



Journal of Intellectual Capital

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Article information:

To cite this document:

Ana Isabel Torres, Silvana Santos Ferraz, Helena Santos-Rodrigues, "The Impact of Knowledge Management Factors in Organizational Sustainable Competitive Advantage", Journal of Intellectual Capital, <https://doi.org/10.1108/JIC-12-2016-0143>

Permanent link to this document:

<https://doi.org/10.1108/JIC-12-2016-0143>

Downloaded on: 29 January 2018, At: 06:17 (PT)

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The Impact of Knowledge Management Factors in Organizational Sustainable Competitive Advantage

Introduction

In the knowledge Era, we are living, the management of intangible assets, namely the management of knowledge assets, has become crucial to organizational sustainable competitive advantage. A sustainable competitive advantage derives of the implementation of a strategy that adds value (Barney, 1991), and depends on a strategic advantage which can offer favorable terms or block their ability to achieve superior results (Besanko, 2000).

Knowledge in the new economic landscape is a critical ingredient to reach the sustainable competitive advantage (Kane *et al.*, 2005). In this sense, the identification of knowledge assets determinants to the organizational sustainable competitive advantage is of pivotal importance. In such a competitive time, there are evident signs that information and knowledge are actual competitive “weapons” for organizations, which have the best information and dominate it more efficiently.

Knowledge is a resource located in the organization core and people and knowledge management is very important as the source of prosperous for organization, addressing the critical issue of organizational adaptation, survival, and competitiveness in the face of increasingly discontinuous environmental change (Malhotra, 2002).

Extent literature suggests that intellectual capital, which represents the sum of knowledge of all organizational actors, is assumed as a factor of competitiveness, much more valuable than the financial and material resources (Bontis *et al.*, 2000; Ahangar, 2011; Yaseen *et al.*, 2016), in both large and small companies (Alegre *et al.*, 2011; European Commission, 2006; González-Loureiro and Figueroa, 2012; Kamukama *et al.*, 2011).

The competitive advantage (CA) will arise when there are management of knowledge and intellectual capital exist in an organization. It is no doubt that organization’s performance capacity it relies on these assets, knowledge and intellectual capital. The knowledge of organization and intellectual capital may facilitate their activities and generate income by using their critical resources, which is knowledge of its people, in order to sustain their performances, thus effectively increase the organization knowledge assets (Kianto *et al.*, 2014). Thus, sustainable CA can flow from unique, rare, inimitable knowledge resources, so companies benefit from better managing its

knowledge assets (Choi and Lee, 2003; Nonaka, 1994).

This paper has a double objective. First, it intend to identify the relevant knowledge and intellectual capital dimensions which represent knowledge management construct. In a second stage, this paper analyses the relations among the components of the following knowledge assets: human capital, process and information systems, with the construct representing the sustainable competitive advantage, analyzed in the context of the Portuguese companies included in this study.

To the best of our knowledge, this perspective and its relation within a sustainable CA have not been studied, and it goes in line with the Kamukama *et al.* (2011) suggestion that emphasize the importance of introducing sustainable CA issue, in the analysis of the effect of intellectual capital assets on performance.

Besides, the analysis of intellectual capital influence on a sustainable competitive advantage framework, other knowledge assets dimensions, such as organizational capabilities and resources, should be incorporate. Therefore, this analysis allows studying the relationships among different knowledge assets dimensions, such as, intellectual capital components – human capital, processes and information systems - on organizational sustainable competitive advantage. This framework helps to pinpoint elements that compose each dimension of knowledge assets and to establish causal relations among business sustainable competitive advantage.

This paper is organized in four major sections: presentation of the conceptual framework used and research hypothesis; description of the methodology and empirical analysis conducted; presentation and discussion of the study results and, finally, conclusions and implications for strategic decision makers and suggestions for further investigation are presented.

Theoretical foundations and conceptual model

Intellectual Capital and Knowledge Management Components

Organizational performance is increasingly a knowledge-related issue. The two key academic discussions addressing knowledge in organizations are the literatures of intellectual capital and knowledge management.

Several authors have discussed the two key concepts of Intellectual Capital (IC) and

Knowledge Management (KM). While the first focuses on intangible resources that contribute to value creation (e.g. Edvinsson and Malone, 1997; Sullivan, 1998; Spender *et al.*, 2013), typically in terms of human, structural and relational capital assets governed by an organization (Bontis, 2001; Guthrie, 2001), the latter concentrates on the knowledge-related processes and management activities in firms (Choi and Lee, 2003; Kianto *et al.*, 2014). In other words, the IC literature examines the kind of intangible resources there are in firms, while the KM literature addresses the mechanisms by which these resources can be controlled and managed.

In literature, the definition of IC and its taxonomy, reflects the holistic approach of this concept as the sum of knowledge and capabilities of employees in creating firms' value (Komnenic and Pokrajcic, 2012; Edvinsson and Malone, 1997). KM is defined as the program that have been developed in order to create and disseminate the knowledge in achieving the organization goals (Kianto *et al.*, 2014); as the way in which "an organization uses its IC (Bontis, 2002), and is the root in gaining, rising and nourishing the IC in the organizations (Marr *et al.*, 2003).

In this sense, the purpose of KM is to leverage organizational IC, and convert it into sustainable CA through improved organizational performance (Bontis and Fitz-Enz, 2002), being critical, particularly in the new economic landscape (Grant, 1996; Kane *et al.*, 2005).

From both, resource-based view of firm (Barney, 1991; Galbreath, 2005) and knowledge-based view of firm (Yang and Chen, 2010) knowledge is the most productive resource of a firm, that drives superior performance and allows members of the organization to realize the value of the various components of the intangible assets in order to make them more manageable (Von Krogh *et al.*, 2001).

Other researchers (Bontis, 1999; Rašulah *et al.*, 2012), also follow this line of thought assuming that intangible assets bring sustainable competitive advantage as they permit to do things that others can't or, else do it better than others translating it into a huge advantage. Today, with ever more fierce competition, managing knowledge is the business secret. Intangible assets such as, knowledge acquired by the organization (Sharkie, 2003) can bring sustainable gains, due to the difficulty of been copied by competitors (Meso and Smith, 2000), and have showed a most relevant influence on innovation and performance, than tangible ones, that promote above-average results (Santos-Rodrigues *et al.*, 2015; Bueno *et al.*, 2010).

As part of strategic management, intangible assets allude to a wider range of

components that help to create value and stand sustainable CA. Even though, there is no general consensus about the categorization of the KM assets and IC assets, several theoretical and empirical approaches, use a tridimensional perspective. For instance, Fonseca (2006) and Edwards (2011) suggest that KM is comprised of three key dimensions: people, processes and systems.

When talking about IC components, Edvinsson and Malone (1997); Bontis (1998); Roos *et al.*, (1997; 2005); Sveiby (1997); Vergauwen (2007) and Santos-Rodrigues *et al.* (2015) (among other researchers) consider that the IC comprise three dimensions: Human Capital (HC), Structural/Organizational Capital (SC) and Relational/Customer Capital (RC).

Human Capital

HC is the foremost component of intellectual capital and it is defined as the knowledge, talents, skills and experience that owned by the workers in organization.

HC represents people knowledge value, such as know-how, capacities, talent, attitude, knowledge, intellectual agility, competence, creativity, and others (Lynn *et al.*, 2009; Bontis and Fitz-Enz, 2002; Davenport *et al.*, 2003; González-Loureiro and Figueroa, 2012; Jardón and Martos, 2012; Santos-Rodrigues *et al.*, 2015; Torres *et al.*, 2016), or values, attitudes and habits of the components of the organization (Sánchez-Cañizares *et al.*, 2007).

The extant literature on HC suggests that organizations need to recruit, nurture and retain talents so the knowledge base can be expanded, which has the capacity to improve a firm's overall productivity (Boxall, 2003), and most of the organizations that use knowledge management practices, to maintain the knowledge base worker, but also to motivate them to turn their tacit to explicit knowledge, enhance organizational competitiveness (Bontis and Fitz-enz 2002).

In this context, HC can be considered the main component of IC assets and one of the most important sources of firm's sustainable competitive advantage (Cabrita and Bontis, 2008).

Several empirical studies have found a positive relationship between HC and organizational performance. Lopes and Matos (2008) studied 49 organizations and found that companies have better organizational performance when sharing knowledge with the organization intellectual capital, which promotes the competitive advantage of the organizations.

Cardoso (2007) analyses 50 industrial organizations and concluded that there is a positive relationship between knowledge management and organizational competitiveness, i.e. the knowledge management promotes a better organizational performance at the economic level (e. g. financial, commercial and productive), as well as at the social level.

In a study of public firms, in diverse industries, Youndt and Snell (2004) found that HC has significant impact on performance measures, such as return on assets and return on equity. Komnencic and Pokrajcic (2012) find that HC is positively associated with all three corporate performance measures.

Lu *et al.*, (2014) show that that IC is significantly and positively associated with firm operating efficiency suggesting that IC can make a company richer. The authors point out that in highly dynamic business world, such as life insurers' companies, managers should invest and fully utilize IC to gain a sustainable competitive advantage. This also could be important for financial and information management, business planning and corporate governance (Lynn *et al.*, 2009).

Yitmen (2011) examined the relationship between IC, innovation and competitiveness in a particular sector in Turkey and found a causality path where IC is positively associated with competitiveness and innovation drivers. The potential to innovate can be regarded as the result of IC within the firm.

More recently, Matos *et al.* (2015) performed a comparative analysis on country reputation through patterns of IC and found evidence that the image of countries, expressed by the Global Competitive Index (GoodCI 2013-2014) is well predicted by National Intellectual Capital (NIC) and Human Development Index (HDI). Therefore, intellectual capital, becomes a factor of differentiation and competitiveness of the countries.

Jardon and Martos (2012) tested the impact of IC dimensions on performance in emerging clusters of developing countries within a sustainable competitive advantage scheme, showing relationships among IC dimensions and sustainable competitive advantage in emerging clusters of small- to medium-sized enterprises (SMEs). The authors argue "*Intellectual capital is more important as a source of sustainable competitive advantage in SMEs, than large companies, because tangible resources are often lower and SMEs should compete through intangible resources. Integration of intellectual capital and sustainable competitive advantage possibly could facilitate the differentiation between resources and capabilities*" (Jardon and Martos, 2012, p. 463).

As such, HC continues to be a key character of innovation, organizational competitiveness and economic performance particularly for knowledge-based environments.

Therefore we formulate the following hypothesis:

Hypothesis 1- Human capital has a positive influence on organizational sustainable competitive advantage.

Processes

KM should be strategic and aims to identify, develop, disseminate and update the strategically relevant knowledge of the company, through internal or external processes (PRO). From the organizational point of view, knowledge is information processed and integrated into routines and processes that enable action. The organizational knowledge is captured by organizational systems, processes, products, rules and culture of an organization (Beckman, 1999). As such, processes are another key dimension of KM (Fonseca, 2006; Edwards, 2011). Skyrme (2000:72) states that the KM *“is the explicit and systematic management of vital knowledge and associating the process of creation, organization, diffusion, use and exploitation.”*

KM is basically a process to extract, process and disseminate knowledge throughout the company, hence it can be shared and thus reused, i.e. the function of KM is to make information useful. According to Nonaka and Takeuchi (1995), organizational knowledge arises as the result of the dissemination of the knowledge generated individually by organizational structures prepared to support their storage and availability across the organization. The creation of organizational knowledge, should be understood as a process that expands the sum of individual knowledge, securing it as part of the organization's knowledge network.

Nonaka (1994) argues that in order to dynamically improve the organizational environment, organizations should not only process the information and diffuse it but, also create knowledge. Thus, processes of KM appears related to the use, creation and dissemination of knowledge, in order to allow organizations to gain competitive advantage that make it stand out in this increasingly competitive economy.

Greenman (2006) also considers that KM systems are considered as useful systems as they facilitate learning within the organizations and provide competitive advantage. The ability of an organization to transfer knowledge and learning is critical to the

organization innovation and its competitiveness. More recent research demonstrates that KM processes have a positive and significant influence on organizational innovation factors (Torres *et al.*, 2016).

In addition, to create and share knowledge in the business organizational learning processes, is of key importance for the competitive businesses development. Regardless the strategy adopted, currently the effective corporate knowledge management should be able to guarantee, to the companies, the competitive edge needed to take them into a position of leadership. Hence, KM should be strategic and aims to identify, develop, disseminate and update knowledge strategically relevant to the company, by means of internal and external processes (Fleury and Oliveira, 2001).

Taken all together we can assume that processes, which provide and sustain the learning and knowledge transfer, are critical to the competitiveness of the organization. Therefore we formulate the following hypothesis:

Hypothesis 2: Processes have a positive influence on organizational sustainable competitive advantage.

Information systems

Information systems (IS) concern the organization technological infrastructure that allow knowledge management and support the sharing of the best practices. That is, the existing infrastructure that allows stakeholders to access and interact with the intellectual assets of the organization, systems or persons (Fonseca, 2006).

In our perspective IS are related to the structural capital (SC) of the organization. According to the literature, SC is the knowledge, skills, experiences and information, institutionalized, codified, and used by databases, patents, manuals, structures, systems, routines and processes (González-Loureiro and Figueroa, 2012; Jardón and Martos, 2012; Santos-Rodrigues *et al.*, 2015; Youndt *et al.*, 2004).

SC refers to formal and informal internal structure, that belongs, in an explicit way, to the organization, such as: processes, technologies, standards partnership networks, as well as other aspects of the organization's culture, as the strategy, management, structure, systems, routines, procedures, among others (Stewart, 1999). Therefore, SC is the knowledge that belongs to the firm with independence of the existing HC. It is supported by HC inputs but independent of it stock.

According to Edvinsson and Malone (1997) SC comprises the computer equipment,

software, databases, client files, patents, trademarks and organizational capacity that supports the productivity of employees, namely, SC is all that remains in the organization when employees go home.

The technological infrastructure includes hardware, software, middle-ware and protocols that enable the electronic capture, share and use of knowledge, within an organization. The aim of these technologies is to facilitate the process of knowledge sharing within the organization and to promote organizational learning. Also, to generate new knowledge, companies should make connections with existing knowledge and, expanding its network of internal and external relationships (Eboli, 2004).

However, the entire technological structure used in a KM system, can be easily replicated, copied, hacked or cloned, even when it is protected by copyrights, patents and licenses. The type of hardware and technology used in knowledge management system is standard, thus is also easily imitated. Thus, technology should be carefully managed as an organization's strategic asset (Meso and Smith, 2000). Therefore, we suggest that IS and the technological infrastructure of the organizations, are mandatory in today's digital "Era", whereas information is a knowledge valuable resource and promotes the competitiveness of the organizations.

Hence, we propose that IS provide the structural route to disseminate knowledge and are supported by HC and PRO inputs to influence organizational sustainable CA suggesting the existence of a mediation mechanism, as following discussed.

Mediation mechanism

Having consider the previous researches it is reasonable to expect that the effect of IS on CA is, in part, mediated by the HC, that is, knowledge, talents, skills and experience that owned by the employees in the organization. As explained before, an enriched work context where workers are motivated and encouraged to transfer into the organization their unique individual knowledge, such as education and creativity, is imperative for the sake of IC management. Organizations can only gain this individual HC if the most talent employees will share their knowledge, skills and creativity with other workers. In this sharing process, the employees generate value to the company, creating experts and value by using and apply their skills, knowledge and resulting in creating or invent a new idea.

This reflects, and further outlines, the foremost component of IC, the HC suggested by a growing number of authors regarding the debate about the impact of ICM practices

in organizational performance (Edvinsson and Malone, 1997; Sullivan, 1998; Bontis, 2001; Guthrie, 2001; Spender *et al.*, 2013; Kianto *et al.*, 2014).

However IC not only includes the traditional intangible assets but also new ones, such as, the value of technology, knowledge and, not to forget, the good relationships with the customers (Kianto *et al.*, 2014). As defined, relational capital is the result of competitive and social intelligence created thought out firm relations and actions with external stakeholders (González-Loureiro and Figueroa, 2012; Jardón and Martos, 2012; Santos-Rodrigues *et al.*, 2015). Therefore, relational capital is based on the good relationships with stakeholders and loyal customers with the organization.

Thus, without this process of value creation based on HC and IS, the organization will collapse and will be unable to produce the creative and innovative solutions. Moreover, processes and management practices that allow employees access to information and other technological resources, feedback, autonomy and participation in the creation process will provide intrinsic motivation, to produce the creative and innovative products and services, which is important to the value creation process, both for customers and firms.

Basically, the process will require the use or combination of people, processes and the technology in order to enhance the organizational sustainable CA. Based on this rationale, we posit that IS will impact CA through employees capabilities, knowledge transfer and knowledge management processes, suggesting a mediation mechanism between IS, HC and PRO on the effect on CA.

Some researchers identify several feasible mediators in terms of theory and empirical measurement: the effect of KM practices on organizational performance is mediated by IC assets (Kianto *et al.*, 2014); HRM practices (and especially employee empowerment) have a positive effect on innovation performance through mediating effect of human capital (Cabello-Medina *et al.* 2011), and Youndt and Snell (2004) found that IC mediates the impact of HR activities on organizational performance.

This type of effects implies a dynamic relationship where the utilization of KM practices would either create new or improved levels of IC assets, leading to increased organizational performance.

As such, we suggest that the relationship between IS and organizational CA is not a direct one, and in our study we propose that this relationship may be mediated by HC, and by PRO. In causality sense, between IS HC and PRO these effects are difficult to theorize. An intuitive claim would be that when the organization has high levels of IS

practices would either create new or improved levels of knowledge assets: HC assets (e.g. skilled individuals and lot of relationships) and PRO (e.g. systems, methods, tools, rules) leading to increased organizational CA.

As discussed before, PRO are the activities useful for managing the IC assets. For example, proper management methods may multiply the leverage of the intangibles, while conversely, poor management can undermine the value creation potential of even the most skilled workforce with the most developed information systems and extensive relationship networks in use. Thus, we suggest the IC management mechanisms are a key factor that impact firms' ability to create value based on knowledge. In fact, both financial and market-related outcomes of organizational performance have been found to result from the possession IC assets (Bontis and Fitz-Enz, 2002; Youndt and Snell, 2004; Cabrita and Bontis, 2008).

Therefore, we postulate that the effects of IS on CA-customers dimension and on CA-financial dimension are mediated by HC and PRO, respectively. The following hypothesis summarizes this discussion regarding the role of the mediating effects in our proposed research model:

Hypothesis 3: IS have a positive influence on HC.

Hypothesis 4: IS have a positive influence on PRO.

Hypothesis 5: HC mediates the effect of IS on CA-customer dimension.

Hypothesis 6: PRO mediate the effect of IS on CA-financial dimension.

Following on, methodology, empirical analysis and model results are presented.

Methodology

Sample and inquiry process

The inquiry process consisted on elaboration and application of an electronic survey and was tested in a small convenience sample (post-graduation students and teachers of Faculty). A few items and scale adaptations and database refinements were made.

In the sampling process we use a convenience sample representing different business areas. Because members of the target population are not usually included in public mailing lists, the sampling process was obtained from e.mail lists from several organizations and associations of Portuguese industries and services, which are usually trustworthy. A pre-contact message was send to each association asking them to solicit the survey participants, to ensure privacy concerns and also to overcome the readers'

suspicious. E-mail message was sent to 1300 e-mails addresses of the Portuguese organizations, asking each manager to answer the survey, including a hyperlink to a unique access to the survey. Survey application and data collection was made between June-July 2014. Finally, 77 completed and valid queries were received. In its majority, the sample is composed by organizations with 30 years existence, being located in urban areas (Lisbon=61% and Porto=10,4%), mostly belonging to the service sector, consulting services (28,6%), financing (6,5%), other industries (24,7%) and services (10,4%), having between 10 and 249 employees (66,3%), with high level education and professional degree (more than 75% of collaborators have a University degree). Noticeably, most respondents have a high level of professional degree.

Variables and measures

The literature review allowed to identify and analyze the relevant elements of KM and IC (e.g. human capital, processes and information systems) needed to include as explanatory variables of organizational CA in the model developed in this study, illustrated on figure 1. Variables included in the model intent to reproduce the relevant dimensions of IC and KM constructs (more quoted in literature reviewed) which potentially affect organizational CA. The definition of dimensions and items measures were adapted from previous researches and are summarized in Appendix 1. KM dimensions include 12 items (adapted from Fonseca, 2006) and CA dimensions include 7 items (adapted from Kaplan and Norton, 1992; Deshpandé *et al.*, 1993; Doyle and Wong, 1996; Narver *et al.*, 1993). Values on KM are interpreted directly as perceptions measures and values on competitive advantage reflect performance measures of organizations. A reversed five points Likert scale is used (5= totally agree....1= totally disagree) which is referred on research literature as an appropriate metric and easy to answer too (Weijters *et al.*, 2010).

Data Analysis

To test the model hypotheses proposed in this study, we perform a two-stage analysis. In first place, we perform a statistics analysis (with SPSS software) using exploratory factorial analysis in order to identify, a clear factor structure among the research variables, and which variable give a major contribute to represent each construct.

In a second stage, to test the research model, we apply the Partial Least Squares (PLS) technique using SmartPLS2 software (Ringle *et al.*, 2005). PLS is a variance-based

structural equation modelling technique (Henseler *et al.*, 2009). We use this technique because the model supports complexity in terms of relationships and level of dimensionality; the study is focused on the prediction of the dependent variable and, this study adds new measurements and relations to previous literature (Roldán and Sánchez-Franco, 2012).

To overcome potential nonnormality in the sample data, we use the bootstrap as an applicable technique to handling the presence of multivariate nonnormal data (Efron and Tibshirani, 1993). This technique produces a bias-corrected bootstrap¹ confidence interval for parameter estimates that produces more accurate confidence intervals that adjusts for possible bias with small samples (Efron and Tibshirani, 1993, p.178), providing them with a type of generalizability using the survey data to test the model (Ping, 2004). Thus, we will perform our analyses on PLS estimation using bootstrap method.

Statistical Analysis Results

The results of factorial analysis applied to the 12 initial variables representing KM, presented on Appendix 2, Panel A, allow to identify the following 3 significant factors, extracted by a decreasing quantity of explained variance and eigenvalues ≥ 1 : human capital (4 items), information systems (4 items), and processes (4 items), accounting respectively for 41,8%, 16% and 8,9% of the explained variance, are the ranked significant factors representing KM and explaining 66,8% of the total variance.

A second factorial analysis applied to the 7 initial CA variables, presented on Appendix 2, Panel B reveals that financial dimension (4 items), and customers dimension (3 items) accounting, respectively for 55,2% and 15,7% of the explained variance are the ranked significant factors, representing organizational CA, explaining 70,8% of total variance. Globally, the results of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (Kaiser, 1958), and the significant value of Bartlett's Test demonstrate the data are adequate to factorial reduction (Sharma, 1996).

¹ The computational details of the bias-correction adjustment are beyond the scope of this study, but, in brief, take into account skewness of the bootstrap distribution and the estimated change in the standard error of the parameter as a function of the presumed parameter value. The bias-correction adjustment is not a closed-form equation but rather an algorithm that makes use of resampling. Efron and Tibshirani (1993) provided the details as well as evidence of the improved accuracy of the adjustment.

Measurement Model Results

To evaluate reflective measurement models, reliability and validity must be analyzed (Henseler *et al.*, 2009). We use PLS a variance-based structural equation modelling technique (Ringle *et al.*, 2005) to test, in a first stage, the measurement model, and in a second stage, to examine the structural relationships proposed on the research model. Table 1 presents the results of the measurement model depicted on figure 1.

We analyze first the individual item reliability, and we verify that the factor loadings are all greater than 0.7, satisfying the reliability condition (> 0.5). Contributions of two items were below the cut off value (0.5), therefore CH2 and PRO4 were excluded from the analysis. To ensure the reliability of the construct, we examined the Cronbach's alpha (α), and acceptable levels (>0.7) (Cronbach, 1951; Gefen *et al.*, 2000; Hair *et al.*, 2006) were obtained for all variables. As showed in Table 1, the reliabilities of constructs (i.e. composite reliability range from 0.84 to 0.91) are all above the recommended values. From these results we verify that all constructs satisfy the internal consistency and reliability conditions. To evaluate convergent validity, average variance extracted (AVE) was analyzed. As AVE surpassed 0.5 (Roldán and Sánchez-Franco, 2012), we conclude that all reflective dimensions and constructs achieve convergent validity.

Table 1. Measurement model results

<i>Construct/Dimension/indicator</i>	<i>Cronbach's Alpha</i>	<i>Loading</i>	<i>Composite Reliability (CR)</i>	<i>Average Variance Extracted (AVE)</i>
HUMAN CAPITAL	0,7877		0,8758	0,7016
CH1		0,8472		
CH3		0,8126		
CH4		0,8508		
INFORMATION SYSTEMS	0,8683		0,9092	0,7148
IS1		0,8083		
IS2		0,8706		
IS3		0,8204		
IS4		0,8804		
PROCESSES	0,7311		0,8448	0,6459

<i>Construct/Dimension/indicator</i>	<i>Cronbach's Alpha</i>	<i>Loading</i>	<i>Composite Reliability (CR)</i>	<i>Average Variance Extracted (AVE)</i>
PRO1		0,737		
PRO2		0,8745		
PRO3		0,7932		
COMPETITIVE ADVANTAGE_FINANCIAL	0,8663		0,9085	0,7127
VC1		0,8461		
VC2		0,8431		
VC3		0,8622		
VC4		0,8253		
COMPETITIVE ADVANTAGE_COSTUMERS	0,7460		0,8546	0,6626
VC5		0,8439		
VC6		0,8378		
VC7		0,7575		

*** $p < 0,01$ (based on t (4999), two-tailed test)

Therefore, we keep on with the analysis as the AVE and CR conditions are satisfied in all reflective constructs and dimensions (Table 1). To analyze the discriminant validity (which indicates if the construct is different from the other constructs) we have demonstrated that the correlations among the constructs are smaller than the square root of AVE (bolded in Table).

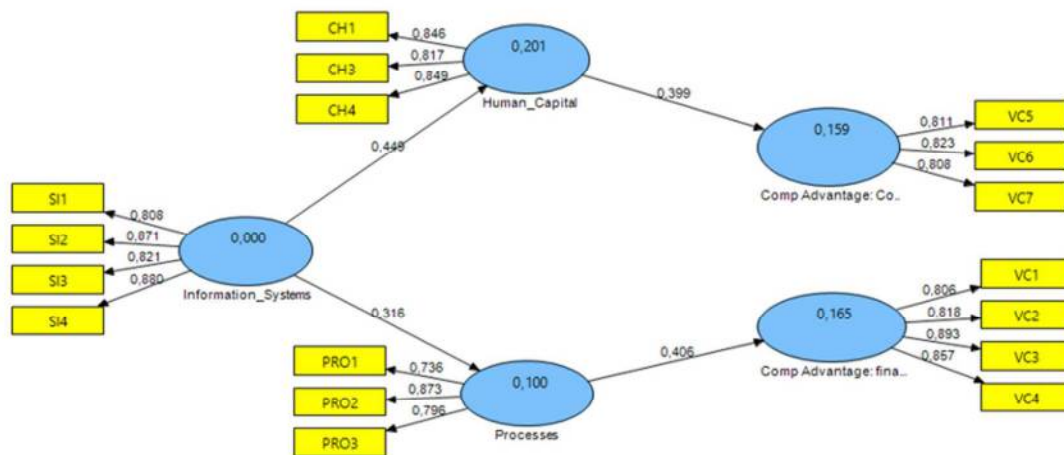
Table 2. Discriminant Validity

	(1)	(2)	(3)	(4)	(5)
(1) CA_COSTUMER	0,845				
(2) CA_FINANCIAL	0,5646	0,837			
(3) HC	0,3983	0,3847	0,846		
(4) IS	0,2301	0,1924	0,4422	0,804	
(5) PROC	0,3279	0,4045	0,5927	0,3151	0,804

So, with this analysis we verify the discriminant validity between all of the constructs, and we validate the measurement model, depicted on figure 1. Therefore, we keep on

with the analysis as the measurement model results fulfil all conditions. Following, we analyze the structural relationships proposed on the research hypothesis.

Figure 1. Measurement Model



Structural Model Results

To test the research hypothesis in our model, we evaluate the statistical significance of path coefficients, using bootstrap technique (with 5000 resamples) in this analysis, to generate standard errors, t-statistics, and confidence intervals of standardized regression coefficients. Table 3 presents the full results of the PLS analysis, including the structural path estimates of the direct effects, statistical significance and confidence intervals.

The results of data analysis showed that the proposed theoretical model explains a significant amount of variation in the endogenous variables: HC explains 16% of the CA regarding costumers dimension, IS explain 20% of HC variance, IS explain 10% of PRO variance, and PRO explain 17% of the CA regarding financial dimension. Figure 2 shows the standardized path estimates of the relationships between the research variables and explained variances of the structural model. For the sake of brevity, the measured indicators are labeled and their corresponding paths and errors have been left off the diagram. When examining the hypothesized relationships proposed, all received empirical support and the model results strongly support all of the hypotheses. Specifically, the results presented in table 3 showed that HC has a significant positive effect on CA-customers (H1 supported); PRO have a significant positive effect on CA-

financial (H2 supported) and IS have both significant positive effects on HC and PRO (H3 and H4 supported).

Table 3 – Direct Effects on Endogenous Variable

<i>Hypo-thesis</i>	<i>Path</i>	<i>Direct effect</i>	<i>t-value (bootstrap)</i>	<i>Percentile 95% confidence interval</i>	<i>Support</i>	<i>Explained variance</i>
H1	Human_Capital -> Comp Advantage: Costumers	0,399	4,6989	[0,232; 0,565] Sig.	Yes	16%
H2	Processes -> Comp Advantage: Financial	0,406	4,9781	[0,261; 0,578] Sig.	Yes	17%
H3	Information_Systems -> Human_Capital	0,449	4,7361	[0,268; 0,634] Sig.	Yes	20%
H4	Information_Systems -> Processes	0,316	2,9034	[0,105 ; 0,532] Sig	Yes	10%

These results indicate that IS have a direct impact on both HC and PRO, which in turn HC and PRO directly influence CA outcomes. On the base of these findings, we suggest that HC and PRO are the leading factors of intellectual capital that may foster CA outcomes.

Mediation effects

To assess the mediation effects proposed in our model we perform a bootstrap analysis (Bollen and Stine, 1990). The results shown in table 4, demonstrate that IS indirectly affect CA, on both dimensions, through the mediation effect of HC on CA-customers (H5 supported) and on CA-financial mediated by PRO (H6 supported). The bootstrap estimates results at 95% confidence intervals indicate that the mediation mechanism was significant: as we expected we found that IS ($\beta= 0.175$, $p< 0.001$) have a significant indirect effect on CA-customers, mediated by HC, and IS ($\beta= 0.105$, $p< 0.07$) have a significant indirect effect (at least at the 10% significance level) on CA-financial, mediated by PRO.

These results indicated that, the impact of IS that may lead to organizational CA will be carried out by HC and PRO. Thus, IS only play an important role in determining CA

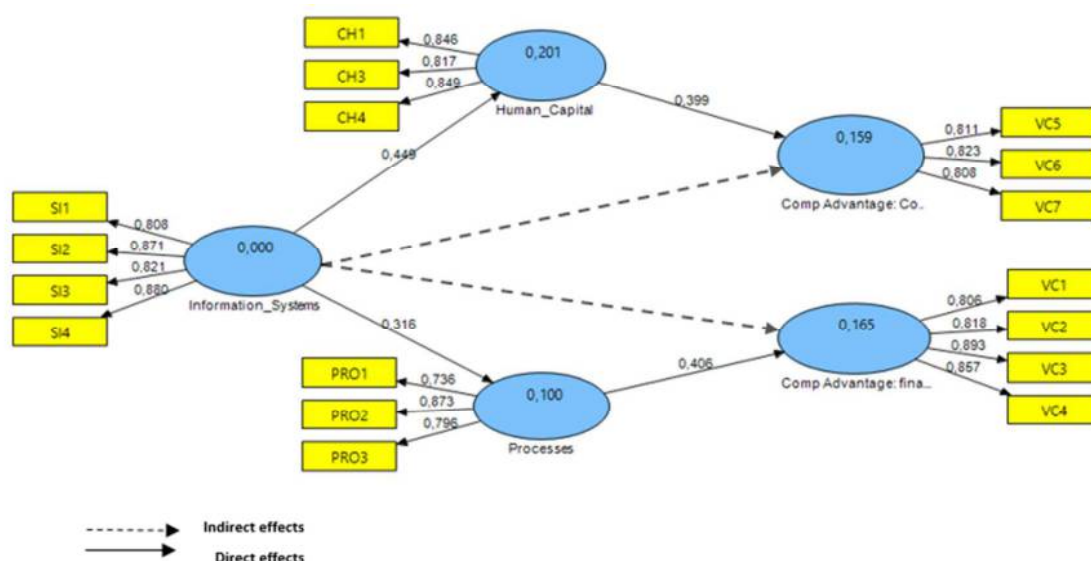
outcomes, through ongoing HC managing programs, such as promoting learning incentives in order to create increased knowledge, skills, talents, creativity and sharing experience it also have a significant effect on the outcome.

Table 4 – Indirect Effects on Endogenous Variable

Hypothesis	Path	Indirect effect	P-value (bootstrap)	Percentile 95% confidence interval	Support
H5	Information_Systems -> Comp. Advantage: Costumers	0,175	0.001	[0,094; 0,291] Sig.	Yes
H6	Information_Systems -> Comp Advantage: Financial	0,105	0.070	[0,026 ; 0,247] Sig	Yes

From this results, we verify that all the standardized coefficients signs show the expected direction, confirming the subjacent organizational competitive advantage theory. Taken as a whole, all the research hypotheses proposed in this model (figure 2) were empirically supported, which means the independent variables, human capital and processes contribute significantly to explain organizational competitive advantage dimensions: human capital have a direct effect on customers dimension and processes show a direct effect on financial dimension. Information systems indirectly influence organizational competitive advantage, on customer dimension, mediated by human capital and also, on financial dimension, mediated by processes.

Figure 2 – Structural model



Assessing a rival model

The model results provide evidence that IS and CA are connected indirectly. We assess a rival model to examine if, IS and CA outcomes are connected directly. In this case, to provide evidence if data are consistent with significantly direct and indirect effects, what means, to test if the relationship between IS and CA is consistent with the mediation effect.

One important criterion of a model's success is its performance compared with that of rival models in which, the examination of the relationships for the hypothesis that were not theorized increase the internal validity of the findings (Bagozzi, 1980; Hair *et al.*, 2006). For example, our model shows no direct path from IS to both CA dimensions. A non-parsimonious model (Hair *et al.*, 2006) would allow direct paths from the IS exogenous construct directly to endogenous constructs. To examine this proposition we included the following direct path, from IS to both CA dimensions. We compared our hypothesized model with the rival model and when investigated the structural relationships among the focal constructs and the explained variance of the endogenous constructs, on both models (i.e. proposed and rival), the results indicated that the added relationships were not significant and does not improve the explained variances of the endogenous constructs².

Overall rival model performance was lower, as expected, and is accompanied by reduced nomological validity. In addition, on the proposed model, we found that the effects of other hypothesized relationships remain unchangeable. This result provides additional evidence of the path estimates stability when other stressors are controlled (Shrout and Bolger, 2002). On the base of these findings, we acknowledge that this comparison provided added confidence in our research model. Therefore, we suggest that the IS capabilities only influence CA, when added to HC and PRO the leading components of intellectual capital.

² The full results of the performed rival model will be provided under request.

Following, the discussion of the results and conclusions of the study are presented. Finally, the managerial contributions of the study and directions for further research are provided.

Discussion and Conclusions

The study shows that human capital, information systems and processes are, in this order, the organizational dimensions which represent the knowledge management construct. Sustainable competitive advantage, clearly distinguishes the financial and customers dimensions. The financial dimension is closely related with return on investments and business assets, growth sales and market share of organizations. The customers dimension is strongly associated with new products sales and meeting customers' expectations, in order to attract and retain them, providing a valuable customer base crucial for the success of business.

The study findings suggest that HC and PRO variables result in high levels of CA, and IS indirectly impact CA through the mediation effects of HC and PRO. HC and PRO are directly linked to business outcomes stressing the importance of employees' knowledge and the processes and practices to incentive knowledge acquisition and dissemination for the commercial and financial success of the organization.

These empirical results are consistent with theoretical approaches which suggest that HC and PRO can increase organizational CA. In addition, to generate new knowledge, companies should make connections with existing knowledge and, expanding its network of internal and external relationships (Eboli, 2004).

The findings show that HC is the primary component of knowledge assets. It is up to organizations to prosper with the development and acquisition of knowledge from external sources, as distinct as, customers, suppliers, labor market, and environment, among others. This finding is in line with prior research which shows that human capital is the root of intellectual capital (Bontis and Fitz-Enz, 2002; Jardon and Martos, 2012).

One major conclusion of this study is that organizational sustainable competitive advantage, on customers dimension mostly depends on human capital. This means that the learning incentives for collaborators' knowledge creation, their participation and retention in the organization are the most valuable ones, and are positively related with the increasing performance of the organization, concerning new products and services, meeting the customers' expectations and creating relationships with them in order to

retain a valuable customer base, for the sake of the business market success.

Therefore, any improvement in HC surely will have an effect on improving business sustainable CA.

Our findings corroborate prior studies which show that HC is associated with corporate performance measures (Komnenic and Pokrajcic, 2012), promoting the CA of SMEs, but not associated with economic and financial measures (Jardon and Martos, 2012). Consequently, managers should invest and fully utilize HC to gain a sustainable CA (Lu *et al.*, 2014).

Another conclusion is that processes are associated with business sustainable CA. The findings show that, flexible organizational structure, knowledge attraction and dissemination, communication and relationship between top management and collaborators are also important for organizational sustainable CA. More flexible processes, flowing communications and participative management will facilitate the process of knowledge transfer between collaborators, which in turn, will increase the market and financial performance of organizations, concerning their return on investments, business assets, growth sales and market share.

These conclusions are consistent with prior research (Bontis and Fitz-enz, 2002; Rašulah *et al.*, 2012) which suggest that processes are those that can be called the knowledge management practices that helps to gain more in-depth understanding of what managers can do within organizations to improve the value creation based on IC (Kianto *et al.*, 2014).

A final conclusion, emerge from the finding that IS are indirectly associated with business sustainable CA. This finding shows that IS, more specifically technical facilities which give support to communication flow and dissemination of information and knowledge within the organization, doesn't directly explain the sustainable CA.

What we found here suggests that IS when added to HC and PRO may raise organizational CA, which supports the existence of a mediation mechanism: IS indirect effect on CA occurs when technological infrastructure increases employees' skills, sharing knowledge with other workers in their organizations and facilitates organizational processes, which in turn directly influence CA.

This type of effects implies a dynamic relationship where the utilization of high levels of IS practices would either create new or improved levels of knowledge assets: HC assets (e.g. skilled individuals and lot of relationships) and PRO (e.g. systems, tools) that would be leveraged by practices that pursue to utilize information and

communication technologies, leading to increased organizational CA over time.

Hence, we conclude that IS provide the structural route and are supported by HC and PRO inputs to disseminate human (individual) capital into organizational capital, creating organizational value.

This conclusion is also in line with other researchers (Meso and Smith, 2000) that found that the information systems entail a standard knowledge and are easy to replicate by other companies, therefore are not *per se* a source of sustainable competitive advantage. More importantly, human capital when associated with structural capital creates relational capital (Jardon and Martos, 2012) being crucial for organizations to generate and disseminate new knowledge and expanding its network of internal and external relationships. These types of relations could be considered as a source of long-term organizational CA.

Implications for Management

For companies the study findings have a practical contribution for their management: human capital and processes are the determinants of CA related to the organizational performance, which permit to suggest that organizations should rely more on employees' knowledge and processes that facilitate knowledge transfer efficiency. Human capital represents the main source of organizational knowledge. In today's competitive environment companies should invest and retain valuable human resources, which knowledge is unique and difficult to imitate from competition, therefore represent a strategic source of competitive advantage.

Thus, a major conclusion of this study suggests that firms should promote HR practices that empower the company staff to be more innovative and competitive, in order to create a sustainable organizational CA. For example, business companies perhaps should empower the most valuable collaborators, encouraging knowledge sharing through collaborative teams, creating innovative products and services solutions, which promote value creation and increased organizational performance overtime. Also, companies should invest and keep the most skilled collaborators (e.g. IT systems experts, creative) to provide innovative solutions, to nurture and maintain long lasting relationships with customers, in order to satisfy and retain a large profitable customer base. In addition, to generate new knowledge, companies should make connections with existing knowledge and, expanding its network of internal and external relationships of their stakeholders.

Another implication for managers is related with another major conclusion of this study suggesting that IS only influence CA when added to HC and PRO. This type of mediation effects implies a dynamic relationship suggesting the organization to invest in high levels of IS practices that would either create new or improved levels of knowledge assets: HC assets (e.g. skilled individuals and lot of relationships) and PRO (e.g. systems, tools) would be leveraged by practices that pursue to utilize information and communication technologies, leading to increased organizational CA.

Moreover, in today's digital economy the role and features of IT are overriding and, thus their utilization by skilled employees is likely to enable better leveraging business CA. Therefore, organizations will strongly benefit from these knowledge investments (e.g. HC, IS and PRO), as those assets are increasingly necessary in such a dynamic business environment, suggesting that the business survival, especially SMEs, should be oriented towards strategic management and technological skills of human resources to be competitive with the challenge of globalization.

It is up to organizations to prosper with the development and acquisition of knowledge from internal and external sources, as distinct as, employees, customers, suppliers, labor market, and environment, among others. Therefore, we suggest companies to carefully manage information systems, while a strategic asset for organizations.

Limitations and future research

Some limitations of this study allow suggesting some directions for further research.

First, the sample of the study mostly comprises SME's from services sector. Future research should include other business sectors, such as industry, in order to develop a comparative cross-sector study. Secondly, the sample is cross-section and the use of panel data in further studies could increase the predictive accuracy of the research model.

Finally, in future research should be taken into account other explanatory variables of organizational competitive advantage, such as: innovation, customer capital and collaborative action, as well, KM and IC variables (e.g. skills of employees and teams) which are referred to play potential roles as moderators in regulating organizational CA.

Acknowledgment

The authors would like to thank to the organizations for their cooperation in this study that helped in the data gathering process.

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Appendix 1

Dimensions and items measures

Dimension / Definition	Items	Source
Intellectual Capital		
Culture and incentives: refers to implicit and explicit cultural aspects, beliefs and incentives to create, and support the intellectual assets in order to achieve the objectives of the organizations.	1. The degree to which the organization invests and encourages the learning and training of employees. 2. Participation of employees in the improvement of the organization.	Fonseca, 2006
Knowledge creation and identification: is based on the ability of the organization and employees in identifying and creating intellectual assets, contributing to its objectives.	3. The degree to which the organization invests and enhances human capital, attracting and/or retaining the best employees' knowledge holders. 4. Organization and employees abilities in creating new knowledge.	
Processes		
Leadership and strategy: represents the use of the techniques of knowledge management as a management model of the leaders and managers of the organization.	1. The degree to which the top management presents flexible and capable of changes in organizational structure. 2. The quality and nature of the relationship between top management and employees.	Fonseca, 2006
Knowledge flow: reveals the nature and the capacity of the knowledge flow and other intellectual assets within an organization (capture, storage, dissemination, and other aspects of distribution of knowledge).	3. The nature and effectiveness of knowledge capture. 4. The nature and effectiveness of the dissemination of knowledge.	
Information Systems		
Technological infrastructure is based on ability and existence of a technological infrastructure that allows knowledge management and sharing of the best practices.	1. The nature and capacity of the technological infrastructure to support knowledge processes and flow. 2. Results of the use of technology infrastructure.	Fonseca, 2006
Infrastructure to access knowledge is based on the existing infrastructure that allows stakeholders to access and interact with the intellectual assets of the organization, systems or persons.	3. The ease access to knowledge in the organization 4. The nature and effectiveness of mechanisms that the organization has to find information and knowledge.	
Competitive Advantage		
Financial perspective	1. Sales growth. 2. Market share. 3. ROI (return on investment). 4. ROA (return on assets).	Kaplan and Norton (1992); Deshpandé <i>et al.</i> , (1993); Doyle and Wong (1996)
Customer perspective	5. Sales of new products. 6. Attracting new customers. 7. Meeting the deadlines set by clients.	Kaplan e Norton (1992); Narver <i>et al.</i> , (1993)

Appendix 2.

Factorial Analysis Results

Panel A – Knowledge Management				
Factors	Items	r	Variance %	Eigenvalues
Human capital	CH1- Learning incentive	0.634	41,791	5,015
	CH2 - Collaborators' participation	0.630		
	CH3 - Collaborators' retention	0.860		
	CH4 - Knowledge creation	0.727		
Information systems	SI1- Technological infrastructure	0.877	16,012	1,921
	SI2- Technological infrastructure results	0.842		
	SI3- Easy access to knowledge	0.744		
	SI4- Knowledge acquisition instruments	0.807		
Processes	PRO1- Organizational structure	0.892	8,954	1,075
	PRO2- Communication	0.543		
	PRO3- Knowledge acquisition	0.634		
	PRO4 - Knowledge sharing	0.302*		
Cumulative Variance %			66,757	
KMO			0,802	
Bartlett's Test (p-value)			433,739 (0.000)	
Panel B – Competitive Advantage				
Factors	Items	r	Variance %	Eigenvalues
Financial	VC1- Growth sales	0.622	55,167	3.862
	VC2 - Market share	0.590		
	VC3 - Return on investment	0.920		
	VC4 - Return on assets	0.915		
Customers	VC5- New product/services sales	0.808	15,655	1.096
	VC6- New customer attraction	0.740		
	VC7- Accomplishment of deadlines	0.759		
Cumulative Variance %			70,821	
KMO			0,790	
Bartlett's Test (p-value)			284,375 (0.000)	

Notes: (r) factor correlation with survey items. *Correlation < 0.5.

Figure 1. Measurement Model

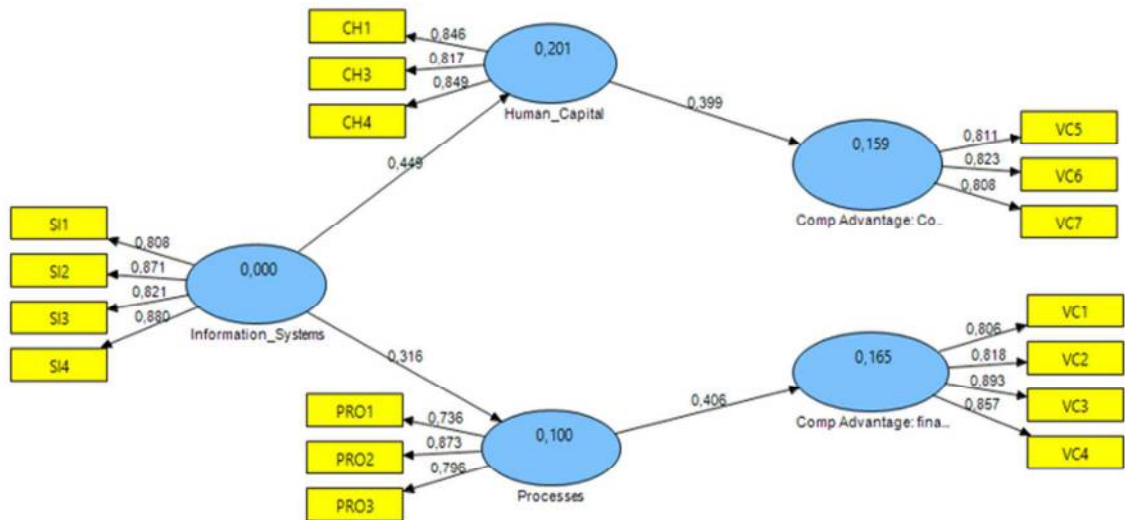


Table 1. Measurement model results

<i>Construct/Dimension/indicator</i>	<i>Cronbach's Alpha</i>	<i>Loading</i>	<i>Composite Reliability (CR)</i>	<i>Average Variance Extracted (AVE)</i>
HUMAN CAPITAL	0,7877		0,8758	0,7016
CH1		0,8472		
CH3		0,8126		
CH4		0,8508		
INFORMATION SYSTEMS	0,8683		0,9092	0,7148
IS1		0,8083		
IS2		0,8706		
IS3		0,8204		
IS4		0,8804		
PROCESSES	0,7311		0,8448	0,6459
PRO1		0,737		
PRO2		0,8745		
PRO3		0,7932		
COMPETITIVE ADVANTAGE_FINANCE	0,8663		0,9085	0,7127
VC1		0,8461		
VC2		0,8431		
VC3		0,8622		
VC4		0,8253		
COMPETITIVE ADVANTAGE_COSTUMERS	0,7460		0,8546	0,6626
VC5		0,8439		
VC6		0,8378		
VC7		0,7575		

*** $p < 0,01$ (based on t (4999), two-tailed test)

Table 2. Discriminant Validity

	(1)	(2)	(3)	(4)	(5)
(1) CA_COSTUMER	0,845				
(2) CA_FINANCIAL	0,5646	0,837			
(3) HC	0,3983	0,3847	0,846		
(4) IS	0,2301	0,1924	0,4422	0,804	
(5) PROC	0,3279	0,4045	0,5927	0,3151	0,804

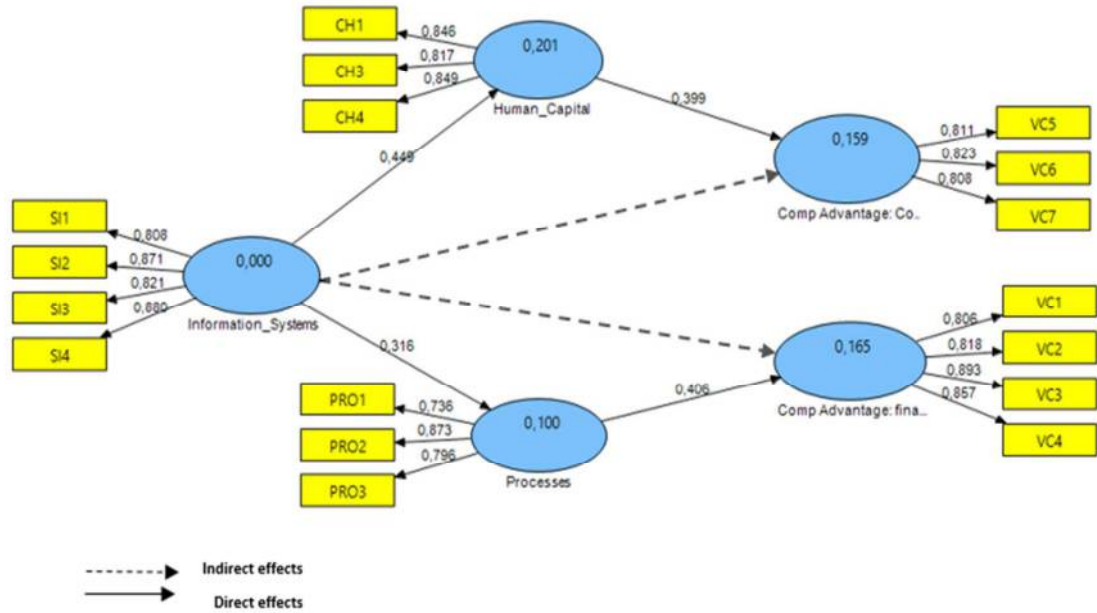
Table 3 -- Direct Effects on Endogenous Variable

<i>Hypo-thesis</i>	<i>Path</i>	<i>Direct effect</i>	<i>t-value (bootstrap)</i>	<i>Percentile 95% confidence interval</i>	<i>Support</i>	<i>Explained variance</i>
H1	Human_Capital -> Comp Advantage: Costumers	0,399	4,6989	[0,232; 0,565] Sig.	Yes	16%
H2	Processes -> Comp Advantage: Financial	0,406	4,9781	[0,261; 0,578] Sig.	Yes	17%
H3	Information_Systems -> Human_Capital	0,449	4,7361	[0,268; 0,634] Sig.	Yes	20%
H4	Information_Systems -> Processes	0,316	2,9034	[0,105 ; 0,532] Sig	Yes	10%

Table 4 – Indirect Effects on Endogenous Variable

<i>Hypothesis</i>	<i>Path</i>	<i>Indirect effect</i>	<i>P-value (bootstrap)</i>	<i>Percentile 95% confidence interval</i>	<i>Support</i>
H5	Information_Systems -> Comp. Advantage: Costumers	0,175	0.001	[0,094; 0,291] Sig.	Yes
H6	Information_Systems -> Comp Advantage: Financial	0,105	.070	[0,026 ; 0,247] Sig	Yes

Figure 2- Structural Model



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Appendix 1

Dimensions and items measures

Dimension / Definition	Items	Source
Intellectual Capital		
Culture and incentives: refers to implicit and explicit cultural aspects, beliefs and incentives to create, and support the intellectual assets in order to achieve the objectives of the organizations.	1. The degree to which the organization invests and encourages the learning and training of employees. 2. Participation of employees in the improvement of the organization.	Fonseca, 2006
Knowledge creation and identification: is based on the ability of the organization and employees in identifying and creating intellectual assets, contributing to its objectives.	3. The degree to which the organization invests and enhances human capital, attracting and/or retaining the best employees' knowledge holders. 4. Organization and employees abilities in creating new knowledge.	
Processes		
Leadership and strategy: represents the use of the techniques of knowledge management as a management model of the leaders and managers of the organization.	1. The degree to which the top management presents flexible and capable of changes in organizational structure. 2. The quality and nature of the relationship between top management and employees.	Fonseca, 2006
Knowledge flow: reveals the nature and the capacity of the knowledge flow and other intellectual assets within an organization (capture, storage, dissemination, and other aspects of distribution of knowledge).	3. The nature and effectiveness of knowledge capture. 4. The nature and effectiveness of the dissemination of knowledge.	
Information Systems		
Technological infrastructure is based on ability and existence of a technological infrastructure that allows knowledge management and sharing of the best practices.	1. The nature and capacity of the technological infrastructure to support knowledge processes and flow. 2. Results of the use of technology infrastructure.	Fonseca, 2006
Infrastructure to access knowledge is based on the existing infrastructure that allows stakeholders to access and interact with the intellectual assets of the organization, systems or persons.	3. The ease access to knowledge in the organization 4. The nature and effectiveness of mechanisms that the organization has to find information and knowledge.	
Competitive Advantage		
Financial perspective	1. Sales growth. 2. Market share. 3. ROI (return on investment). 4. ROA (return on assets).	Kaplan and Norton (1992); Deshpandé <i>et al.</i> , (1993); Doyle and Wong (1996)
Customer perspective	5. Sales of new products. 6. Attracting new customers. 7. Meeting the deadlines set by clients.	Kaplan e Norton (1992); Narver <i>et al.</i> , (1993)

Appendix 2. Factorial Analysis Results

Panel A – Knowledge Management				
Factors	Items	r	Variance %	Eigenvalues
Human capital	CH1- Learning incentive	0.634	41,791	5,015
	CH2 - Collaborators' participation	0.630		
	CH3 - Collaborators' retention	0.860		
	CH4 - Knowledge creation	0.727		
Information systems	SI1- Technological infrastructure	0.877	16,012	1,921
	SI2- Technological infrastructure results	0.842		
	SI3- Easy access to knowledge	0.744		
	SI4- Knowledge acquisition instruments	0.807		
Processes	PRO1- Organizational structure	0.892	8,954	1,075
	PRO2- Communication	0.543		
	PRO3- Knowledge acquisition	0.634		
	PRO4 - Knowledge sharing	0.302*		
Cumulative Variance %			66,757	
KMO			0,802	
Bartlett's Test (p-value)			433,739 (0.000)	
Panel B – Competitive Advantage				
Factors	Items	r	Variance %	Eigenvalues
Financial	VC1- Growth sales	0.622	55,167	3.862
	VC2 - Market share	0.590		
	VC3 - Return on investment	0.920		
	VC4 - Return on assets	0.915		
Customers	VC5- New product/services sales	0.808	15,655	1.096
	VC6- New customer attraction	0.740		
	VC7- Accomplishment of deadlines	0.759		
Cumulative Variance %			70,821	
KMO			0,790	
Bartlett's Test (p-value)			284,375 (0.000)	

Notes: r: factor correlation with survey items.

*Correlation < 0.5.