INFORMATION TECHNOLOGIES AND HUMAN BEHAVIORS AS INTERACTING KNOWLEDGE MANAGEMENT ENABLERS OF THE ORGANIZATIONAL LEARNING CAPACITY

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Abstract

Today's global competition demands an unprecedented learning capacity from organizations. With this aim, knowledge management has become essential in organizations. Information technologies are one of the major knowledge management initiatives fostered by organizations, but they are not sufficient as enablers of a learning capacity. Knowledge resides in human minds and, therefore, employee behaviors, interpretative abilities and values are key factors to knowledge management. Keeping in mind these ideas, this paper takes a comprehensive view of knowledge management by analyzing how information technologies must interact with specific human behaviors at work in order to reinforce them as enablers for the development of a learning capacity. Data from 111 companies are the point of departure of the empirical analysis, which is based on a structural equation model-estimation. Results imply that there is consistent evidence of the superiority of the proposed interaction. Consequently, firms need to create a fit between its technological and human systems. Along with implications, limitations and future research is concluded.

Keywords: learning capacity, knowledge management, information technology, humanist knowledge management, interaction.

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Suggested track: A Managing organizational knowledge and competence.

1. INTRODUCTION

Organizations are increasingly finding themselves in a world characterized by globalization, turbulence and complexity, which is denoted in its extreme form as hypercompetition (Johannessen et al., 2001). This picture is a result of the transition from an industrial society to a knowledge-based society in which knowledge has become the primary strategic resource for companies (Grant, 1996; Stewart, 1997). Accordingly, researchers and practitioners strive for clues on how to collect knowledge resources effectively and leveraging them through learning for competitive advantage. The flourishing interest in knowledge and learning has then led to a deluge of knowledge management efforts in the business world as a requirement to effectively develop a learning capacity.

Today, there is a lot of discussion on knowledge management, which is baffled with divergent approaches coexisting about it. Throughout this discussion, information technology (IT) is often advanced as the anchor to develop initiatives about knowledge management. As a knowledge management initiative, IT is useful for information processing and, then, to efficiently handled the conversion between data and information. However, IT is a poor substitute for converting information into knowledge. This is best accomplished by human actors that, on the other hand, are slow in converting data into information (Bhatt, 2001). This is why a more social and humanist approach to knowledge management has been also proposed as a basis for action. Consequently, both IT and humanist inspired initiatives that are required for knowledge management. And even when some researchers suggest that IT and humanist based efforts in knowledge management may be mutually exclusive (Hansen et al., 1999), other preliminary research suggest that competitive advantage lies in the integration of both approaches (Bhatt, 2001; Popper y Lipshitz, 1998; Prieto, 2003). In agreement with this last point of view, we believe that knowledge management initiatives needs to shape, coordinate and refine the interactions between information technologies, people and values.

Keeping in mind these ideas, the specific problem stated in this work is to empirically test in what extend information technology contributes to develop a learning capacity, analyzing how it interacts with human behaviors and values as knowledge management initiatives to enhance their effects on the learning capacity. Along with this purpose, we initially found our conceptual model by addressing the theoretical underpinnings about the learning capacity and knowledge management in organizations. The model laid the groundwork for the development of hypothesis by

embracing IT as well as the humanist based knowledge management and, specially, tries to show how IT may reinforce the humanist initiatives. Then, hypotheses are empirically tested using structural equations modeling. Finally, the findings and implications for managerial practice and future research are discussed.

2. DEVELOPING A CONCEPTUAL MODEL: THEORETICAL FOUNDATIONS AND HYPOTHESIS

Understanding the learning capacity in organizations

Published research has largely suggested that learning guides the alignment between organization and environment. The capacity to learn depends on the ability to fill the gap between knowledge stored from the past and knowledge required to act in response with changing environmental conditions (Zack, 1999). According to this, we define the learning capacity as the organizational potential to use available knowledge within the organization and to continually renew that knowledge to fit environmental conditions.

Knowledge is a set of thoughts about how the environment and the organization work. When environmental or organizational conditions change, it produces a problematic situation or “knowledge gap” that triggers learning processes to produce new knowledge. When the new knowledge engrosses the existing knowledge, it will lead to adjustments in the original thoughts (Revilla, 1995). And organizational purposes and competitive intentions will be reshaped as well.

It is generally accepted that organizations learn through their individual members, which develop new knowledge through their own personal problem solving processes (Kim, 1993; Hedlund, 1994; Revilla, 1995). Some individual knowledge is directly applied to perform assigned tasks, but much of it must be shared with others in a group before becoming a basis for action (Sanchez, 2001). Within groups, individuals develop a common knowledge when they both share knowledge and receive knowledge from coworkers. Similarly, groups in an organization interact, communicate their knowledge to other groups and acquire other knowledge required to put their own knowledge into action. So, individuals and groups play an important role in the integration of some knowledge in the organization, in such a way that knowledge become embedded in the organization’s systems, routines and convictions (Nonaka and Takeuchi, 1995; Sanchez, 2001).

Then, learning occurs when organizational members act as learning agents responding to changes in the internal and external environment and embedding results in private and shared beliefs and behaviors. And knowledge must be leveraged involving individuals, groups and the organization for the overall learning capacity to be sustained (Nonaka and Takeuchi, 1995; Crossan et al., 1999; Sanchez, 2001). However, the efficient development and sustainig of a learning capacity in organizations is not a product of hazard, but the result of an effort materialized in what has been called “knowledge management”. Knowledge management emerges as a business approach that guides organizations to identify the knowledge required to fit environmental conditions, compare it to its actual knowledge store and enhance the learning processes which are required to fulfill the knowledge gaps (Zack, 1999).

Knowledge management in organizations

For purposes of this paper a central activity in managing knowledge into competence is designing and maintaining tools and practices that both support efficient application of past knowledge and effectively manage change in knowledge in accordance with environmental changes. In doing so, knowledge management involves gathering and disseminating information as well as generating and evaluating alternative frameworks for interpreting information (Sanchez, 2001). In accordance, literature has often recognized that knowledge management embraces a dual effort focused on the development of proper information management systems as well as on the support of sensemaking processes throughout the organization (Gloet and Berrell, 2003). Within this framework, one way of doing things in knowledge management is based on the idea that IT and its associated systems provide a useful frame to define knowledge management practices. Together with it, the importance of sensemaking and interpretive elements recognize the role of human experience on knowledge management.

The role of information technology in knowledge management

The way of doing things in knowledge management is often dominated by the idea that IT provide an ideal framework to circumscribe the principles and practices associated with knowledge management. In fact, IT has been often seen as an enabler of knowledge management (Liebowitz and Wilcox, 1997; Ruggles, 1997; Davenport and Prusak, 1998) that focuses primarily on creating operational efficiency through improving administrative and management information systems.

IT greatly affects to how data and information are gathered, storaged, processed and communicated within and across organizations, impacting how knowledge is collected and flowed through organizational channels. IT holds knowledge repositories, which include business applications, manuals, reports and databases. It is also appropriate to play the role of enhancing the analysis, discorse and communication required for knowledge development and, specially, to support a virtual network that is not constrained by barriers of time and place. By accelerating the speed at which information is processed through the organization, IT can help ensure that each member is current with regard to relevant internal and external information. Then, it is expected that organizations that invest and manage IT systems are likely to enhance their knowledge management abilities (Ruggles, 1997; Scott, 2000). However, we must be cautious in considering IT as a solution to cope with all knowledge related problems.

The role of the humanist interpretive elements in knowledge management

If organizations are aware that their ability to survive depends on their potential to make sense of their environments and to constantly adapt beliefs, thoughts and actions in the light of new conditions, then, effective knowledge management must skill organizations for it. Sensemaking processes are only possible in the human mind, and involve creating, testing and sharing multiple interpretations of the environment with a variety of actions. Then, knowledge management initiatives should be focused on the sense-making behaviors of individuals, discourse, and interactions between them, so that they all can find out what others think, reshape their points of view and learn (Senge, 1990; Choo, 1998). In this sense, those behavioral practices and values related to the interplay between interpretive processes and action taking by individuals are considered essential.

However, the identification of particular behaviors, values and attitudes for knowledge management is hard because each person perceives and interprets the environment differently, depending on the individual's intuitions, cognitions and reactions (Sinkula et al., 1997). Sense making is further complicated because organizations can intrude actively into the environment in order to influence parts of it (Choo, 1998). At the same time, the creation of a shared understanding is social, both because experience is social and because one's interests include other people. Notwithstanding this difficulty, attributes such as openness, care, inventiveness has been discussed in the learning literature as important conditions to shape the behaviors that employees have on work settings, prompt them to encourage their competence, and support interactions

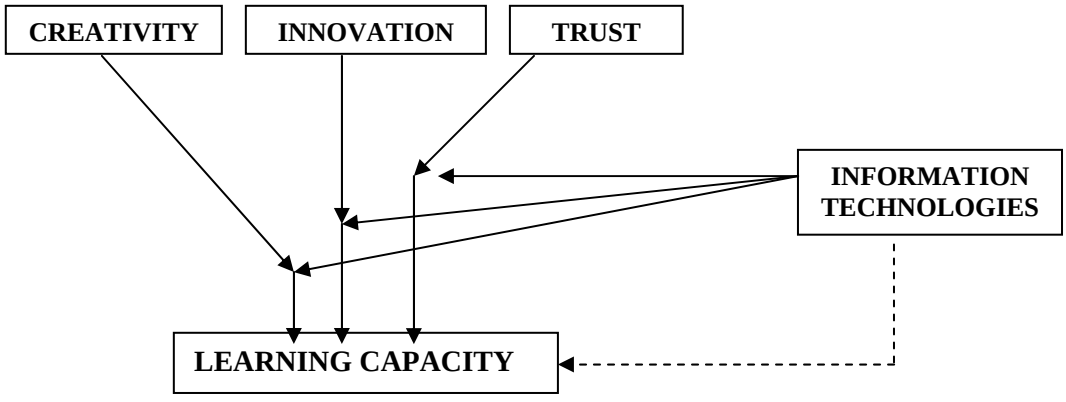
between them (Janz and Prasarnphanich, 2003). As a result, learning and knowledge exchange is supported as well.

Proposed model and hypothesis of research

We propose an integrated model of tecnological and humanist knowledge management initiatives as enablers of the learning capacity. In particular, we suggest that the valuable potential of IT as an enabler of the learning capacity can be realized when acting together with sensenmaking and interpretive behaviors. In fact, if shared interpretation is a complicated process, IT must be used to help individuals to create multiple interpretations and develop consensus by enabling them to be more active and efficient in information processing. IT quicks and effective connects people with people and provides access to huge amounts of information, reducing confusion inherent to sensemaking processses. Then, due to IT-enhanced connectivity, organizational members can more easily gather information about environmental changes, share individual interpretations of the information, and make consensus development more efficient (Tippins and Sohi, 2003).

In general, we can found in literature that the learning capacity is contingent with a long range of human and social attributes that we have condensed in three essential ones that, respectively, are expected to create, test and share alternative interpretations of environments (Nonaka, 1994; Muñoz Seca and Riverola, 1997; Prieto, 2003): creativity, innovative behaviors and trust. And puting IT in a proper position in relation to knowledge management, we think that it is when IT coexists and interacts with previous attributes, that it works as enabler of the learning capacity by reinforcing creativity, innovation and trust' properties. Figure 2 reflects the proposed interaction model framework and provides an overview of all the relationships. Next, we will develop the hypothesis that are implicit in the model.

Figure 2: Proposed interaction model framework



IT is often considered a necessary but not sufficient condition for the development of a learning capacity. IT solves the problem of managing data and information, but not solves the problem of interpreting and transforming information into knowledge. This suggest that IT is fundamentally necessary to provide a framework for knowledge developing and to decide on how this knowledge is to be used most effectively, which remain a distinctly human activity (Loermans, 2002). Even more, research on IT designed to support learning has often suggested that IT may both enable and disable the capacity to learn (Robey et al., 2000). Then, the direct link between IT and the learning capacity is not always clear.

HIPOTHESIS 1: IT is a indefinite condition for the development of a learning capacity in organizations.

Creativity involves the production of new ideas that are potentially useful in any organizational domain (Amabile et al., 1996; Woodman et al., 1993; Shalley et al., 2000). Creativity is therefore a necessary step for organizations to design new ways of thinking in order to face up the contingencies instigated by changing environmental conditions. Accordingly, creativity is a starting point to confront environmental changes as learning opportunities (Muñoz Seca y Riverola, 1997). Consequently, the enhancement of a learning capacity involves managers to search for creative workers and to manage a set of conditions to support a work atmosphere in which creative thinking is reinforced (Woodman et al., 1993; Oldham and Cummings, 1996; Cummings and Oldham, 1997).

HIPOTHESIS 2a: Creativity is a positive condition for the development of a learning capacity in organizations.

Given the increased importance of IT used as a means of communication in organizations, the creative performance of small groups and individuals can be affected when provided IT tools for communicating ideas and experiences. In this sense, we think that IT can positively influence the relationship between creativity and the learning capacity. Communicating ideas through IT can increase relevant creative abilities to the extend that produces some kind of “virtual brainstorming” or virtual “creative abrasion” (Leonard Barton, 1995). But it can also decrease creative abilities when individuals decide to locate and make use of other’s ideas instead of creating new ones. Then, there is a moderating effect of the interaction between creativity and IT on the learning capacity.

HIPOTHESIS 2b: The positive relationship between creativity and the learning capacity is moderated by IT.

Innovations are defined as the successful implementation of new ideas and original solutions to solve new and well-known problematic situations (Muñoz Seca and Riverola, 1997). Innovations are then required to crystallize new insights into some concrete "form", such as products, services and processes. In this way, innovations trigger the behavioral phenomenon that involves knowledge use to induce changes – not necessary big ones- in organizations. As a result, new knowledge is generated and the learning capacity is enhanced (Hamel and Prahalad, 1991; Slater and Narver, 1995; Goshal and Bartlett, 1997; Muñoz Seca y Riverola, 1997).

HIPOTHESIS 3a: An innovative behavior is a positive condition for the development of a learning capacity in organizations.

Huber (1990) argued that the use of IT leads to more quickly retrieve information. IT may also connect different organizational areas and functions. And there is a growing recognition that both speed and connectivity are important in the development of innovations. It all makes easier to put in practice new insights and the induction of changes required for problem resolution. Then, we can consider that fast and extensive access to information and people through IT reinforces the innovative potential of organizations and, then, coadjuvates the relationship between innovation and the learning capacity.

*HIPOTHESIS 3b: The positive relationship between innovation and the learning capacity is mod*erated by IT.

Trust is based on the conviction that one will find what is expected. It is a human attribute that should emerge in collectivity enhance the individuals' willingness to be confident in knowledge exchange and to act on the basis of other's knowledge is increased (Mayer et al., 1995; Nevis et al., 1995; Nahapiet and Goshal, 1998; Scott, 2000). Trust induces individuals to have confidence in their companions' actions or cognitions (Goshal and Barlett, 1994), to express new ideas, to challenge well-established practices and to commit to something more than self-complacence (Handy, 1995). Trust is also the main coordinating mechanism to cooperate, delegate and to support coherence in the community form. Then, as several authors (Duncan and Weiss, 1979; Von Krogh, 1998; Nonaka, 1994; Coopey, 1995; Handy, 1995; Nonaka et al., 1998; Schäffer and Willauer, 2002) have pointed out, trust is an essential condition for the understanding of the learning capacity.

HIPOTHESIS 4a: Trust is a positive condition for the development of a learning capacity in organizations.

IT also acts as a support of trust as enabler of the learning capacity. IT provides a synthetic environment or organizational network within which participants can share certain kinds of interpretations and experience. Then, the role of trust as enabler of the learning capacity can be reinforced when IT eliminates physical and temporal barriers and increases speed in support of individual's predisposition to exchange of knowledge, cooperate and delegate. This way, even when It do not have the social presence of face-to-face contacts, it facilitates interaction between organizational members, encourages discourse and the jointly constructed interpretation among individuals and, consequently, makes it easy the flow and the collection of knowledge.

HIPOTHESIS 4b: The positive relationship between trust and the learning capacity is moderated by IT.

3. EMPIRICAL RESEARCH

3.1. Data collection and sample

Survey methodology has been used for the empirical analysis. The questionnaire has been designed and developed from a thorough literature review and completed by us with some indicators. It was then validated through a pretest (carried out with personal interviews with business managers and practitioners) which allowed us to purify our survey items and rectify any potential deficiency. We made some minor modifications based on the specific suggestions received. The questionnaire was then administered to a random sample of 1064 Spanish companies determined through the data base *Duns & Bradstreet* (50.000 Main Spanish Companies, 2000). We have chosen companies no reporting more than 2500 employees in order to preserve the internal homogeneity of sample companies as well as for not to restraint the answers about the topics that are being evaluated. It was also necessary to focus on knowledge intensive industries, but covering a range enough for not restraining the scope of the analysis. Human Resource Managers and Top Managers have been selected as the potential responders of the questionnaires (Andreu y Solé Parellada, 2001; PricewaterhouseCoopers Consulting, 2001). Human Resources Managers were selected because they are found to play key roles about knowledge management and top managers are often sensitive to globally understand the organizational characteristics. A total of 111 surveys were returned representing a 10,52% response rate.

3.2. Measures

The measurement of the analysis variables has been built on a multiple-items method, which enhances confidence about the accuracy and consistency of the assessment. Each item was based on a five point Likert scale and all of them are perceptual variables. All constructs and operational definitions of measures are summarized in the Appendix. Language for the items is well grounded in the literature.

Information technology is mainly operationalized by using six items based on Davenport and Prusak (1998) and Dewar and Kraemer (2000). This items have tried to embrace a range enough of archetypal IT systems in organizations.

Creativity, innovative behaviors and trust were measured with thirteen survey items also based on prior research. The operationalization of creativity is rooted in Kanter (1989), Scott and Bruce (1994), Woodman et al. (1993), Amabile et al. (1996), Oldham and Cummings (1996) and Shalley et al. (2000). Slater and Narver (1995), Scott and Bruce (1994), Lumpkin and Dess (1996) and Barringer and Bluedorn (1999) influenced the crafting of the innovative orientation items. And the specific wordings of items for trust came from McAllister (1995), Wicks et al. (1999) and Goshal and Barlett (1994, 1997).

The *learning capacity in organizations* has been measured attending to the learning framework of Bontis (1999). This author describes the learning capacity by distinguing two distinct but related dimensions: 1) the *knowledge stocks* which uphold all that is already known. Specially, knowledge exist in the mind of individuals, knowledge is also shared among members in work groups and, finally, knowledge exists at the overall organizational level; 2) The *learning flows* that make knowledge stocks evolution possible. To understand learning flows, the concepts of exploration and exploitation are especially constructive (March, 1991; Bontis et al., 2000). Exploration takes place when individuals generate new knowledge that is shared within groups and progressively assimilated by the organization. Exploitation encompasses the diffusion of embedded organizational knowledge that has been learnt from the past down to the groups and organizational members so that it is used for value creation.

Then, we have operationalized the learning capacity as multidimensional construct through the knowledge stocks and learning flows. Knowledge stocks and learning flows are treated as first-order indicators of the second-order construct, the learning capacity. Knowledge stocks have been measured by including fifteen items concerning to the

individual stocks, group stocks and organizational stocks of knowledge. Learning flows have been measured using ten items concerning to exploration and exploitation flows. Most of the items were adopted from relevant literature, especially Bontis (1999).

3.3. Analysis and results

Data analysis has been conducted by Structural Equation Modeling (SEM), using LISREL 8, maximum likelihood program (Jöreskog and Sörbom, 1993). SEM is a valid method to explain all paths of inter-related dependence relationships between a set of unobserved constructs, each measured by one or more observed indicators. To develop a SEM model, the linkages between latent constructs and their measurable indicators must be first specified by developing the structural model. But prior to testing all of the defined causal relationships, items for each dimensional scale are subjected to scale refinement based on an evaluation of measurement model fit. This analysis, conducted by using confirmatory factor analysis, let us to demonstrate the quality of the measurement in terms of psychometric properties, reliability and overall model fit.

Measurement models estimation. Three separate confirmatory factor analysis were conducted: one for the knowledge management variables and two for the broad dimensions of the learning capacity. The measurement models include paths from each construct to all items used to measure it. These paths were examined using t-statistics (for expected factor loadings), whereas paths that were not specified were evaluated using standarized residuals and modification indices. Based on these statistics and theoretical considerations we deleted items if appropriate (Anderson y Gerbing, 1988; Mentzer et al., 2001).

Tables 1 and 2 illustrate the final measurement models for the different groups of constructs. All the estimated loadings (λij) are positive and significantly related to its underlying factor (t-values greater than 1.96) in support of convergent validity. Likewise, the inter-constructs correlation parameters showed that discriminant validity – the degree to which a construct differs from others- is achieved among constructs (even when correlation between knowledge stocks constructs and correlation between learning flows constructs are slightly high, it is not alarming since these constructs are measures of a single concept: the learning capacity). In relation to the quality of the measurement model, the constructs display satisfactory levels of reliability as indicated by the total coefficients of determination (R^2) and the composite reliabilities (ρ_c). And based on fit indices reported, the fit of the measurement models is not problematic. So, these observations indicate acceptable measurement models.

Table 1: Adjusted measurement model for knowledge management variables

Paths	Standarized loadings	t-values	R^2	Composite reliability (ρ_c)	Constructs correlation	Goodness of fit indices
KM initiatives						
V26←inform. Technologies (IT)	0.692	6.689	0.478	0.754	$\phi_{IT\text{-}CRE}$ = 0.468 (3.884)	χ^2= 66.268 (P= 0.637) GFI = 0.916 AGFI = 0.908 RMR = 0.0596 CFI = 1.000
V28← inform. technologies (IT)	0.467	4.410	0.218			
V30← inform. technologies (IT)	0.705	6.819	0.497		$\phi_{IT\text{-}INN}$ = 0.489 (3.943)	
V31← inform. technologies (IT)	0.486	4.599	0.235			
V33←creativity (CREAT)	0.785	6.400	0.616	0.756	$\phi_{IT\text{-}TRU}$ = 0.375 (3.376)	
V34←creativity (CREAT)	0.775	6.270	0.600			
V36←innovation (INNO)	0.746	4.700	0.556	0.778	$\phi_{CRE\text{-}INN}$ = 0.492 (4.707)	
V37←innovation (INNO)	0.745	5.412	0.556			
V40←trust (TRU)	0.803	10.256	0.645	0.874	$\phi_{CREA\text{-}TRU}$ = 0.738 (11.849)	
V41← trust (TRU)	0.905	11.242	0.819			
V43←trust (TRU)	0.733	8.886	0.538		$\phi_{IINN\text{-}TRU}$ = 0.567 (6.596)	
V44← trust (TRU)	0.737	8.799	0.543			

Table 2: Adjusted measurement models for the learning capacity variables

Paths	Standarized loadings	t-values	R^2	Composite reliability (ρ_c)	Constructs correlation	Goodness of fit indices
FIRST ORDER MEASUREMENT MODELS						
Knowledge stocks						
V1←individual stock	0.670	7.124	0.450	0.757	$\phi_{I\text{-}G}$ = 0.597 (6.897)	χ^2= 35.376 (P= 0.312) GFI = 0.940 AGFI = 0.896 RMR = 0.0510 *CFI = 0.990*
V2←individual stock	0.822	9.022	0.676			
V3←individual stock	0.707	7.579	0.500			
V6←group stock	0.616	6.664	0.379	0.782	$\phi_{I\text{-}O}$ = 0.513 (4.785)	
V7←group stock	0.826	9.818	0.682			
V8←group stock	0.711	8.015	0.506			
V9←group stock	0.614	6.648	0.377		$\phi_{G\text{-}O}$ = 0.873 (12.725)	
V11←organizational stock	0.532	5.346	0.283	0.652		
V13←organizational stock	0.745	7.728	0.556			
V15←organizational stock	0.586	5.991	0.344			
Learning flows						
V16←exploration flows	0.662	7.060	0.438	0.775	ϕ = 0.867 (13.589)	χ^2= 21.391 (P= 0.316) GFI = 0.952 AGFI = 0.909 RMR = 0.0472 CFI = 0.990
V19←exploration flows	0.753	8.321	0.566			
V20←exploration flows	0.798	8.976	0.637			
V21←exploitation flows	0.607	6.199	0.369	0.720		
V22←exploitation flows	0.641	6.613	0.410			
V23←exploitation flows	0.549	5.504	0.302			
V24←exploitation flows	0.584	5.917	0.341			
V25←exploitation flows	0.530	5.278	0.281			
SECOND ORDER MEASUREMENT MODEL						
Learning capacity						
individual stock←knowledge stocks	0.461					χ^2= 2.752 (P= 0.431) GFI = 0.990 AGFI = 0.952 RMR = 0.0169 CFI = 1.000
group stock← knowledge stocks	0.712					
organization stock← knowledge stock	0.859					
exploration flows←learning flows	0.888					
exploitation flows←learning flows	0.748					
knowledge stocks←learning capacity	0.951					
learning flows←learning capacity	0.997					

Since the learning capacity is a multidimensional construct with two essential dimensions, it has been represented with a second-order confirmatory factor analysis from with knowledge stocks and learning flows emanates. To establish the existence of a single second-order factor (learning capacity), we have explicitly tested that first order factors (knowledge stocks and learning flows) converge to a single higher order construct. This model has been estimated by previously transforming the indicators of each one of the knowledge stocks and learning flows constructs in five single factors by applying principal components factors analysis (using SPSS for Windows, Version

10.0). Table 2 also shows the results for this second-order model for learning capacity. Path coefficients are significant ($p \leq 0.05$) and overall model fit is excellent. Then, there is evidence of convergence of the variable indicators within their respective first-order factors (knowledge stocks and learning flows) and convergence of the first-order factors within the second-order construct (learning capacity).

Structural models estimation. In order to test our hypothesis by differentiating the effect of each variable, we have estimated a separate model for each one of the humanist variables in order to better comprehend their significance. Specially, we have estimated three equations corresponding to creativity, innovation and trust, each one including the effect of IT and the interactive effect. These equations with interactive effects have been estimated by using Ping´s Method. Ping (1995) proposed a variation of Kenny and Judd (1984) technique that considerably simplifies it. The measurement parameters previously estimated have been used to calculate the loadings and error variances for the indicators of the interaction term products. And the model with interaction variables is estimated by fixing the loading and the error variances for the product indicators (for a detailed description of the steps, the reader is referred to Ping, 1995, 1996).

The use of product indicators in a structural model renders the model non-normal and, thus, chi-square estimates cannot be meaningfully interpreted (Ping, 1995). Significance of the structural interaction model requires estimated parameters are positive and significant (t-values greater than 1.96 for a significance level of 0.05) and a good fit of the model. It is also required that the proposed interaction models (non-linear relationships) outperform the alternative models without interaction (only linear relationships). Results are reported in Table 3.

Table 3: Structural models estimation

Model 1	STOCKS = 0.600 · CREAT + 0.067 · IT + ζ'_3 (4.768)* (0.517)	R^2 = 0.402
	FLUJOS = 0.668 · CREAT + 0.097 · IT + ζ'_4 (5.767)* (0.812)	R^2 = 0.516
Model 1'	STOCKS = 0.768 · CREAT – 0.133 · IT – 0.189 · CREAT·IT + ζ_3 (4.471)* (-0.707) (-1.546)	R^2 = 0.465
	FLUJOS = 0.798 · CREAT –0.054 · IT – 0.147 · CREAT·IT + ζ_4 (5.051)* (-0.336) (-1.302)	R^2 = 0.558
Model 2	STOCKS = 0.638 · INNO – 0.016 · IT + ζ'_5 (4.511)* (-0.112)	R^2 = 0.398
	FLUJOS = 0.675 · INNO + 0.030 · IT + ζ'_6 (5.091)* (0.225)	R^2 = 0.477
Model 2'	STOCKS = 0.633 · INNO + 0.068 · IT + 0.136 · INNO·IT + ζ_5 (4.560)* (0.462) (1.597)**	R^2 = 0.426
	FLUJOS = 0.669 · INNO + 0.136 · IT + 0.170 · INNO·IT + ζ_6 (5.186)* (0.981) (2.138)*	R^2 = 0.525
Model 3	STOCKS = 0.729 · TRU + 0.033 · IT + ζ'_1 (7.415)* (0.302)	R^2 = 0.552
	FLOWS = 0.781 · TRU + 0.083 · IT + ζ'_2 (8.933)* (0.855)	R^2 = 0.666
Model 3'	STOCKS = 0.776 · TRU + 0.066 · IT + 0.118 · TRU·IT + ζ_1 (7.587)* (0.601) (1.506)**	R^2 = 0.577
	FLOWS = 0.825 · TRU + 0.116 · IT + 0.114 · TRU·IT + ζ_2 (9.088)* (1.172) (1.624)**	R^2 = 0.690

* Significant at a 95% confidence level
** Significant at a 92% confidence level

Results show that creativity, innovation and trust are significant enablers of the learning capacity, but the direct effect of IT is never significant. This results give support to our hypotesis H_1, H_{2a}, H_{3a} and H_{4a}. First, we can see how IT does not play a main role as an enabler of the learning capacity when considered alone. Even more, although not significat, their effects are sometimes negative. Then, its position as enabler of the learning capacity is, at least, indefinite. On the contrary, the effect of creativity, innovative behaviors and trust on the learning capacity is positive and significant.

If we observe models with interactions, we can see that model 1 outperforms model 1' (R^2 increases), but the interaction between creativity and IT is not significant. Then, our hypothesis H_{2b} must be refused. When comparing model 2 and model 2', the R^2 increases as well (then, the proposed model with interaction outperforms the alternative model without interaction), and the interaction between IT and innovation has a positive and significant effect on the learning capacity. Thus, the hypothesis H_{3b} can be accepted. Finally, the interaction term between IT and trust is also a positive and significant enabler of the learning capacity, and the model with interaction (model 3') outperforms the model without interaction (model 3). So, we can not reject our hypothesis H_{4b}.

These results let us to assume that IT alone does not lead to improvements in the capacity to learn, but it can act as a reinforcing mechanism for some behaviors, attitudes and skills. Nevertheless, this work should encourage us and other researchers to persevere in our hypothesis in the future.

4. DISCUSSION

4.1. Implications

Our focus in this research was to empirically test how IT can be used as a supportive tool for the humanist-centered knowledge management. Specifically, we have tested the moderator effect of IT in the relation between creativity and the learning capacity, innovation and the learning capacity, and trust and the learning capacity. Findings provide fair support for the theory underlying our model. In this sense, we have demonstrated that human and social behaviors play an important role in developing a learning capacity through knowledge management and how this role can be reinforced through IT.

First, as hypothesized, we have found support for a positive main effect of creativity, innovation and trust on the learning capacity. They all can be considered as human or social enablers of the knowledge stocks and the learning flows in organizations. We have also found that the main effect of IT on the learning capacity cannot be validated. This main effect is never significant. Finally, as we have previously said, a major contribution of this research has been to analyze the indirect effect of IT on the learning capacity by strenghening human centered knowledge management. Our findings allow us to accept a reinforcement effect of IT when openness to innovation and trust enhance the learning capacity. However, our results do not confirm that IT reinforces the relationship between creativity and the learning capacity. This result lead us to think that the important thing about creativity is not so much to obtain information as to discover new waiys of thinking about it. We must not forget that creativity is about diverging thinking, while innovation and trust are about convergent thinking.

Even when we believe that further research should be undertaken in this area, the work presented here can offer some managerial implications. Managers must understand that leveraging the learning capacity involves a combination of human and IT systems. When undertaking knowledge management efforts, most companies tend to focus on IT devices as the only solution. But to leverage knowledge, the focus mainly should be in how, when or why people use IT. Then, managers need realize that the difficulty in most knowledge management efforts lies in changing people’s work habits and

behaviors and not in large investments in IT. IT must be used to support human behaviors, but not conversely. Moreover, as stated by Bhatt (2001), when organizations coordinate a proper fit between IT and people, they are creating a unique pattern that is not easily traded in the mearketplace nor imitated by other organizations. IT is then used to increase the efficicnecy of people and enhace information processing within the organization, while people improve on interpretations by bringing multiple meanings on information.

In summary, even when current research in knowledge management often claims for the consideration of IT as an essential factor in knowledge management, it is important to put IT in its proper perspective in relation to it. In this sense, we have contributed to appreciate the maximum benefits that can be derived from the implementation of humanist knowledge management initiatives (Loermans, 2002) by incorporating and empirically testing the interactive role of IT. As a general conclusion, we can affirm that, although one of our hypothesis have been refuted, the proposed integration between IT and the humanist knowledge management initiatives has been proved as valid to explain the development of a learning capacity in organizations. Then, the real challenge for managers is concerned with connecting people with information and people with people.

4.2. Limitations and future research

Findings in this study should be interpreted within the limits it presents.

First, even when have tried to define our constructs as precisely as possible, the measurement items used here can realistically be thought of as only proxies for underlying and latent facts that are neither fully nor easily measurable. Accordingly, and even when should be useful for future research on knowledge management, some of the measures might benefit from further development.

A second limitation concerns to the set of humanist conditions considered. The implication for future research is the potential need to provide a more complete inventory of knowledge management initiatives. In this sense, there are conditions such as care, empowerment, education, appropriate incentives, etc. that has also been considered as motivational human enablers of the learning capacity.

Finally, limitations also refer to our data. The response rate was only 10.5%, leaving a small number of firms in the sample relative to the number of variables and complexity

of the analyses. Since all the data are derived from a single-source within each organization, the relationships are subject to response biases and consistencies. Future research should be done with a major sample and multiple respondents within firms in order to increase the accuracy of analysis. Moreover, we make causal inferences arguments whereas we have cross-sectional data. Longitudinal data would be suitable to support causal argument and to analyze the evolution of a learning capacity as well as its consequences for business performance and excellence.

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Appendix: Construct Definition and Sample Survey Items

Section		Variable	Item	Description
LEARNING CAPACITY IN ORGANIZATION		**LEARNING CAPACITY IN THE ORGANIZATION**		
	Knowledge stocks	Individual-level knowledge	V1	Individuals knowledge and work qualification
			V2	Individuals competence for work performance
			V3	Individuals awareness of critical issues that affect their work
			V4	Individuals confidence on their personal competencies
			V5	Individuals sense of responsibility about work
		Group-level knowledge	V6	Groups development of a shared knowledge about their work
			V7	Groups capacity to make decisions concerning their work
			V8	Groups capacity for effective conflict resolution
			V9	Groups coordination and organization of work
			V10	Groups ability to share successes and failures
		Organization-level knowledge	V11	Organization create a strategy that positions well its future
			V12	Organizational structure allows working effectively
			V13	Organizational management methods allow working efficiently
			V14	Organization holds actualized documents, information and databases
			V15	Organization's culture is properly distinctive
	Knowledge flows	Exploration	V16	Individual lessons learnt are actively shared within the group
			V17	Individual opinions and viewpoints are considered within groups
			V18	Individuals put input into the organization's decisions
			V19	Organization adopts recommendations made by groups or individuals
			V20	Organization do not "reinvent the wheel"
		Exploitation	V21	Policies and procedures aid individual work
			V22	Internal training and work training are essential in organization
			V23	Interdisciplinary training, work rotation and special assignations are usual
			V24	Individuals support group decisions
			V25	Past experiences are an influence for organizational future behavior
KNOWLEDGE MANAGEMENT		Information technologies	V26	Intranets are a key within the organization
			V27	Collaboration technologies are a key within the organization
			V28	Managing technologies are a key within the organization
			V29	Documentary and codification systems are a key within the organization
			V30	Searching technologies are a key within the organization
			V31	Organizational workstations are effectively computerized
		Creativity	V32	Creativity is encouraged within the organization
			V33	Employee's autonomy is respected by work supervision
			V34	Employees are allowed to solve known problems in different ways
			V35	There are adequate resources devoted to work in the organization
		Innovation	V36	The organization is committed with innovation
			V37	Managers are flexible and open to risky projects
			V38	Failures are tolerated within the organization
			V39	The organization is open to change and entrepreneurship
		Trust	V40	A warm and care climate is inspired in the organization
			V41	Collaboration, helping and support between employees are stimulated
			V42	Integrity, equity and fairness are noticeable values within the organization
			V43	Employees realize that they are assisted personal and professionally
			V44	Managers trust on their employee's abilities and competencies