sustained success of a company greatly depend on how it manages its resources, especially intangible resources (Wernerfelt, 1984; Barney, 1991, Reed et al., 2006). In recent years, in most industries and companies, intangible resources have surpassed tangible resources, both in value and contribution to growth (Nakamura, 2003; Kaplan and Norton, 2004; OECD, 2010). Intellectual capital pervades most industries, from advanced goods and services to traditional manufacturing. For example, in the U.S., the ten industries whose intellectual capital represents at least 50 percent of their market value are the same ten whose intangible resources represent at least 90 percent of their market value (Hassett and Shapiro, 2011). The percentage of intangible resources in the market value of the 500 companies included in the Standard and Poor's index has increased steadily since 1975. Whereas, in that year, book value represented 83% of the market value of a company, in 2015 it represented only 16%. (Ocean Tomo, 2015). Global intangible value constitutes 52% of the overall enterprise value of all publicly traded companies worldwide (GIFT, 2018).

Several empirical studies confirm the importance of intangibles for productivity. Roth and Thum (2013) and Corrado et al. (2009) confirmed a positive and significant relationship between intangible capital investment and labor productivity growth. Ilmakunnas and Piekkola (2014) report a significant effect of organizational capital on productivity. Overall, the empirical literature on productivity and efficiency confirms the role played by intangible resources—such as human competencies, employee training, organizational values and culture, management practices, R&D, and customer and supplier relationships—in determining firms' performance.

While the ability of intangible resources to enhance traditional production factors has been studied since the time of Adam Smith and Alfred Marshall, they often go unnoticed due to the difficulty of identifying, measuring, and valuing them (Lev, 2001). Intangible resources generally do not appear in financial statements and, consequently, are not managed properly. Worse still, business accounting has traditionally treated outlays on intangibles as intermediate expenditures rather than investments.

The development of systematic models for measuring and managing intangible resources did not emerge until the last decades of the 20th century. Since then, many authors have used the term "intellectual capital" (IC) to refer to the set of intangible resources that, in combination, generate

value and produce future benefits for a company (Stewart, 1997; Sullivan, 2000; Edvinsson and Malone, 1997; Bontis, 1998, 2002; Andriessen, 2004; Reed et al., 2006).

Although some methodologies for measuring and managing intellectual capital have been developed, such as the Intangible Asset Monitor (Sveiby, 1997), Intellectual Capital Index (Roos et al., 1997), Skandia Navigator (Edvinsson and Malone, 1997), Balanced Scorecard (Kaplan and Norton, 1992, 2004), MERITUM (2002), and Intellectus (Bueno et al., 2011), they have not been widely adopted. Therefore, despite its relevance, the systematic management of intangible resources is not a widespread practice.

Total Quality Management (TQM), in turn, supports the Resource-Based and Intellectual Capital Views, emphasizing that competitive capacity and sustainable organizational performance depend on the effective management of intangible resources. TQM asserts that processes are the vehicle through which an organization harnesses and releases the capabilities of its people to produce results. Therefore, for an organization to achieve excellence in key performance results, its leaders should implement policies, strategies, and actions focused on people, partnerships, resources, and processes (EFQM, 2016). In other words, TQM suggests the management of intangible resources as a key factor to achieve sustainable results.

In short, there is ample theoretical and empirical consensus regarding the importance of intangible resources for business performance, yet explicit attention to their management is lacking. On the other hand, TQM, an extended practice in organizations, is based on the management of intangible resources.

This paper analyzes whether companies, when successfully implementing TQM, are, at the same time, efficiently managing their intangible resources with a positive impact on business results, similar to those obtained when specific management systems for intellectual capital are used.

If this were the case, it would be possible to propose TQM as an ideal way to carry out an integrated management of quality and intangible resources.

## **Intellectual Capital and Quality Management Systems**

In most of the literature, the terminology of Intangible Assets/Resources, Intellectual Capital, and Knowledge Assets is used interchangeably (Lev, 2001). In this work, Intellectual Capital (IC) is used to designate the set of intangible resources that, in combination, are able to generate value for the organization. It is widely accepted that these resources are grouped into three basic components of IC: human capital, structural capital, and relational capital. These three types of capital 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 (social intelligence) (CIC, 2003).

While each of the components of intellectual capital can have an independent impact on the performance of the organization, the components interact, and it is the type and quality of these interactions that ultimately determine their influence on overall business results. The value that human capital can generate for the company is reinforced by structural capital: processes, culture, and organizational structures that help workers to use their capacity to achieve better firm performance, and by the quality of the relationships of the company with customers and suppliers, government, investors, and associations. These interactions and their impact on business performance have been studied, among others, by Bontis (1998), Bontis and Fitz-enz (2002), Cabrita (2005), Wang et al. (2005), Ciavolino and Dahlgard, (2009) and Miles (2011). Understanding how intellectual capital components relate will help to improve organizational performance by taking actions to further develop and strengthen the highest-impact relations.

On the other hand, during the last decades, total quality management systems (TQM) have been implemented all around the world in all types of organizations. Many have adopted the criteria established by the standards ISO 9000 and/or the excellence models, such as the EFQM, the Malcolm Baldrige, or the Uruguayan Quality Model (MMC). These management models postulate 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" (ISO 9004:2018).

These quality management systems not only contribute to making explicit the organizational knowledge, by providing a framework to structure and document it, but also have a positive impact on:

- a) **Organizational Culture:** Encouraging a culture based on continuous improvement, promoting cooperative leadership styles, trust, and involvement.
- b) **Personnel:** Properly managing their competencies and creating a work environment that reinforces improvement, personal development, and achievement of organizational goals.
- c) **Relationships:** Promoting win-win relationships with customers and suppliers, satisfying the needs and expectations of all stakeholders in a balanced manner, and encouraging the sharing of knowledge.

Consequently, organizations that implement and maintain management systems according to these models and standards not only document knowledge and improve processes management (i.e., generating structural capital), but also perform several activities that strengthen other intangible resources, such as teamwork, sense of belonging, engagement, personal

competencies, trust, cooperative leadership, etc., thus influencing all components of intellectual capital.

Similarly, Lim et al. (1999) point out that the success of implementing a 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 elements of intellectual capital—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 and intellectual capital. Thus, quality management can be considered as a process where knowledge is the primary input and intellectual capital the primary output (Zhao and Bryar, 2001). Martín-Castilla and Rodríguez-Ruiz (2008) relate the different elements of the EFQM excellence model with intellectual capital components, and Heng (2001) illustrates the existing synergy among ISO 9000 requirements, knowledge management, and the management of intellectual capital.

Therefore, TQM implemented with ISO 9000 and/or excellence models can be considered a good framework for managing intangible resources. It is reasonable to expect that companies that successfully implement quality management systems also effectively manage their intangible resources. Thus, they can be used to analyze whether good management of intangible resources has a significant positive impact on business results.

### **Uruguayan Quality Model (MMC)**

For the past 25 years, the Uruguayan National Quality Award's assessment process has relied on the MMC, a standard used to evaluate organizations that apply for the award. Based on similar excellence models like the Malcolm Baldrige Award, the MMC frames principles and elements (or enablers) that guide companies in implementing quality management systems to achieve excellence through balanced satisfaction of stakeholder needs.

The elements necessary for implementing strategy and achieving results are primarily intangible resources. These are grouped into seven management areas: senior management leadership, planning, people development, external customer approach, information and analysis, process management, and impact on society and environment.

MMC distinguishes between two result categories: **financial results** and **non-financial results**. The latter encompasses customer satisfaction, the quality of the production process for goods and services, and the development and engagement of people.

Even though solid financial results are required for the long-term success of any organization, financial results alone are not sufficient to ensure it. If the organization is not able to satisfy all

stakeholders—customers, suppliers, staff, and society at large—it is not likely to survive in the long run. To a large extent, strong financial results are the consequence or reward of having a balanced management process that achieves good results for all stakeholders (González et al., 2009; Algorta et al., 2014; ISO 9004, 2018).

For this study, the elements of MMC (the intangible resources managed by companies that apply this model) are grouped according to the intellectual capital categories (Table I). For this, the following criteria were considered:

- The elements of "senior management leadership" have been included in human capital; although some could also be related to structural capital, through values and culture, or to relational capital through the way leaders relate with the stakeholders.
- The elements of "planning" and "information and analysis" are grouped together because there is no planning without information and, in turn, information is necessary to control and monitor the plans.
- The elements of "people development" are considered human capital.
- The elements related to "promotion and disclosure of the quality culture among the stakeholders" are included in relational capital.

Table I: Grouping of elements of MMC in the intellectual capital constructs

Construct		Elements of the MMC	MMC Nº	Indicator	
Human Capital (first order)		Leadership by example	1.1	L1	
		Organizational Values	1.2	L2	
		Education and Training	3.1	E1	
		Involvement	3.2	E2	
		Employee performance recognition	3.3	E3	
		Quality of life at work	3.4	E4	
Structural Capital (second order)		Planning and monitoring (first order)	Strategic planning	2.1	P1
			Operational planning	2.2	P2
		Processes (first order)	information about products, services and processes	5.1	I1
			Analysis and review of the organization's strategic performance	5.2	I2
			Design and control of processes	6.1	O1
			Supporting processes	6.2	O2
		Documentation	6.5	O5	
		Processes for preservation of ecosystems	7.2	S2	

Relational Capital (second order)	Customers (first order)	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 (first order)	Suppliers	6.4	04
	Society (first order)	Promotion and disclosure of the quality culture among the stakeholders	7.1	S1
Management Results (first order)		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 (first order)		Product market performance	8.4	R4
		Financial performance	8.5	R5
<p><b>Note:</b> second order constructs are the cause of the first order components.  MMC N<sup>o</sup>: the number of the element in MMC.  Indicator: evaluation item  The MMC can be consulted and downloaded from <a href="http://www.inacal.ogr.uy">www.inacal.ogr.uy</a></p>				

### Evaluation Process of the Uruguayan National Quality Award

To provide background on how the data was compiled for statistical analysis, a brief description of the Uruguayan National Quality Award evaluation process is provided.

To apply for the Uruguayan National Quality Award, the first step is to submit a self-assessment report describing how each area of the MMC is managed and what results were achieved. A team of expert evaluators analyzes the report and assigns a score ranging from 0 to 100 to each element based on the degree of progress.

The evaluators consider the following aspects: whether the processes and systems developed by the organization have the appropriate theoretical framework, whether they are appropriately implemented, and whether the results achieved align with expectations and show positive trends relative to those of other similar organizations.

To minimize the differences in scores due to the subjectivity inherent in the evaluation process, the following steps are taken:

- Discussion and calibration among the evaluators through workshops.
- The development and use of an evaluation guide during the assessment process.
- Evaluation teams composed of at least four experts from different fields, professions, and organizations.

Each evaluator individually analyzes and assigns a score to each element. The team then meets, reviews the different scores, and assigns a consensus-based final score to each element. Subsequently, the team makes an on-site visit to verify the reliability of the information provided in the self-assessment report. Final scores are determined after the final visit.

The advantages of this assessment method are numerous:

- a) The MMC clearly outlines the aspects of the management system that need to be evaluated.
- b) The evaluation process is conducted by multidisciplinary teams of 4 to 5 experts who are properly trained for the task.
- c) The evaluation is "objective," based on the evidence presented in the self-assessment report, which is later verified during the site visit to the organization.
- d) The scores are verified by a council of judges, thus minimizing the risk of biases and standardizing the evaluations across different groups.

Consequently, this evaluation methodology falls between two approaches: one based on objective indicators and another based on opinions and individual perceptions. While not achieving the full objectivity of a "physical" measurement, this methodology offers greater objectivity than simply relying on personal opinions or perceptions gathered through interviews or surveys.

The data used for the statistical analysis come from the scores assigned by evaluator teams to companies applying for the Uruguayan National Quality Award between 1998 and 2014. Although these data are confidential, they can be accessed due to an agreement between the Catholic University of Uruguay and the National Quality Institute of Uruguay.

## **Structural Model of Intellectual Capital and Organizational Results**

To analyze how the intangible resources of the MMC interact and influence organizational results (both financial and non-financial), a structural model was developed (Figure 1), based on statistical relationships identified in previous studies on intellectual capital management (Bontis, 1998; Chen et al., 2004; Wang et al., 2005; Cabrita, 2005; Miles, 2011). Special attention was given to the following:

- Human capital is the fundamental component of intellectual capital and indirectly affects organizational results through its impact on the other components. Employees, when properly motivated and skilled, are the ones who develop high-quality processes and establish long-lasting relationships with customers. Therefore, improving and enhancing human capital will positively affect the other components of intellectual capital, which, in turn, will have a beneficial impact on organizational performance.
- Customer satisfaction is increased by improving the quality perceived by customers (Zeithaml et al., 1988; Fornell et al., 1996). Perceived quality can be enhanced by effectively managing customer relationships (relational capital) and the processes that create the value proposition (structural capital). Moreover, relationships with customers are strongly influenced by how processes are managed (Algorta et al., 2014).
- Financial results are determined by non-financial results (Miles, 2011; Algorta et al., 2014; Miles et al., 2018). Customer satisfaction leads to improved financial performance (Ittner and Larcker, 1998; Banker et al., 2000), and higher-quality processes result in superior financial outcomes (Powell, 1995; Hardie, 1998).

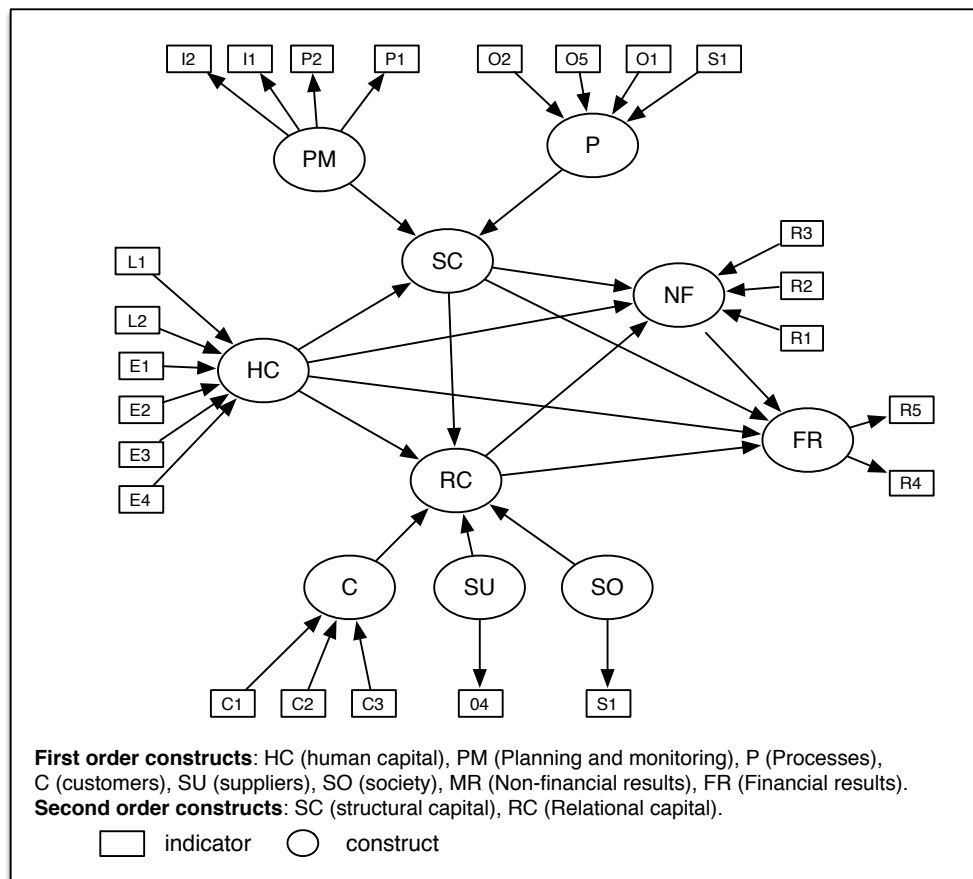


Figure 1: Structural model: intellectual capital components and organizational results

As seen in Figure 1, human capital is conceptualized as a first-order construct. Structural capital is conceptualized as a second-order construct, with "planning" and "processes" as its dimensions.

Relational capital is modeled as second-order constructs formed by the first-order constructs: relationships with customers, suppliers, and society.

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

To determine if a construct is reflective, the following question can be asked: "If all indicators have the same direction, does an increase in one indicator imply that the other indicators will change in a similar manner?" If the answer is yes, then the construct is reflective (Chin, 1998).

Based on this criterion, the constructs "financial results" and "planning and monitoring" were modeled as reflective constructs. The other constructs were modeled as formative.

## **Research Design**

The objective of this paper is to analyze whether companies that successfully implement TQM also manage their intangible resources effectively. Additionally, the study aims to detect how the components of intellectual capital relate to each other and impact business results.

With the intangible resources considered in the MMC (Table I), a structural model was developed to show the relationships between the elements of IC and business results. The constructs and paths of the model are defined based on previous empirical studies of intellectual capital.

The model is tested using structural equation modeling (SEM) based on partial least squares (PLS). SEM is considered a second-generation multivariate analysis technique (Fornell, 1982) that combines multiple regression (by examining dependency relationships) and factor analysis (by representing unobserved variables with multiple observed measures) to estimate a set of dependency relationships that are all simultaneously interrelated.

When applying SEM, two approaches can be used: covariance-based or partial least squares (PLS). In this study, PLS was chosen because it is a technique designed to reflect the theoretical and empirical conditions of social sciences, where less conclusive theories and scarce information are common (Wold, 1979). PLS aims to obtain values for latent variables for predictive purposes (Chin, 1998). Moreover, PLS is a powerful analysis method due to its minimal requirements regarding measurement scales, sample sizes, and residual distributions (Chin et al., 2003).

This methodology has been applied in similar studies analyzing the structure of intellectual capital (Bontis, 1998; Bontis et al., 2000; Fitz-enz and Bontis, 2002; Wang et al., 2005; Cabrita, 2005; Miles, 2011) and the structure of excellence models (González et al., 2009; Algorta et al., 2014).

## Sample

This study considers the 84 companies that applied for the Uruguayan National Quality Award (PNC) in the large firm's category between 1998 and 2014. The sample consists of 31% private industrial or agricultural firms, 41% private service or commercial firms, and 27% state-owned enterprises. To be admitted to the PNC assessment process, a company must first demonstrate that it has a relatively successful TQM program and implementation.

This sample is not representative of all companies that apply TQM principles or implement the MMC, but rather of those that applied for the PNC. There may be companies that effectively implement MMC but do not apply for the award, as well as companies that, despite applying MMC, do not achieve good results and therefore do not apply for the PNC. Therefore, generalizing the findings of this research should be done cautiously.

The sample size required when using PLS is determined by the most complex multiple regression in the model. For the regression to be identified, the following criteria must be met: (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 is 10 times either (a) or (b), whichever is greater (Barclay et al., 1995; Chin, 1998; Hair et al., 1999).

In this research, the formative construct with the largest number of indicators is "human capital" with 6 indicators. The dependent variable with the largest number of independent variables influencing it is "financial results" with 4 (see Figure 1). Therefore, the minimum required sample size is 60, and the sample size obtained is sufficiently large to conduct a statistical study based on structural equation modeling (PLS approach) using PLS-Graph software (Chin and Frye, 2003).

## Data for the Analysis

The data used for the statistical analysis are the scores obtained from the evaluations carried out by the teams of evaluators for the companies that applied for the Uruguayan National Quality Award between 1998 and 2014. Although these data are confidential, they can be accessed due to an agreement between the Catholic University of Uruguay and the National Quality Institute of Uruguay.

## Results of the statistical analysis

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 conclusions about the relationships among constructs (Barclay *et al.*, 1995).

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

### ***First stage: measurement model evaluation***

The capability of the indicators to correctly measure the corresponding constructs was evaluated.

Reflective and formative constructs were analyzed separately.

#### Reflective constructs analysis

The characteristics that should be evaluated for reflective construct are: individual item reliability, construct reliability, convergent validity, and discriminant validity.

The individual item reliability refers to the extent to which an indicator validly measures the latent variable to which it has been connected. It is assessed by examining the loadings ( $\lambda$ ) or simple correlations of the measures with their respective constructs. As shown in Table II, all the values observed were over 0.707 which implies more of a shared variance between the construct and its measures than an error variance (Carmines and Zeller, 1979; Barclay *et al.*, 1995). This means that more than 50% of the variance in the observed variable is shared with the construct.

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 this 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 (Table II).

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). AVE 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 II.

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 validly 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 III.

<b>Construct and Indicator</b>	<b>Loading</b>	<b>α Cronbach</b>	<b>- Composite reliability</b>	<b>AVE</b>
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 II: Reflective constructs evaluation – Part I

As can be seen, loads, composite reliability and AVE are all good.

<b>Reflective Construct</b>	<b>AVE</b>	<b>Square correlations among constructs</b>							
		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 III. Reflective constructs evaluation – Part II discriminant validity

As can be observed, the constructs share more variance with their own indicators than they share with other constructs of the model. Therefore, discriminant validity is guaranteed.

### Formative Construct Analysis

It is necessary to analyze the collinearity of the indicators for formative constructs. This is because 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 IV. In all the cases, the VIF (variance inflation factor) and the CI (condition index) are inside the established values to rule out a significant multicollinearity. (VIF<5, CI<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
Non-Financial Results	3,712	12,482

Table IV. Analysis of formative construct multicollinearity

### Weights of indicators of formative constructs

In Table V, we can observe the weights and standard errors for the indicators of the formative constructs and the first order constructs.

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 (employee performance recognition)	0.4313	0.1304	3.3077***
	E4 (Quality of life in the workplace)	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**
Non-Financial 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 <sub>499</sub> , one-tailed test)				

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

### ***Second stage: structural model assessment***

Once the measurement model quality has been validated, the structural model should 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 stability of the model and the statistical significance of the indicators and path coefficients, a nonparametric technique was used. With a bootstrap resampling method, “t” values for each relationship represented in the model were generated. A Student’s t distribution with n-1 degrees of freedom (“n” being the number of subsamples analyzed: 500 in this research) was used for assessing the “t” values and standard errors obtained (Chin, 1998). Given that the relationships signs were specified in the model, a one-tailed Student t distribution was employed, with the following values:  $p < 0.001$ ,  $t = 3.107$ ;  $p < 0.01$ ,  $t = 2.335$ ;  $p < 0.05$ ,  $t = 1.648$ .

#### Estimation of path coefficient

To assess the strength of the relations between constructs, path coefficients were examined.

Path coefficients indicate to what extent the predictor variables contribute to the explained variance ( $R^2$ ) of the endogenous variables; they should be interpreted in a similar fashion to the coefficients obtained on linear regressions analyses. Chin (1998) recommends: 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 shows the path coefficients with their degree of significance.

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**		
Non-Financial 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  $Q^2$

It can be observed in Table V that the relationships between the intellectual capital components and the financial results are not significant. Also, the relationships between human capital and non-financial results are not significant. This means that the influence of intellectual capital components on financial results is not direct; intellectual capital influences financial results through non-financial results.

#### Model predictive power

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 dependent 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. Table VI shows the  $R^2$  values for the dependent constructs. The average explained variance of this model is 62%. Thus, the model has an appropriate predictive power as all explained variances exceed 0.1.

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. If it is less than zero, this 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.

#### Contribution to 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 for "non-financial results" is 83%, composed by structural capital, explaining 46%, and by relational capital explaining 38%. In turn, the variance of relational capital (0.81) is explained by human capital (0.54) and by structural capital (0.27).

## **Discussion, Implications, and Limitations**

In this paper, we analyze whether companies that successfully implement TQM also manage their intangible resources effectively, achieving a positive impact on business results. To do this, a structural model was tested to examine the relationship between the different components of intellectual capital and how they impact business results. A total of eighty-four companies that applied for the National Quality Award of Uruguay between 1996 and 2014 were analyzed.

First, we observe that the significant relationships between the components of intellectual capital and their impact on business results are similar to those found in specific studies on intellectual capital (Bontis, 1998; Cabrita, 2005; Wang et al., 2005; Miles, 2011). This suggests that TQM is an effective way to manage intangible resources.

This study demonstrates that intangible resources (intellectual capital) have a significant effect on business results, as they explain 75% of the variation in financial results and 83% in non-financial results (human development, process management, and customer relationship management). The study also confirms that financial results are largely a consequence of non-financial results, validating the notion that satisfied clients, better-trained personnel, and properly managed processes lead to improved financial results (Kaplan and Norton, 2004). Additionally, by validating the importance of structural capital, this study emphasizes the

relevance of structured management practices (Bloom et al., 2012; Bloom et al., 2017; McKenzie & Woodruff, 2017; Miles et al., 2018).

Not all components of intellectual capital have a direct impact on business results. Human capital needs quality processes, adequate planning, and effective relationships to have an impact on both non-financial and financial results. The analysis shows that human capital does not have a significant direct impact on either. Instead, human capital directly and significantly influences structural 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 relational capital."

Relational capital is influenced by structural capital, though to a lesser degree than by human capital. The explained variation of relational capital (81%) is mainly attributed to human capital (54%) and, to a lesser extent, structural capital (27%). This confirms that in relationships with customers and other stakeholders, the skills and attitudes of employees are critical, but must be complemented by effective planning and processes to be successful (Zeithaml et al., 1988).

Both relational and structural capital have a direct influence on non-financial results and an indirect influence on financial results. Their individual impact on non-financial results is similar, confirming that a balanced management of these elements is necessary to ensure superior business results (Andriessen, 2004; Algorta et al., 2014).

### **Management Implications**

This paper highlights the importance of managing intangible resources for achieving excellent business results, both financial and non-financial. It has been demonstrated that an effective way to manage intangible resources is through the implementation of TQM (for example, EFQM, Malcolm Baldrige, or ISO 9000). With proper implementation of TQM, a firm can effectively manage both quality and intangible resources, generating a significant positive impact on business results.

The paper also provides guidance on which aspects of intangible resource management require more attention in order to improve performance. Developing human capital is important, but the greatest impact on business results will be achieved if structural capital is simultaneously strengthened, particularly in areas related to planning and monitoring, and if relational capital is improved, especially in customer relationships. Additionally, it is crucial to align organizational values and recognize employee performance. These findings are particularly relevant, as in many cases, managers mistakenly dismiss these aspects as "soft topics" or issues that have little impact on financial results.

Finally, the study confirms that improving financial results requires achieving good non-financial results. While it is clear that having satisfied clients, efficient processes, and competent, committed personnel leads to better financial results, managers often act with a short-term mindset, focusing solely on financial outcomes and neglecting other areas. This paper aims to refocus attention on the right priorities.

## **Limitations**

This study has some limitations that should be considered when interpreting the results. The data used comes from company evaluations over sixteen years (1998–2014). The analytical technique used does not account for the influence of the macroeconomic and social context, which may have impacted the management and results of each company.

The choice of a multisector sample, while providing broader conclusions, may affect the quality of the results obtained, particularly given the heterogeneity of the sectors considered.

Another limitation concerns causality. PLS is a method used to estimate the probability of an event based on available information from other events. This technique is oriented toward prediction rather than determining causality. Therefore, we can assert that the relationships found in this study predict business results, but do not necessarily cause them.

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