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The impact of knowledge management on innovation and entrepreneurship in the biotechnology and telecommunications industries

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Abstract In the resource-based view approach, the knowledge frontier rests on the understanding of the process of creating and recreating distinctive competences. Moreover, in spite of the importance of knowledge assets, how innovation distinctive competences are generated in organizations is still an unknown factor. This research studies the effect of introducing knowledge management programs in the development of innovation distinctive competences, using two knowledge intensive industries. We establish a conceptual delimitation of knowledge management as a directive system through a set of principles and practices. The theoretical relationships we propose are tested in an empirical study carried out in 222 firms from the Spanish biotechnology and telecommunications industries.

Keywords Knowledge management · Innovation · Distinctive competences · Entrepreneurship · Knowledge intensive industries

JEL Classifications L26

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1 Introduction

The study of the process of generation and regeneration of distinctive competences in the firm constitutes a relevant problem. Knowledge on organizational actions and decisions that allow for the development and renewal of the strategic assets portfolio in an organization still lacks a satisfactory structure (Hegde and Shapira 2007; McEvily and Marcus 2005; Ranft and Lord 2002; Zollo and Winter 2002). The aim of this research is to analyze how the introduction of knowledge management (KM) systems allows for the generation of distinctive competences based on innovation, in order to create lasting abnormal results. Our interest lies in how KM might influence the acquisition and generation of competences and how it leads to obtaining economic profits. This problem is more closely related to dynamic approaches of the resource-based view (RBV), which focuses on explaining how distinctive competences are created, developed and accumulated.

Present research lines study the relationship between innovation and entrepreneurs (Más-Verdú 2007; Drucker 1985; Mazzarol and Reboud, 2006). From the resource perspective, novelty in the economy is generated principally through resource recombination, and the principal agents who accomplish these recombinations are entrepreneurs (Wong et al. 2005). Schumpeter (1934) had the clearest possible conception that it was entrepreneurship that created new lines of development within an economy, in ways that could not be anticipated

through analysis of the "circular flow" economy. Entrepreneurial initiative creates new activities, whose profitability then attracts imitators, and so the resource distribution in the economy as a whole is shifted (McKee 2008; Miles et al. 2005; Wong et al. 2005).

In recent years, KM has aroused much interest in the field of management (Dalmaris et al. 2007; Smith et al. 2005; Davenport and Prusak 2000; Von Krogh et al. 2000; Nonaka and Takeuchi 1995). Although knowledge is not a new concept, the increasing spread of theoretical works on KM is due to its significance to business, as well as to the development of the knowledge-based approach (KBA) (Von Krogh et al. 2000; Nonaka and Takeuchi 1995; Nonaka 1994). KM has gained popularity as a consequence of the emergent need to incorporate the dynamics of change to the information architecture and the business model, as well as to develop and encourage the growth of systems that are useful in adapting to a turbulent environment inherent to a knowledge-based economy.

This research aims to study the relationship between two key constructs in management literature: KM and innovation. An appropriate context in which to examine the effect of KM on the stock of innovation competences is presented by knowledge intensive industries, where knowledge and technological innovation have become successful key factors (Dalmaris et al. 2007; Kirby and Cox 2006; Huse et al. 2005). For this reason, we have used Spanish biotechnology and telecommunications industries for the empirical study.

This paper is structured into three sections. The first section studies the relationship between KM and innovation distinctive competences. We then explain the empirical design used in this research. Finally, we present our results and discuss their relevance to the knowledge accumulated.

2 Theory and hypotheses

2.1 Knowledge management and innovation distinctive competences

Many organizations have expressed their dissatisfaction with the results obtained after introducing KM programs. Key questions are often asked, such as: How should the KM concept be managed? How should knowledge be captured, stored and transferred? How could innovation distinctive competences be created?

The first obstacle to finding out the effects of KM on innovation lies in the use of an inadequate construct measure. In spite of the growing recognition of its importance and wide use in firms, public administrations, institutions and other organizations, there is no widely accepted definition of the construct by the scientific community.

It was not until the mid-1990s, due mainly to contributions from Nonaka and Takeuchi (1995), that a term was finally established in management literature: when the resource-based approach referred to knowledge as the basic source of competitive advantage. Since then, so-called KM has become widespread. Via knowledge management "the executives of companies hope to balance their knowledge assets and achieve results that exert a positive contribution on their balance sheets, and also on the life of each of their individual employees" (Dalmaris et al. 2007).

Randeree (2006:145) declares that "knowledge management is taking an increasingly fundamental role in the business of many organizations, as they realize that competitiveness depends on the effective management of intellectual resources." In a similar way to Randerée, we understand knowledge management as a management system that captures aspects of established models of organization and extends them to provide a practical methodology. We define the content of knowledge management construct from two dimensions: principles and practices.

Our particular concept of knowledge management is as a management tool characterized by a set of principles along with a series of practices and techniques through which the principles are introduced, the aim of which is to create, convert, disseminate and utilize knowledge. This definition allows us to verify whether a management system functions on the basis of the beliefs and values embodied in KM principles. The analysis of whether these principles materialize in a set of practices and techniques in the routine behavior of the firm is also important.

Every firm develops KM principles in different contexts. However, we consider it appropriate to determine a set of common principles that should be incorporated into a KM system. Few studies in the literature explicitly set out these principles. They refer to drivers for the generation and application of knowledge, or features of the learning organization. Through a

literature review (Randeree 2006; Scarbrough 2003; Rastogi 2000; Davenport and Prusak 2000; Nonaka and Takeuchi 1995; Nonaka 1994), we can conclude the existence of six basic KM principles in the organizations that focus on KM: (1) orientation towards the development, transfer and protection of knowledge; (2) continuous learning in the organization; (3) an understanding of the organization as a global system; (4) development of an innovative culture that encourages R&D projects; (5) approach based on people; (6) competences development and management based on competences.

Certain obstacles exist to effective KM introduction. The barriers and reasons for failure may derive from (Yu 2002): (1) the absence of a culture that overcomes resistance by members in an organization to the sharing of knowledge; (2) a lack of or inadequate communication to employees of the KM concept and its benefits; (3) a hierarchy that evades knowledge diffusion and the learning process; (4) an organizational structure with scarce flexibility that hinders internal knowledge transfer; (5) obsolete or over-complex technology; (6) mistakes on the integration of KM with the habitual work practices; (7) lack of training.

A set of practices related to KM principles must be developed to overcome these obstacles. Many practices exist that enable the development, transfer and protection of knowledge (Darroch 2005; Gloet and Terziovski 2004; Ding and Peters 2000; Rastogi 2000; Davenport and Prusak 2000; Nonaka 1994).

With regard to the innovation capability, Tsai (2001) and Liao et al. (2007) define a firm's innovation capability as including: (1) Product innovation: refers to the provision of differentiated, improved or new products/services in the market. This product innovation may include two categories: radical innovation and incremental innovation; (2) process innovation: is a process in which a firm can provide a better manufacturing or service process than the current operation; (3) managerial innovation: is a capability for implementing new managerial regulations, systems, practices, methods, etc., that increase managerial efficiency.

Two dimensions can be distinguished within the scope of innovation competences (Subramaniam and Youndt 2005; Chandy and Tellis 1998; Gopalakrishnan and Damanpour 1997; Damanpour 1996): Schumpeterian competences and continuous improvement competences. Innovation competences, while facilitating the integration of certain functional activities, continually explore new combinations of resources and, in order to adjust to the market or change it (Soosay and Hyland 2008; Eisenhardt and Martín 2000; Teece et al. 1997). Helfat and Raubitschek (2000), adopt a similar criterion, by distinguishing between knowledge systems and learning systems as different categories while being related to dynamic competences.

Schumpeterian competences are based on the radical growth of knowledge stock and generative learning. They lead to discontinuous changes in the activities developed in an organization by developing new technological or organizational abilities.

Continuous improvement competences are based on the incremental growth of knowledge stock. These competences lead to marginal changes with regard to the practices developed in the organization, and strengthen its competences and capabilities.

KM can contribute to the sustainability of competitive advantages, enabling the development of distinctive competences. Gloet and Terziovski (2004) go so far as to consider KM as the main drive behind the set of competences in an organization. In particular, KM implantation can enable innovation competences deployment (Subramaniam and Youndt 2005; Ronchi et al. 2003; Scarbrough 2003). The way organizations develop their wisdom and regenerate their knowledge stock is directly conditioned by the nature and significance of this management system. Along these lines, Zollo and Winter (2002: 339) state that the organization develops dynamic competences when three mechanisms coexist: the accumulation of experience, the articulation of knowledge and its codification. A KM system includes these elements. Hence, we can highlight the significance of KM for the generation and valuation of both individual and organizational knowledge. The introduction of KM systems permits the acquisition of new knowledge, which creates new routines, mental models and innovation (Ronchi et al. 2003; Studdard 2006).

KM adoption has a positive effect on the organizational processes that create, store, distribute and interpret knowledge, as well as the recruitment, retention and active involvement of talented employees. KM also has a positive impact on firm skill in managing R&D projects, to leverage the internal capability for knowledge acquisition and to increase

the stock of available knowledge (Gloet and Terziovski 2004; Cavusgil et al. 2003; Scarbrough 2003).

An organization focused on the development and of knowledge provides its human capital with rapid access to requested knowledge and technologies (Sherman et al. 2005; Ding and Peters 2000). Internal knowledge transfer occurs when knowledge-based assets are acquired and used (Hegde and Shapira 2007; Ranft and Lord 2002: 420). The organization of human and technical means to spread organizational memory promotes the capacity to apply technologies and innovations, to throw out obsolete knowledge and to try alternative ideas (Darrock et al. 2005).

The codification of the tacit knowledge gathered by the members of an organization enables knowledge diffusion to take place (Cavusgil et al. 2003; Nonaka 1994). Codification provides a support mechanism for the knowledge evolution process, since it promotes the generation of new proposals that change present routines.

The development of an organizational culture that encourages the sharing of knowledge promotes dialogue about work and the mistakes that have been made. In this sense, firms that belong to a cluster can use shared resources. Resources such as specialized manufacturing knowledge and technical capabilities can be shared in the form of a common "culture" of excellence and leading edge technical intelligence. An organizational and cultural context like this can attract talented people, thereby increasing human capital with relevant tacit knowledge (Scarbrough 2003).

Continuous learning and an innovative culture have a positive effect on the growth of knowledge stock (Liao et al. 2007). These authors state that organizations that encourage learning and commitment to innovation obtain more efficient programs focused on the internal development of technological competences.

A systemic view of the organization involves the development of systems that include the agents connected to the organization. In this sense, the availability of systems and resources to gather relevant information about suppliers, customers, financial markets, laws, etc., promotes this global view (Scarbrough 2003; Carlile 2002). The competences for technological perspective and competitive intelligence can multiply them.

Finally, competences management allows programs to be established that guide the internal development of technological competences, taking into account innovation competences referring to the key technologies (O'Regan and Ghobadian 2006). Competences development can benefit from the introduction of formation programs, multidisciplinary work teams or by encouraging diversity in research lines (McEvily and Marcus 2005; Dosi et al. 2000).

The promotion of innovation distinctive competences and the introduction of KM can strengthen the sustainability of the competitive advantages generated. The way KM is configured in an organization is unique, since the principles and practices used depend on the social and technological context of the firm. The possibility a firm has of appropriating the profits generated by its resources depends on the existence of perfectly defined property rights. The profits generated are the result of a complex network of relationships and are not attributed to determined production factors. We consider that KM enables firm profits to be appropriated since it promotes group work, and encourages the sharing of knowledge and the breaking down of interdepartmental barriers (Smith et al. 2005). In fact, the more an individuals' knowledge is inserted into organizational routines, the greater the possibility of the firm appropriating the results.

This theoretical reasoning implies that KM is defined as an antecedent variable of innovation distinctive competences. The argumentation of the positive effects of KM on the generation or regeneration of innovation distinctive competences, by highlighting its strategic relevance, allows us to formulate the following hypothesis:

H1: There is a positive relationship between the degree to which KM principles and practices are adopted and innovation distinctive competences.

As we distinguish two dimensions in construct innovation distinctive competences, this hypothesis can be split in two:

H1a: There is a positive relationship between the degree to which KM principles and practices are adopted and Schumpeterian distinctive competences.

H1b: There is a positive relationship between the degree to which KM principles and practices are adopted and continuous improvement competences.

The two dimensions of innovation competences are important for allocating resources in the firm. Investment in tangible resources and the use of human and

organizational resources lead to the development of flows of knowledge. The effect of innovation competences in the firm will be greater when Schumpeterian competences and continuous improvement competences have a strong feedback flow (Liao et al. 2007; Tsai 2001; Chandy and Tellis 1998; Gopalakrishnan and Damanpour 1997; Damanpour 1996). Chandy and Tellis (1998) state that when a radical innovation is introduced in a firm, it results in other incremental innovations. Therefore, it is necessary to consider the relation between the two dimensions, since it makes the theoretical model more valuable.

H2: Continuous improvement and Schumpeterian competences are positively correlated.

The theoretical model we developed with the key constructs is shown in Fig. 1.

3 Methodology

3.1 Variable definition

3.1.1 Knowledge management

In the last section we defined KM as a management system characterized by a set of principles and practices, whose aim is to create, store, convert, transfer, disseminate and apply the knowledge of the firm. Thus, KM is defined as a third-order level latent construct with two dimensions: principles and practices. Every dimension is a second-order level latent construct with six elements, which are the basic principles and practices that the organization uses to introduce these principles. In order to measure KM, we take the scale developed by Palacios and Garrigos (2005) as our base.

3.1.2 Innovation distinctive competences

Two approaches can be used to measure distinctive competences: (1) by means of substitute quantitative measures (proxy variables); (2) by means of suitable classification scales, thereby allowing the judgement and experience of managers to be expressed in subjective measures of such intangibles through numerical or semantic scales. A key problem in valuing capacities is how to remain objective. Some researchers (Rangone 1997: 209) prefer, whenever possible, to use proxy variables to evaluate intangible components. One basic reason for this option is the distrust expressed in much of the literature towards the objectivity of managers' perceptions of their own

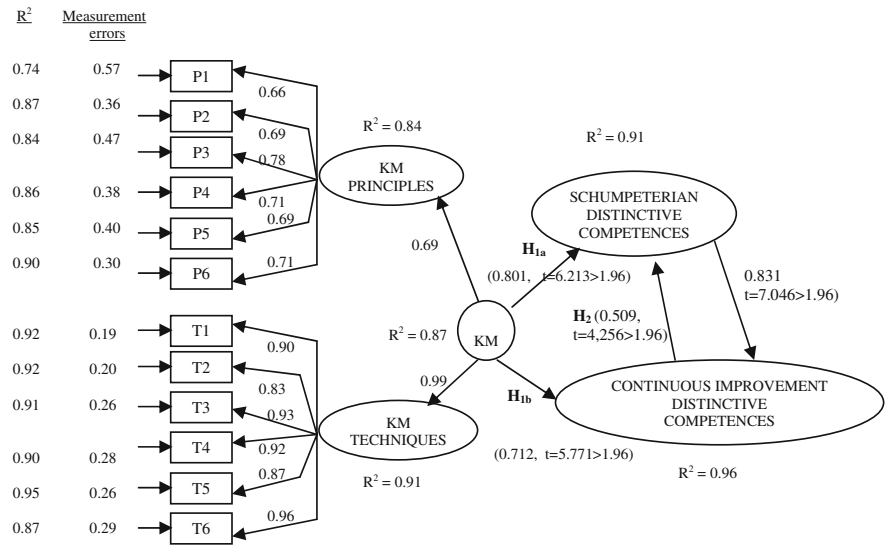

Fig. 1 Theoretical model

P/T1 = Orientation towards the development, transfer and protection of knowledge
P/T2 = Continuous learning in the organization
P/T3 = An understanding of the organization as a global system
P/T4 = Development of an innovative culture that encourages R&D project
P/T5 = Approach based on individuals
P/T6 = Competences development and management based on competences

organization's distinctive competences, recalling that they have a wide margin of variation, which may lead to serious errors of evaluation. This reluctance has been overcome in academic research by the work done to test the reliability and validity of subjective measurement scales.

The difficulty in measuring most intangible assets quantitatively has also been an influence. It may also be added that the proxy variables used frequently confuse flows with stock of assets, by adopting flow variables such as expenditure on R&D as measures, when distinctive competences are really stock variables (Dierickx and Cool 1989).

With regard to subjective scales, we consider that the correct measurement of distinctive competences should be carried out in relation to competitors. A successful strategy will only be feasible if it is constructed on the basis of the relative strengths of the firm. To measure innovation distinctive competences, we take previous work by Palacios et al. (2006) as our base. This scale measures innovation distinctive competences by means of a subjective semantic scale, based on the self-classification by managers of their firm in relation to its competitors. The scale requires the respondents to evaluate how well or badly they perceive the organization's stock of distinctive competences in each specific area in comparison with the competition. A Likert-type scale was used, with a range of five points from 1 = "much worse" to 5 = "much better." The scale is made up of 84 items to measure Schumpeterian competences and 73 items for continuous improvement competences. These scales meet the sociometric conditions (dimensionality, reliability and validity) required for measurement scales in social sciences. In the article by Palacios et al. (2006), you can see the list of items that make up the innovation distinctive competences scale.

3.2 Data collection

We consider knowledge- or high technology-intensive industries (Dalmaris et al. 2007) to be the most suitable population on which to carry out the empirical study. The biotechnology and telecommunications industries were chosen for the research because the management of intangibles is more clearly appreciated than in other types of industry. They are dynamic industries characterized by technological discontinuity, where innovation (usually radical) is a fundamental aim and the R&D effort is very high.

The fields of biotechnology and telecommunications are appropriate to study knowledge-based entrepreneurship since during the last 2 decades there has been an upsurge of new firms. Furthermore, it is undisputable that those new firms are knowledge based since these industries are widely acknowledged as science-based and even science-driven industries (Sciascia et al. 2006). Another interesting feature of new firms is almost always pure cases of entrepreneurship, in the sense that they are new technology-based firms. Firms are built upon the use of a new technology or the production of a new product. They do not usually use generic technologies that are already widely developed elsewhere. Hence, we dismiss here the problem of knowing whether or not the creation of a new firm can really be considered as a case of entrepreneurship (Metcalfe 2004).

In these industries there is a sophisticated and extensive venture capital market, investing in the early start-up phase of new companies. It is not just good ideas that lead to new and profitable companies; often large amounts of private equity or venture funding are required to take start ups from initial concept development, through proof of concept, and finally to product launch and market development. In particular, we note the existence of venture capital (VC) companies to finance start-up or early phase biotechnology and telecommunications companies (Colombo and Grilli 2006).

Within the knowledge-intensive industries, the universe selected was the Spanish population of biotechnology and telecommunications industries. The information on the variables was collected in a primary study, carried out by mail questionnaire. The questionnaire respondent was the manager of the firm, since he or she has the necessary global perspective to answer all the questions. The measuring instrument was pre-tested in 20 firms, 10 from the biotechnology and 10 from the telecommunications industries. The fieldwork was undertaken between January 2007 and April 2007.

The questionnaire was sent to all the firms making up the population. A total of 257 questionnaire responses were obtained. The statistical debugging of the questionnaires forced us to eliminate 35 of them for various reasons (existence of items without any

answer, doubts about the reliability of the responses, etc.). The sample finally included 222 firms (102 from the biotechnology industry and 120 from the telecommunications industry), thus giving a response rate of 45.1% and 14.2%, respectively. This final sample has a statistical margin of error of ±5.7% with a 95.5% confidence interval (for the worst case scenario).

The correlation matrix, the mean and standard deviation for each variable are reported in Table 1.

4 Results

Concerning the quality of the measurement model for the full sample, the constructs display satisfactory levels of reliability as indicated by composite reliabilities ranging from 0.85 to 0.99 and shared variance coefficients ranging from 0.74 to 0.95, following Fornell and Larcker's (1981) formula.

Although the initial scale used to measure Schumpeterian competences was made up of 84 items, 47 items were eliminated because their individual reliability was lower than the minimum required statistically. Similarly, 49 items were eliminated from the scale used to measure continuous improvement competences.

Convergent validity, in which the measurement is strongly and positively correlated with other measurements of the same construct, or with the variable with which it should theoretically correlate, can be judged by looking at both the significance of the factor loadings and the shared variance. The amount of variance shared or captured by a construct should be greater than the amount of measurement error (shared variance >0.50). All the multi-item constructs meet this criterion, and each loading (λ) is significantly related to its underlying factor (t-values greater than 5.22) in support of convergent validity.

Likewise, a series of chi-square difference tests on the factor correlations showed that discriminant validity, which indicates to what extent two measures developed for similar but conceptually different constructs are related, is achieved among all constructs (Anderson and Gerbing 1988). In particular, discriminant validity was established between the two latent variables, innovation distinctive competences and knowledge management, by constraining the estimated correlation parameter between them to 1.0 and then performing a chi-square difference test on the values obtained for the constrained ($X^2 = 298.12$, d.f = 124) and unconstrained models ($X^2 = 242.13$, d.f = 123). The resulting significant difference in chi-square ($\Delta X^2 = 55.99$, Δd.f = 1) indicates that the two constructs are not perfectly correlated and that discriminant validity is achieved (Bagozzi 1981). That is, from a measurement model point of view, the constructs innovation distinctive competences and knowledge management represent two distinct constructs, not one.

Turning to the structural model itself, the analysis carried out is integral and takes into account all the variables. The purpose of this analysis is to test the relationships between the different pairs of variables as a whole, in order to determine the direction and significance of these relationships. The results are shown in Fig. 1. For each of the relationships considered, the value of the parameter appears first, followed, in parentheses, by the t-value that determines the significance of this parameter. When this value is below 1.96, the relationship is not significant. Table 2 reports the goodness-of-fit indicators of the structural equation system. The model has 42 degrees of freedom and is significant as a whole ($p > 0.05$). The results provide satisfactory support for the model.

The results of the structural equation model confirm all the causal relationships proposed in Fig. 1. The degree of KM introduction has a strong effect on the accumulation of Schumpeterian distinctive competences (0.801, $p < 0.001$), and indirectly on continuous improvement distinctive competences

Table 1 Correlation matrix and summary statistics

		Mean	Standard deviation	1	2
1	Continuous learning distinctive competences	3.694	0.355		
2	Schumpeterian distinctive competences	3.714	0.352	0.432***	
3	Knowledge management	3.782	0.365	0.104**	0.109***

*** $p < 0.001$; ** $p < 0.01$

Table 2 Goodness-of-fit indicators of the structural equation system

Chi^2 Satorra-Bentler	d.f.	P	BBNFI	IFI	GFI	AGFI	PGFI
0.0712	42	0.3125	0.9413	0.9442	0.9275	0.9103	0.9289

(0.66, $p < 0.001$). In the same way, KM introduction has a strong effect the accumulation of continuous improvement distinctive competences (0.712, $p < 0.001$), and indirectly on Schumpeterian distinctive competences (0.591, $p < 0.001$).

5 Conclusions and future implications

KM construct suggests the existence of two dimensions: principles and practices. Principles, referring to a higher level of research that is more abstract or related to ideas, are carried out through a set of techniques that add the necessary tools to guarantee that KM is adequately implemented in the organization. Therefore, we understand that the degree to which a KM system is adopted requires principles and practices to be introduced that focus on the orientation towards the development, transfer and protection of knowledge, continuous learning in the organization, an understanding of the organization as a global system, the development of an innovative culture that encourages R&D projects, an approach based on individuals and competence development and management based on competences.

From the theoretical model developed and subsequently validated through the empirical data, we can draw the following conclusions:

(1) There is a positive causal relationship between KM (principles and practices) and innovation distinctive competences. Introducing a KM program in the organization has an effect on the generation of innovation distinctive competences. The abilities that KM helps to develop are skills in investment and knowledge flow management, the acquisition of internal knowledge, transfer, dissemination and internal application of accumulated knowledge, and an increase in the variety of the organizational memory. In this sense, KM should be understood as an institutional mechanism able to stimulate the coordination of explicit and tacit knowledge that is disseminated through the organization and its environment. Therefore, KM is strongly connected to the innovation capacity of the firm. This empirical evidence allows us to further the knowledge on organizational actions that enable development and renewal of the strategic assets portfolio, proclaimed by the dynamic approaches of RBV.

(2) This work is an interesting contribution to the literature in that it exacts knowledge on the causal relationship between KM and innovation. The implantation of a KM system is not able to directly improve firm performance, but it exerts an indirect influence by developing innovation distinctive competences. Thus, consultant and software firm advertising that considers KM as a panacea to improve organizational competitiveness is shown to have no basis. A firm will successfully introduce KM programs if it is able to imbue KM principles and practices with processes, routines and individuals, in order to increase its organizational memory and its ability to obtain, transfer and apply knowledge.

(3) The effect of KM introduction on the accumulation of innovation distinctive competences is due to the utilization of practices, more than to the acceptation of a set of principles. This supports the work of Drucker (1993), who predicted that an important challenge to organizations in the knowledge society would be the systematic construction of practices to manage their own auto-transformation. This empirical study reveals that it is more important to put KM principles into practice than the existence of a commitment towards the KM approach, but this doesn't articulate across practices. In the present business context, this result indicates that it is not possible to develop principles to manage and develop knowledge without the support of technological and organizational practices. KM stimulates the raising, dissemination and application of knowledge through the organization by means of techniques and practices that promote continuous learning and the development of employees' cognitive competences.

(4) There is a positive relationship between Schumpeterian distinctive competences and continuous distinctive competences. The effect of Schumpeterian distinctive competences on continuous distinctive competences (0.831) is stronger than the other way around, which shows the positive relationship between both dimensions of innovation distinctive competences. It confirms that when a radical innovation is introduced into a firm, it results in other incremental innovations.

One limitation of the study refers to the common method bias. To some extent the correlations among some variables could be due to the fact that they were all assessed in the same manner from the same data source, i.e., questions in a mail questionnaire.

Future research should extend the scope of the study by introducing new elements, as well as incorporating breakthroughs in the field. A first line of study lies in the methodological field. Although the KM measurement scale has been successfully validated, it is an exploratory contribution that requires new empirical studies to test and improve it. A second line of research should introduce longitudinal works that include knowledge stocks and flows. For organizations, it would be especially interesting to determine the knowledge flows that allow for the improvement of a particular type of competence, recombining their resources to prioritize some flow variables. A longitudinal approach would enable us to theoretically reflect the existence of a temporal gap between the beginning of a KM program and the generation of results. In addition, the necessary time could be calibrated to widen the stock of innovation distinctive competences and its effect on firm performance. At a theoretical level, it would be of interest to study KM effects on all types of distinctive competences. Adding cohesion and functional competences could incorporate new knowledge about the way in which the introduction of a KM system may improve functional activities, as well as the combination of resources and capacities that adjust better to the market.

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