



Managerial perceptions of the competitive environment and dynamic capabilities generation

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Abstract

Purpose – The aim of this paper is to study empirically the influence of managerial perceptions of the environment on dynamic capabilities (DC) generation. It seeks to identify three dimensions of competitive environment (dynamism, complexity, and munificence) and then use the theoretical model developed by Zollo and Winter to explain DC creation.

Design/methodology/approach – The authors use data collected from 200 Spanish firms through a questionnaire to perform multiple and simple regression analyses that examine the relationship between managerial perceptions and DC generation.

Findings – It is found that managerial perception of munificence in the environment is related positively and significantly to the processes of DC creation; only when managers perceive the environment as highly dynamic and complex do they promote processes for developing DC.

Practical implications – The findings suggest that managerial cognition plays an important role in DC processes. Thus, managers should evaluate their mental models and value systems to determine whether they provide an accurate understanding of the environment.

Originality/value – The understanding of DC must be developed through empirical papers, as unresolved theoretical inconsistencies create many challenges in this area. The proliferation of theoretical papers has produced a disconnected body of research.

Keywords Individual perception, Managers, Learning, Organizations

Paper type Research paper

1. Introduction

There is no doubt that firms now find themselves in high-speed competitive environments where maintaining competitive advantage is a definite challenge (Avila *et al.*, 2009).

Our study seeks to identify the keys to survival and even progress in such difficult competitive environments. To achieve this goal, our research adopts the framework of the theory of resources and capabilities (Barney, 1986, 1991, 2001; Peteraf, 1993; Rumelt, 1991; Teece, 1982; Wernerfelt, 1984), specifically the dynamic capabilities (DC) focus (Eisenhardt and Martin, 2000; Teece *et al.*, 1997), which attempts to explain why adaptive differences are found among firms in the same sector (Teece, 2007).

Currently, the main challenge for the DC focus is to develop empirical studies that provide evidence to resolve the conceptual debates in the literature (Ambrosini *et al.*, 2009; Aragón-Correa and Sharma, 2003; Macher and Mowery, 2009; Narayanan *et al.*, 2009). This paper contributes to the emerging literature on DC by measuring the relationship between managerial perceptions of competitive environment and DC generation.

In defining DC, the literature consistently refers to their utility for survival and advance in challenging competitive environments. This study thus investigates



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to what extent managers' perceptions stimulate the development of DC in the organization. We base our work on the model proposed by Zollo and Winter (2002), which establishes that DC are developed through three learning mechanisms responsible for renewing existing knowledge in the organization.

The paper makes three main contributions:

- (1) Measurement of the DC generated in the organization, using three measurement scales for learning mechanisms (experience accumulation, knowledge articulation, and knowledge codification).
- (2) Empirical evidence to confirm that perceived munificence promotes the use of learning mechanisms to generate DC, despite the fact that only negative environmental dimensions (dynamism and complexity) have been considered in the DC literature.
- (3) Demonstration that the generation of DC is not a necessary condition for survival in some context.

When managers perceive the environment as stable and simple, they tend not to devote resources to generating DC. Only when managers perceive a high degree of dynamism and complexity in the environment do they promote the generation of DC.

2. Literature review

2.1 *Dynamic capabilities focus*

The DC perspective emerged in the 1990s as an extension of the theory of resources and capabilities (Barney, 1991, 1995). Its main objective is to provide a dynamic view of the principles established by the theory.

The theory of resources and capabilities argues that the firm obtains a competitive advantage because it has available a set of resources that are heterogeneous as compared with those of other firms. These resources are defined as rare, valuable, difficult to imitate, and imperfectly substitutable (Barney, 1991, 1995).

This argument provides a good starting point for studies of strategic management. Despite its value, and given the changing conditions in the competitive environment, the theory requires a dynamic vision that attempts to explain how this set of resources evolves as required by the agents and circumstances of the environment. The DC focus emerges to address the limitations of the theory of resources and capabilities.

Although the DC perspective has advanced considerably since its beginnings, some contradictions still impede the development of the scientific literature (Ambrosini and Bowman, 2009) and, to a greater extent, the performance of empirical studies to contrast and develop the theoretical principles (Pablo *et al.*, 2007).

DC have been defined as "the firm's abilities to integrate, construct and reconfigure the internal and external competences so as to react quickly to dynamic environments" (Teece *et al.*, 1997). In spite of a long list of definitions of DC, there seems to be consensus on the concept of DC as internal processes responsible for modifying the set of the organization's resources (Ambrosini and Bowman, 2009). One of the most recent definitions, proposed by Helfat *et al.* (2007), stresses that DC are produced by the organization's conscious intentions and therefore do not emerge spontaneously.

All definitions we find in the literature are derived from the idiosyncratic nature of the organization (Zollo and Winter, 2002), itself the result of the firm's path dependence

(Makadok, 2001). Because DC are highly encrusted in the organization, it is difficult to identify them (Eisenhardt and Martin, 2000).

Many of the authors who define DC establish that they can be understood as organizational routines, since DC assume learned, stable, and repetitive patterns of behaviour (Zollo and Winter, 2002) that enable balanced reconfiguration of the firm's resources without destabilizing the organization (Ambrosini and Bowman, 2009; Collis, 1994; Helfat *et al.*, 2007; Zahra *et al.*, 2006; Zollo and Winter, 2002; Zott, 2003).

Some examples of DC can be found in the processes of acquisition, fusion or creation of strategic alliances (Karim and Mitchell, 2000; Zollo and Winter, 2002), technological innovation for the development of products and services (Danneels, 2002), absorption capacity[1] (Zahra and George, 2002) and reconfiguration of the organizational structure (Karim, 2006).

2.2 The process of generating DC

In spite of the extensive body of theoretical studies of this topic, very few papers study the generation or creation of DC. Most studies attempt to contribute new definitions of the term and discuss the implications to be derived from them (Ambrosini and Bowman, 2009).

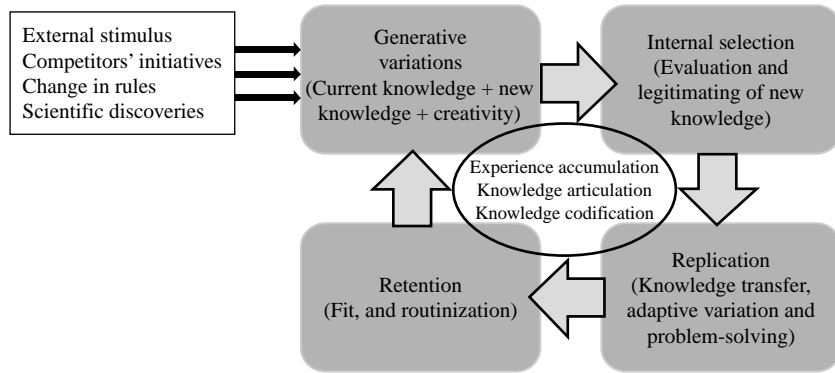
Our interest in understanding the generation of DC and the set of factors that stimulate or inhibit their generation has led us to ground our study in the work of Zollo and Winter (2002), the main study of the internal processes that give rise to the generation of DC (Ambrosini and Bowman, 2009; Barreto, 2010). Other studies deepen our understanding of this process by contributing complementary ideas and suggesting global models of the construction of DC (Bierly and Chakrabarti, 1996; Grant, 1996; Nielsen, 2006; Nonaka, 1994; Paoli and Prencipe, 2003; Zahra *et al.*, 2006).

Although there is no consensus on a model to explain the process of generating DC, we find that all studies share a common premise: organizational learning is the foundation for DC (Ambrosini *et al.*, 2009; Bierly and Chakrabarti, 1996; Grant, 1996; Nielsen, 2006; Paoli and Prencipe, 2003; Zollo and Winter, 2002).

Zollo and Winter (2002) articulate this assumption and propose a set of learning mechanisms that enable the generation of DC, mechanisms to develop the learning needed to understand the environmental circumstances and to change organizational routines. The learning mechanisms proposed by Zollo and Winter are experience accumulation, knowledge articulation, and knowledge codification. These mechanisms constitute ways of accumulating and renewing knowledge, as well as establishing knowledge in new organizational routines.

This models the problem of the creation of DC clearly and specifically and thus provides the crucial starting place for developing empirical studies (Ambrosini and Bowman, 2009). The fundamental role of the learning mechanisms is to modify existing knowledge to adapt the organization to its competitive environment (Chen *et al.*, 2010; Li and Tsai, 2009).

According to the model developed by Zollo and Winter (2002), the three learning mechanisms constitute a cycle by which organizational knowledge evolves. For Zollo and Winter, this is a cycle of ongoing tasks of exploration and exploitation, to seek solutions to the demands of the environment and convert these solutions into organizational routines. Figure 1 describes this cycle.



Source: Adapted form Zollo and Winter (2002)

Figure 1.
The cycle of renewal of
organizational knowledge

Experience accumulation constitutes a fundamental learning process by which organizational routines are developed and established within the organization. It is a semi-automatic process of accumulating tacit knowledge, since the organization can accumulate experience without performing explicit processes of organizational learning (Ruiz-Moreno *et al.*, 2005; Zollo and Winter, 2002).

Knowledge articulation is the process by which individual knowledge is shared through group discussions, information sessions, and processes that evaluate performance (Zollo and Winter, 2002). With this set of processes, the organization's members determine the effectiveness of organizational tasks and propose and communicate changes to improve performance (Easterby-Smith *et al.*, 2009; Levinthal and March, 2006; Macher and Mowery, 2009).

Knowledge codification is the mechanism through which individuals express their knowledge in written tools, reports, memoranda, and work programmes. This organizational learning mechanism involves a higher level of cognitive effort (Zollo and Winter, 2002). Knowledge codification consists of converting knowledge into information that any member of the organization can access, thereby facilitating the use of the tacit knowledge submerged in organizational routines.

Knowledge articulation and codification are closely related. The more easily knowledge is articulated and transmitted, the less cognitive effort is required to codify it. We cannot, therefore, ignore the relation between the three learning mechanisms, as the level of articulation of knowledge codification depends ultimately on the experience accumulated in the organization (Zollo and Singh, 2004).

Some empirical studies have used the theoretical model developed by Zollo and Winter (2002) as a starting point (Macher and Mowery, 2009; Swift and Huang, 2008; Zollo and Singh, 2004). The study performed by Macher and Mowery (2009) confirms that these learning mechanisms are used in specific industries when the organization seeks to generate new processes for product development. Zahra *et al.* (2006) have added other mechanisms to explain the genesis and evolution of DC – namely, trial and error, improvisation, and imitation.

2.3 Managerial cognition and DC generation

Many scholars (Ambrosini and Bowman, 2009; Eisenhardt and Martin, 2000; Helfat *et al.*, 2007; Tripsas and Gavetti, 2002) highlight the key role managers' play in adaptation

processes. In the DC, framework is argued that the generation of DC successfully depends on the commitment and skills of managers (Ambrosini and Bowman, 2009; Rosenbloom, 2000).

In this sense, Harreld *et al.* (2007) put forward that one of the managerial goals should be to develop DC. According to Augier and Teece (2009), managers must to articulate goals, help to evaluate opportunities, set culture and build trust in order to develop successful adaptation processes. Even, Rosenbloom (2000) demonstrated that managers are able to create an organizational learning culture that enhances DC. To this end, first, they must be able to sense changes in the competitive environment, for then, to reconfigure assets in order to meet new challenges. In great measure, the generation DC process will depend on the managers' ability to identify new strategic opportunities and threats. Not many CEOs have the necessary skills to scan the competitive environment, and sometimes, managers may fail to perceive environmental conditions in the correct way, with the result of inadequate strategic decisions for adaptation.

Adner and Helfat (2003) thus introduce the concept of dynamic managerial capabilities, or the capabilities with which managers build, integrate, and reconfigure organizational resources and competences. This concept is a direct analogy to more general organizational DC.

Dynamic managerial capabilities are rooted in three underlying factors: managerial human capital (Castanias and Helfat, 1991, 2001), managerial social capital (Burt, 1997; Gelatkanycz *et al.*, 2001), and managerial cognition (Hambrick and Mason, 1984). Managerial human capital refers to managers' skills based on education, training, and expertise and managerial social capital to social relationships that managers maintain, including internal and external networks.

Despite the interest of both components, we focus attention on managerial cognition that is, on the managerial beliefs and mental models that serve as a basis for decision making (Adner and Helfat, 2003). Our survey measures managerial perceptions of competitive environment to analyze how managerial beliefs influence the generation of DC.

Top management often fails to promote mechanisms for change due to inappropriate mental models (Tripsas and Gavetti, 2002). Managers may not lack full information about future events, alternatives, and consequences (Augier and Teece, 2009). They may also have a limited field of vision, selective perceptions, and interpretations filtered by their cognitive base and value system (Adner and Helfat, 2003). Consequently, even though environmental conditions require an adaptation process, top management may not perceive the need for change. Although the DC literature has considered dynamism of the environment to be the major factor in developing DC, it is even more consistent to view managerial cognition as one of the most significant triggers. Other environmental perceptions may also influence managers to initiate renewal processes.

Building on these observations, we will analyze how managers' environmental perceptions can influence the generation of DC. We focus on their perceptions of dynamism, complexity, and munificence.

3. Research model and hypotheses

3.1 Managerial perception of dynamism

Environments characterized by dynamism require continuous adaptation and reconfiguration to endow the organization with the resources and capabilities

needed in the environment (Teece *et al.*, 1997). Such change can only be achieved by generating DC.

However, there are different points of view related with the level of environmental dynamism. Some scholars propose that DC are always needed, even when the environment is stable (Ambrosini *et al.*, 2009; Eisenhardt and Martin, 2000). Therefore, these authors decompose the DC in different types, following a hierarchy based on the level of environmental dynamism. For example, Ambrosini *et al.* (2009) distinguish between incremental DC (in stable environments) and renewing DC (in changing environments).

On the contrary, Zollo and Winter (2002) suggest that organizations in stable environments do not invest time and resources in the generation and maintenance of DC, as obtaining competitive advantage in such contexts can be limited to developing efficient processes that are well understood and codified (O'Connor, 2008) without the need for more complex tools. The generation and maintenance of DC involves a substantial cost that companies do not assume when it is not necessary.

In this sense, to develop DC, first, environment must be changing, and then, managers must perceive that this condition requires adaptation processes. Even though the environment is objectively very dynamic, renewal processes begin only when managers perceive correctly the changes occurring in their competitive environments and believe that they should become involved in such processes (Adner and Helfat, 2003; Eisenhardt and Martin, 2000; Helfat *et al.*, 2007; Tripsas and Gavetti, 2002). Further, how the way that the managers interpret the questions of the competitive environment will affect the decisions and actions related to the development of DC (Aragón-Correa and Sharma, 2003; Augier and Teece, 2009; Adner and Helfat, 2003; Hitt and Ireland, 2002).

We can thus expect firms whose managers perceive clear dynamism of the environment to make considerable use of the three learning mechanisms proposed by Zollo and Winter (2002) to generate DC. That is, when managers perceive that the environment surrounding them is dynamic and uncertain, they believe it necessary to design tools that enable them to survive and even progress under these conditions.

According to this approach, we can establish the first hypothesis, which is divided into three sub-hypotheses:

- H1a.* The level of experience accumulated in organizations is positively related to the degree of dynamism perceived by their managers.
- H1b.* The level of knowledge articulation in organizations is positively related to the degree of dynamism perceived by their managers.
- H1c.* The level of knowledge codification in organizations is positively related to the degree of dynamism perceived by their managers.

3.2 Managerial perception of complexity

Since one fundamental trait of today's environment is its dynamism or uncertainty, we stress the variety involved in managing change. The firm must be prepared not only to react, but also to understand and respond to a wide range of contingencies (Child, 1972; Duncan, 1976; Sánchez, 1995).

Thus, another dimension that characterizes competitive environments is their complexity. A competitive environment is complex when it is shaped by a set of many

factors that are very different from each other (Dess and Beard, 1984; Mintzberg, 1979; Miller and Friesen, 1987). Complexity can come from the diversity of agents that form the environment and of inputs and outputs used, from the heterogeneity of geographical markets, the set of technologies used in the organization, etc. A high degree of complexity can even come from the level of uncertainty in the competitive environment. Whatever its source, such heterogeneity indicates such conditions as multiple information sources, a great variety of interpretations, contradictory demands from stakeholders (Freeman, 1984) that can ultimately hinder or slow the organizational decision-making processes.

The organization should thus promote learning systems that channel cognitive effort into integrating the different perspectives to enable comprehension of the different signals received from the environment, storing of information related to previous experiences, and the transmission and growth of this information (Benitez-Amado *et al.*, 2009). We highlight the value of absorptive capacity (Zahra and George, 2002) as one of the most DC influencing the firm's ability to create and deploy new knowledge to understand different situations.

Kogut and Zander (1993) compare DC to combinatorial capabilities, which constitute processes of organizational learning responsible for exploiting basic knowledge to recombine it to respond to a wide range of circumstances. DC thus also constitute a mechanism for integrating the organization's basic organizational routines. This mechanism involves a higher order capacity that enables the organization to use basic knowledge to treat a complex problem (Teece *et al.*, 1997).

We can thus conclude that the learning mechanisms proposed by Zollo and Winter (2002) for the construction of DC will help keep organizations safe from the challenges of complex competitive environments. We should assume that firms whose managers perceive high complexity in the competitive environment will promote the development and use of learning mechanisms to generate capabilities that enable them to reconfigure, integrate, and combine their resources and basic knowledge in the face of new and varied demands from agents in the environment.

In accordance with this approach, we develop *H2* with its three sub-hypotheses:

- H2a.* The level of experience accumulated in organizations is positively related to the degree of complexity perceived by their managers.
- H2b.* The level of knowledge articulation in organizations is positively related to the degree of complexity perceived by their managers.
- H2c.* The level of knowledge codification in organizations is positively related to the degree of complexity perceived by their managers.

3.3 Managerial perception of munificence

The last dimension of the environment we will discuss is munificence, or the degree to which environmental conditions enable sustained growth in the organizations that participate in the environment (Aldrich, 1979; Dess and Beard, 1984). In a munificent environment, the resources that the firm needs are within its reach, enabling the firm to establish a lower degree of rivalry with its competitors in the sector. A munificent competitive environment is commonly characterized by a high rate of growth of sales (Dess and Beard, 1984) and relatively few legal actions among the members of the sector. In contrast, hostile and competitive environments experience frequent

aggressive actions by competitors and stakeholders that block the opportunities surrounding the firm.

The conditions of the competitive environment ultimately shape the organization. In munificent competitive environments, top management has a wide range of strategic options that can be implemented without restrictions due to limitations of resources or blockages by stakeholders (Wiersema and Bantel, 1993).

When managers perceive a high level of munificence in their context, we can expect them to try to find the right conditions for developing processes of organizational learning and thus for generating DC. In contrast, when they perceive environments with aggressive actions by competitors and stakeholders, they allocate resources to others goals. In these environments, we expect the promotion of learning processes to take second place, whether due to the cost involved or to the time and dedication required for putting them into practice. Further, scarcity of resources and pressures exercised by stakeholders will generate difficulties and tension for the managers, ultimately blocking and restricting many of the strategic options considered (Wiersema and Bantel, 1993). We can now develop the third hypothesis:

H3a. The level of experience accumulated in organizations is positively related to the degree of munificence perceived by their managers.

H3b. The level of knowledge articulation in organizations is positively related to the degree of munificence perceived by their managers.

H3c. The level of knowledge codification in organizations is positively related to the degree of munificence perceived by their managers.

In Figure 2, we draw together our research model. Each learning mechanism is explained through the managerial perceptions of environment and three control variables considered (size, sales, and age).

4. Research design and methodology

4.1 Measures and survey

To contrast the hypotheses proposed, we designed a questionnaire composed of all variables in the set of hypotheses (Appendix). These variables include the three dimensions of competitive environment considered (dynamism, complexity, and munificence) and the three learning mechanisms proposed by Zollo and Winter (2002) for the generation of DC, as well as a set of control variables – the firm’s age, sales

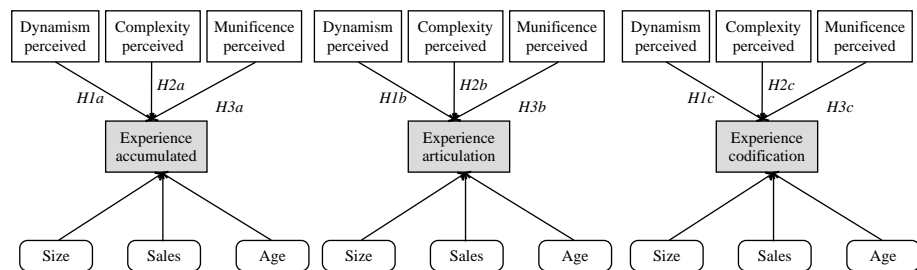


Figure 2.
The research model

volume, and size. To measure managerial perceptions of the competitive environment, we asked the interviewee about his or her subjective evaluation of the environment.

Before using the questionnaire, we developed a pilot survey to refine the scales designed. We interviewed four CEOs and used their responses and suggestions to improve the questionnaire. The purpose of these interviews was to ensure the clarity and the understanding of items. Based on the CEOs' comments, we rewrote questions that were unclear or difficult to answer. The revised questionnaire consisted of short questions and simple words that avoided ambiguous formulations.

The questionnaire was sent to a population of 1,500 Spanish firms. The data collection process ended in April 2009. We obtained a total of 200 valid responses, which compose our research sample (response rate of 13.4 percent). To test for no response bias, we calculated the sample error equal to 6.5 percent, obtaining confidence level of 95 percent ($p = q = 0.5$). A maximum level of 10 percent is considered acceptable in social sciences studies (Scandura and Williams, 2000). We then followed Armstrong and Overton (1977) to develop an exploratory analysis to compare the key dimensions (size, sales, age, etc.) of the population and the sample and confirmed that there were no statistically significant differences between the basic characteristics of the firms in the populations and the firms ultimately included in the study sample. We also compared the first and last responses to determine that there were no significant differences between them. To achieve this last goal, we used several extrapolation techniques proposed by Armstrong and Overton (1977).

Table I shows the breakdown of the sample taking into account the size and age sales of businesses.

The firms in the population were chosen from any sector of the Spanish economy, as we sought to access different competitive environments with different levels of dynamism, complexity, and munificence to enable us to test the set of hypotheses proposed. Table II shows the distribution of firms in according to sectors of activity.

Size	Fewer than 50 employees	43 cases
	Between 50 and 250 employees	52 cases
	Between 250 and 1,000 employees	44 cases
	More than 1,000 employees	61 cases
Sales	Less than €1 million	15 cases
	Between €1 and €7 millions	37 cases
	Between €7 and €40 millions	55 cases
	More than €40 millions	93 cases
Age	Less than five years	25 cases
	Between five and ten years	45 cases
	More than ten years	130 cases

Table I.
Sample details

Primary	24 (12.00)
Secondary	49 (24.50)
Tertiary	127 (63.50)

Table II.
Sector of activity of firms in the sample

Note: The values in parentheses are calculated in percentage

All questionnaires were addressed to the general manager or CEO of the firm in question. We stated explicitly in each part of the questionnaire that the questionnaire only be answered by the person to whom it was addressed.

The questionnaire contained a set of Likert-type measurement scales, in which the interviewee could indicate on a scale of 1-7 to what extent he or she agreed with the statement described in the item as it applied to his or her firm. We began with a set of 12 items to measure the three dimensions of competitive environment (three items for each dimension). To measure the learning mechanisms, we added eight items for each mechanism (knowledge codification, knowledge articulation, and experience accumulation).

The measurement scale used for studying the dimensions of the environment was taken from Tan and Litschert (1994), as this scale has been used and validated in numerous prior studies. Since we did not find a scale that fit our objectives to measure the three learning mechanisms, we designed three eight-item scales based on the scientific literature. The set of items used is designed to reflect the possible traits of the three mechanisms as they are described in prior studies. For control variables (age, size, and sales volume), we used number of employees to measure firm size.

Each of the scales included in the questionnaire underwent a confirmatory and an exploratory analysis to test a set of psychometric properties such as reliability and convergent and discriminant validity. In some cases, it was necessary to delete certain items, because they did not meet the statistical standards established. The resulting scales show high values of reliability and validity (for more detail, see Appendices 1 and 2; Table III).

We now present a Table IV with the descriptive analysis of the variables.

5. Statistical research

To contrast the hypotheses, we first performed a multivariate regression analysis, in which the dependent variables were the three learning mechanisms (experience accumulation, knowledge articulation, and knowledge codification) and the independent variables were the three dimensions of the competitive environment (dynamism, complexity, and munificence). The analysis was performed in several stages, introducing a new independent variable at each stage to analyze the effect of inclusion on the global model.

To complete the contrast, we performed a simple regression analysis, dividing the sample into three levels and analyzing the dynamism and complexity of the competitive environment.

The regression analysis was performed with the application SPSS 15.0. Before developing the study, we confirmed that the variables considered fulfilled the properties required for regression analysis. The set of variables fulfilled the requirements of

Table III.
Cronbach's alpha for the measurement scales

Variable (no. of items in the purified scale)	Cronbach's alpha
Dynamism (three items)	0.872
Complexity (two items)	0.851
Munificence (three items)	0.815
Experience accumulation (four items)	0.896
Knowledge articulation (six items)	0.905
Knowledge codification (six items)	0.823

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. Dynamism	4.50	1.51								
2. Complexity	4.48	1.54	0.713**							
3. Munificence	4.95	1.37	0.041	0.000						
4. Experience accumulation	4.97	1.13	0.151*	0.114	0.415**					
5. Knowledge articulation	3.46	0.85	0.097	0.092	0.320**	0.665**				
6. Knowledge codification	4.56	1.46	0.146*	0.094	0.235**	0.434**	0.431**			
7. Size	2.63	1.17	-0.011	0.033	-0.093	-0.072	0.007	0.219**		
8. Age	2.54	0.73	0.016	0.137	-0.223	-0.118	-0.162*	-0.034	0.370**	
9. Sales	3.13	0.96	-0.006	0.031	-0.018	-0.033	-0.033	0.106	0.579**	0.507**

Note: Significance at: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

Table IV. Means, standard deviations, and correlations

linearity, homoscedasticity, and normality. We also confirmed that there were no problems of multicollinearity by using the tolerance index and the variance inflation factor.

Table V shows the results of the first multiple regression. This analysis seeks to explain the behaviour of the variable experience accumulation through the three dimensions of the competitive environment and the three control variables. On introducing each of the variables, we observe that only perception of munificence exercises a significant influence on accumulated experience. In this regression analysis, the other variables do not exercise a significant influence on experience accumulation.

The perception of munificence expressed by the interviewee produces a regression coefficient of 0.402 in the final model, significant for a confidence level of 99 percent. With this variable, the final model that emerges from the regression explains 19.2 percent of the variance in experience accumulation.

The results obtained from this initial analysis enable us to confirm *H3a*. We do not, however, obtain empirical evidence to confirm *H1* and *H2a*, as the regression coefficients for perception of dynamism and complexity are not statistically significant.

Table IV shows the following multivariate regression analysis taking knowledge articulation as the independent variable. The results are similar to those in the previous table. Only the interviewee's perception of munificence influences the independent variable significantly.

The regression coefficient for munificence of the environment reaches 0.297 in the final model and is significant for a confidence level of 99 percent. The other variables considered in the analysis do not exercise a significant influence on knowledge articulation. The final model explains 12.9 percent of the variance in knowledge articulation (Table VI).

These results enable us to confirm *H3b*, which establishes a positive relation between the manager's perception of munificence and the level of knowledge articulation. We do not, however, find empirical evidence to confirm *H1* and *H2b*, as the perceptions of dynamism and complexity are not significantly related to knowledge articulation.

Table V shows the regression analysis, taking knowledge codification as the dependent variable. The results are consistent with the previous regressions. Only munificence of the competitive environment influences the organization's level of knowledge codification significantly. Perception of munificence of the competitive environment produces a regression coefficient of 0.297, significant for a confidence level of 99 percent. This third regression explains 13.9 percent of the variance in knowledge codification (Table VII).

With this last regression, we confirm that *H3c* is fulfilled. However, we do not obtain empirical evidence for *H1* and *H2c*.

To continue studying *H1* and *H2*, we perform an additional analysis, stratifying the study sample into three levels to analyze dynamism and complexity.

To divide the sample, we performed an optimal scaling process, using the statistical programme SPSS 15.0. The sample was divided by grouping the cases based on the comparison of the arithmetic mean and the standard deviation (Jaccard *et al.*, 1990).

For each dimension (dynamism and complexity) we stratified the sample. We then performed a simple regression analysis, taking perceived dynamism and perceived complexity as independent variables and each learning mechanism as a dependent variable. A simple regression analysis avoids creating interactions between the two independent variables.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	4.462*** (0.250)	4.450*** (0.266)	2.809*** (0.354)	2.907*** (0.400)	3.002*** (0.474)	3.000*** (0.480)
Dynamism	0.151** (0.053)	0.141 (0.075)	0.107 (0.069)	0.105 (0.069)	0.101 (0.069)	0.101 (0.101)
Complexity		0.014 (0.074)	0.038 (0.067)	0.041 (0.068)	0.46 (0.069)	0.047 (0.047)
Munificence			0.410*** (0.053)	0.407*** (0.053)	0.402*** (0.055)	0.402*** (0.055)
Size				-0.034 (0.063)	-0.025 (0.067)	-0.026 (0.077)
Age					-0.027 (0.111)	-0.028 (0.122)
Sales						0.003 (0.102)
F	4.061**	0.018	40.950***	0.277	0.142	0.001
R ²	0.023	0.023	0.19	0.192	0.192	0.192
Adjusted R ²	0.018	0.013	0.178	0.175	0.171	0.162
Change in R ²	0.023	0.000	0.168	0.000	0.000	0.192

Notes: Significance at: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$; dependent variable: accumulated experience; regression coefficients and standard errors are shown in parentheses

Table V. Multivariate regression, accumulated experience

Table VI.
Multivariate regression,
knowledge articulation

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	3.221 *** (0.191)	3.189 *** (0.203)	2.223 *** (0.281)	2.147 *** (0.318)	2.159 *** (0.373)	2.526 *** (0.377)
Dynamism	0.097 (0.040)	0.063 (0.057)	0.037 (0.055)	0.039 (0.055)	0.021 (0.055)	0.022 (0.055)
Complexity		0.047 (0.056)	0.066 *** (0.054)	0.064 *** (0.054)	0.093 *** (0.054)	0.093 *** (0.054)
Munificence			0.319 *** (0.042)	0.322 *** (0.042)	0.296 *** (0.043)	0.297 *** (0.044)
Size				0.035 (0.050)	0.083 (0.053)	0.089 (0.061)
Age					-0.139 * (0.087)	-0.134 (0.096)
Sales		0.220				-0.014 (0.080)
F	1.880	0.011	22.320 ***	0.263	3.481 *	0.022
R ²	0.009	0.011	0.112	0.113	0.129	0.129
Adjusted R ²	0.004	0.000	0.098	0.095	0.106	0.102
Change in R ²	0.009	0.001	0.101	0.001	0.016	0.000

Notes: Significance at: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$; dependent variable: knowledge articulation; regression coefficients and standard errors are shown in parentheses

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	3.929*** (0.323)	3.954*** (0.343)	2.771*** (0.489)	1.864*** (0.535)	2.244*** (0.632)	2.251*** (0.639)
Dynamism	0.146** (0.068)	0.162 (0.097)	0.143 (0.095)	0.158 (0.092)	0.147 (0.092)	0.148 (0.093)
Complexity		-0.021 (0.095)	-0.008 (0.093)	-0.027 (0.091)	-0.009 (0.092)	-0.010 (0.092)
Munificence			0.229*** (0.073)	0.251*** (0.071)	0.236*** (0.073)	0.236*** (0.074)
Size				0.245*** (0.084)	0.274*** (0.090)	0.278*** (0.103)
Age					-0.084 (0.148)	-0.081 (0.162)
Sales						-0.008 (0.136)
F	4.330**	0.046	11.055***	13.366***	1.269	0.008
R ²	0.021	0.022	0.074	0.133	0.139	0.139
Adjusted R ²	0.016	0.012	0.060	0.115	0.117	0.112
Change in R ²	0.021	0.000	0.052	0.059	0.000	0.000

Notes: Significance at: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$; dependent variable: knowledge codification; regression coefficients and standard errors are shown in parentheses

Table VII. Multivariate regression, knowledge codification

The simple regression analysis for which perceived dynamism explains the variance of the learning mechanisms is presented in Table VIII.

As the table shows, when the level of perceived dynamism is low or medium, we do not find a significant relation to any of the learning mechanisms. When perceived dynamism is high, however, the regression coefficients calculated show a positive and significant relation between this independent variable and the three learning mechanisms. Therefore, this further analysis shows weak support. Therefore, this relationship was only supported in the sub-sample analysis.

In Table IX, we stratify the sample to analyze the perceived complexity of the competitive environment.

As with perceived dynamism, the data for perceived complexity show that, when the level of perceived complexity is medium or low, there is no significant relation between this variable and the three learning mechanisms. Only the group of firms with high-perceived complexity shows positive and significant regression coefficients (although these are less significant for knowledge codification). Then, this relationship is also confirmed in the sub-group analysis.

6. Conclusions

6.1 Discussion

This paper seeks to develop an empirically verifiable model to explain whether managerial perceptions of the environment are a significant antecedent for developing DC.

The empirical study enables us to confirm that, if managers perceive the need for adaptation to the environment, they promote the use of learning mechanisms to generate DC. In contrast, when the environment is perceived as stable and simple, organizations do not foster the generation of DC.

We thus prove the argument supported by other authors (Adner and Helfat, 2003; Augier and Teece, 2009; Tripsas and Gavetti, 2002) who demonstrate that top management's cognition of the competitive environment plays a crucial role in the development of DC. Any process that may generate DC is triggered once the managers perceive the need to do so. We thus reaffirm one of the most recent conceptualizations of DC established by Helfat *et al.*, 2007, which places special emphasis on the intentional nature of DC generation with the goal of consciously changing the organization's set of resources.

For perceived dynamism of the competitive environment, we have proven that, only when the interviewee perceives a high level of dynamism in his or her competitive environment does the organization show a significant development of learning mechanisms which, according to Zollo and Winter (2002), generate DC. This fact has some empirical relevance to one of the current debates in the DC focus (Barreto, 2010). Teece *et al.* (1997) and Zollo and Winter (2002) argue that DC are only generated in dynamic environments, since generating and maintaining DC in more stable environments would involve unnecessary cost to the organization. These authors thus argue that DC are not common in stable environments. In contrast, Eisenhardt and Martin (2000) affirm that DC are also useful in stable environments, where changes are infrequent and predictable. This stance agrees with the study by Aragón-Correa and Sharma (2003), which argues for a contingent focus of DC that attends to the level of dynamism in the competitive environment.

Dynamism	Experience accumulation			Knowledge articulation			Knowledge codification		
	Regression coefficient	R ²	Adjusted R ²	Regression coefficient	R ²	Adjusted R ²	Regression coefficient	R ²	Adjusted R ²
Low (67 cases)	-0.620	0.004	-0.011	0.070	0.005	-0.010	-0.620	0.002	-0.014
Medium (70 cases)	0.038	0.001	-0.013	-0.057	0.003	-0.011	0.038	0.000	-0.015
High (63 cases)	0.496***	0.246	0.234	0.329***	0.106	0.091	0.496***	0.075	0.060

Notes: Significance at: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$; independent variable: perception of dynamism in competitive environment; dependent variables: each of the learning mechanisms

Table VIII. Simple regression, levels of dynamism perceived in the competitive environment

Table IX.
Simple regression, levels
of complexity perceived
in the competitive
environment

Complexity	Experience accumulation		Knowledge articulation		Knowledge codification	
	Regression coefficient	R ² Adjusted R ²	Regression coefficient	R ² Adjusted R ²	Regression coefficient	R ² Adjusted R ²
Low (59 cases)	0.184	0.034 0.017	0.194	0.038 0.021	0.117	0.014 -0.004
Medium (72 cases)	0.068	0.050 -0.010	0.217	0.040 0.038	-0.557	0.004 -0.010
High (69 cases)	0.289***	0.084 0.070	0.404***	0.163 0.150	0.217*	0.047 0.033

Notes: Significance at: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$; independent variable: perception of complexity in the competitive environment; dependent variables: each of the learning mechanisms

As to the managerial perception of complexity, our study shows that, when this dimension is perceived to be high, the organization demonstrates a significant level of development of learning mechanisms (although the level seems to be higher in accumulated experience and knowledge articulation). Dynamism and uncertainty of competitive environment are not the only triggers generating DC.

From the theoretical perspective, in complex environments, the organization should promote learning systems that channel the cognitive effort performed into different specialized areas in the organization. This finding affirms the need for an integrating capacity to synthesize the information received from experience as well as from the results obtained from the effort. Our results thus show that, when the competitive environment is perceived as highly complex, the organization invests in the use of learning mechanisms that enable it to develop DC to aid it in overcoming the complexity of the competitive environment.

Our study also obtains a clear influence of managerial perception of munificence on the mechanisms that generate DC as defined by Zollo and Winter (2002). From this result, we can conclude that, if the environment permits, establishing a set of managerial social networks and collaborative relationships increases the use and promotion of learning mechanisms to generate DC. These relationships may prepare the organization to be alert to opportunities and threats in its competitive environment, as well as to compare its set of resources and capabilities critically with those of the members of the social networks. According to our study, the perception of munificence will stimulate the use of learning mechanisms and enable the continuous renewal of organizational knowledge. Thus, DC can also be derived from the positive and intense relation with agents in the competitive environment (Bruni and Verona, 2009).

Our analysis of the three control variables (size, age, and sales) does not show their relevance in determining the use of learning mechanisms. This result allows us to establish that managerial perceptions of the competitive environment are more crucial in generating DC than are the generic traits of the organization. Second, this result may be consistent with the complex, tacit nature of DC. Research at the theoretical level argues that these capabilities are highly incrustated in the organization and closely related to the firm's idiosyncrasies (Ambrosini and Bowman, 2009). This quality can make it very difficult to obtain general conclusions about the size, age, and level of sales in the organization that successfully generates these capabilities.

Consequently, this study makes two key contributions to the literature. First, the findings of the study show that managerial perceptions of the competitive environment play an important role in the generation of DC. However, if managers do not perceive an important level of dynamisms and complexity in the competitive environments, they do not consider necessary to generate DC. Our work shows that stable and simple environments were not generated DC. This finding is interesting to scholars in the research area. And second, our study shows that the positive attributes of the environment also promote the generation of DC. Thus, in companies where managers maintain good relations with the others players, our results show that DC have been generated. These findings are also valuable to scholars who study DC.

6.2 Limitations

Our data correspond to a population of Spanish firms, which could be an obstacle for generalization from the results obtained. A study by Madhoc and Osegowisch (2000)

shows that the country of origin may be a crucial factor shaping DC in firms that generate them. The origin of the organizations imposes a series of traits on their capabilities, derived from their culture, legal framework, and orientation to learning and knowledge. According to this line of argument, the DC generated in our sample can differ from the DC generated in other geographical frameworks.

Our study also only considers data from a single point in time. The phenomenon of DC may require longitudinal study to allow us to observe how specific internal variables evolve when, for example, managerial perceptions of the competitive environment change.

6.3 Future lines of research

This study could be extended in different ways. First, we consider the interest of studying the influence of managerial perceptions in specific DC. For example, analyze whether managerial perceptions of the environment differently influence the generation of DC such as innovation or absorption capacity. Second, this study should combine several empirical tools and use the case study as a starting point to enable generalization from the results obtained with other statistical techniques. We need more in-depth study of a set of internal traits that have not yet been considered in empirical studies. And third, organizational routines appear to be a key factor in the generation of DC, as they assume the goal of reconfiguration to enable the organization to adapt to external demands. Given the tacit nature of these characteristics, there are few empirical studies that identify them, although it is possible to approach them through a set of variables such as frequency of repetition of work processes, discretionality of the organization's members, and level of formalization of behaviour. We thus believe it is important to study the extent to which organizational routines can promote or block the process that generates DC.

6.4 Implications for practice

Our study's goal has been to obtain empirical evidence to bring analysis of the phenomenon of DC closer to business managers. Our results show that, when the competitive environment is perceived as difficult, learning practices should not be ignored. The three learning mechanisms analyzed constitute a tool for the adaptation and renewal of the set of organizational resources. In this sense, first, companies must invest in technology that allows them to obtain a correct perception of the main features of the competitive environment. For example, internet applications that help them to scan the environment and get valuable market knowledge on trends, competitors' actions, etc. With these tools, managers will detect if environmental conditions require the creation of DC. And second, managers must invest effort and resources to establish networking with other agents in the environment, which can provide learning opportunities for adaptation. And third, we must recognize that the task of leadership in top management is also important. Managers' commitment is crucial to the success of learning processes. Then, they must develop an organization culture that enhances knowledge transfers, through meetings, collaborative tasks, development of guides, dictionaries, etc.

Note

1. Cohen and Levinthal (1990) define absorption capacity as "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial end."

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Appendix 1

Name	Item	Correlation item – total	Final scale loadings	Reliability
EXP01	Our organization has acquired important knowledge since its foundation	0.485	Eliminated	
EXP02	Most of the members of the organization have belonged to the organization since its foundation	0.329	Eliminated	
EXP03	Most of the members of the organization have indefinite contracts	0.480	Eliminated	
EXP04	Our organization manages to hire experts in each subject matter, which can provide new ideas, solutions, and perspectives in the organization	0.561	0.68	0.47
EXP05	The knowledge acquired by each member of our organization is easily shared with the other members of the organization	0.697	0.89	0.80
EXP06	The members of our organization usually learn easily from the experiences of others	0.615	0.83	0.69
EXP07	Our organization's systems enable employees to have easy access to different information sources	0.500	0.77	0.59
EXP08	Our organization's members face new situations alone, resolving the problems that these situations pose on their own	0.536	Eliminated	
ART01	The most frequent problems that emerge in performing our daily work are usually discussed in the group by the members of the organization	0.750	0.89	0.79
ART02	The members of the organization usually meet often to resolve work issues	0.899	0.99	0.98
ART03	Management of our organization promotes meetings to debate work problems, even though these meetings are held during the work day	0.754	0.92	0.84
ART04	Any problem that emerges in any area of work is shared and discussed among the members working in this area	0.694	0.85	0.73
ART05	The results and clarifications obtained at each meeting are recorded in written minutes	0.440	Eliminated	

(continued)

Managerial perceptions of the environment

Table AI.
Results of the confirmatory analysis of measurement scales for the learning mechanisms

Table AI.

Name	Item	Correlation item – total	Final scale loadings	Reliability
ART06	In our organization, the employees propose new ways of doing things, which are well accepted by the other employees	0.680	0.82	0.68
ART07	In general, there is good communication among the members of the organization	0.634	0.87	0.69
ART08	Some members of our organization have given talks or colloquia for the other employees	0.506	Eliminated	
COD01	The members of our organization have produced manuals, guides, or codes that help the employees to perform the daily tasks	0.741	0.86	0.74
COD02	In our organization, the employees have produced dictionaries and glossaries in which they establish the main terms that are used in performing our work	0.652	0.79	0.62
COD03	The members of our organization have easy access to these manuals and use them often	0.826	0.92	0.85
COD04	These manuals have been marketed to other firms, technical schools or educational centres	0.329	Eliminated	
COD05	A person outside the organization could understand these manuals without having to be an expert in the subject matter	0.619	0.73	0.54
COD06	Attempts to produce manuals and guides have not succeeded in our organization	0.296	Eliminated	
COD07	The organization's management motivates the development of manuals that can help the organization's employees	0.673	0.84	0.71
COD08	Our organization invests time and money in producing memoranda, manuals, dictionaries, etc. that facilitate the performance of daily tasks	0.778	0.90	0.81

Name	Item	Correlation item – total	Final scale loadings	Reliability
ENTDIN01	The legal, technological, economic, etc. demands imposed on the organization by its environment are changing constantly	0.738	0.95	0.90
ENTDIN02	The main agents in our organization's environment (government, providers, customers, etc.) change their demands unpredictably	0.651	0.83	0.68
ENTDIN03	Our organization's environment requires managers to react rapidly to the changes that occur	0.644	0.87	0.75
ENTDIN04	Normally, managers in our organization have advance knowledge of the changes that will occur in the environment	- 0.006	Eliminated	
ENTCOM01	The environmental factors that influence our organization are very different from each other	0.261	0.94	0.89
ENTCOM02	In our organization's environment, we find quite a large group of agents that condition our decisions	0.391	0.90	0.80
ENTCOM03	The managers in our organization must master highly varied knowledge to respond to the demands of the environment	0.300	Eliminated	
ENTCOM04	Our organization operates in several markets, whose characteristics are very diverse	0.058	Eliminated	
ENTMUN01	The sector in which our organization operates enjoys high growth in the demand for products.	0.621	0.86	0.73
ENTMUN02	Our organization has achieved satisfactory growth in recent years	0.657	0.85	0.73
ENTMUN03	Changes in the environment have influenced our organization positively	0.548	0.80	0.64
ENTMUN04	The environmental conditions hinder the functioning of firms in the sector	0.205	Eliminated	

Table AII.
Results of the
confirmatory analysis
of the measurement scale
for managerial
perceptions of the
environment

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