



Absorptive capacity: a literature review and a model of its determinants

Capacidad de absorción: revisión de la literatura y un modelo de sus determinantes

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Abstract

This article aims to carry out a review of the literature on one of the most relevant concepts in the study of organizational behavior that emerged from the work of Cohen & Levinthal (1990). We refer to absorptive capacity, which has received widespread attention and has been applied in different fields: learning and knowledge management, innovation processes and technological development, strategic management, human resource management, organizational design, among others. This research is based on a descriptive study with documentary design. It intends to advance the integration and comprehension of absorptive capacity through the identification and discussion of different aspects related to its origin, components, determinants, its relation with the cognition of individuals, and the importance it has for the development, performance and achievement of competitive advantages of a company. This provides a general vision for its management and application, and a model of its determinants. The factors that define the construct are presented through a model, among them: organizational, environment and cognitive. The latter is highlighted as a differentiating factor from the models that have traditionally been developed in the existing literature.

Resumen

El presente artículo tiene como objetivo llevar a cabo una revisión de la literatura sobre uno de los constructos más relevantes en el estudio del comportamiento de las organizaciones que surge inicialmente a partir del trabajo de Cohen & Levinthal (1990). El mismo se refiere a la capacidad de absorción que ha tenido una amplia aplicación en distintos campos de estudios de la organización, tales como: aprendizaje y gestión del conocimiento, procesos de innovación y desarrollo tecnológico, administración estratégica, dirección de recursos humanos, diseño organizativo, entre otros. La investigación, abordada bajo un enfoque metodológico de tipo descriptivo y con diseño documental, pretende avanzar en la integración y comprensión de este constructo a través de la identificación y discusión de diferentes aspectos referidos a su origen, componentes, determinantes, su relación con la cognición del individuo y la importancia que tiene para el desarrollo, el desempeño y el logro de ventajas competitivas, proporcionando así una visión general para su gestión y aplicación. Como resultado de la investigación se ofrece un modelo de los factores que definen la capacidad de absorción de la organización, alrededor de tres niveles principales: organizacional, del entorno y cognitivo, destacándose este último como un factor diferenciador de los modelos que tradicionalmente han sido desarrollados por la literatura.

Keywords | palabras clave

Absorptive capacity, environment, competitive advantages, cognition, organization, knowledge.
Capacidad de absorción, cognición, conocimientos, entorno, organización, ventajas competitivas.

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1. Introduction

The theory of organization provides conceptual and empirical tools that contribute to the study, analysis and understanding of the behavior of organizations (Zapata & Mirabal, 2018), thus helping «to explain a part of the organizational reality, in order to provide more understanding about its proper operation» (Sánchez and Nélida, 2017, p. 66). In this sense, and specifically, the concept of absorptive capacity (AC) has been a subject of special attention to understand various organizational phenomena (Gao *et al.*, 2017), especially those related to knowledge management processes, learning, innovation and performance.

In this regard, Lichtenthaler (2016a, p.1) points out that the literature «emphasizes the importance of absorptive capacity in the development of knowledge, the promotion of open innovation, the management of strategic alliances, in the development of learning, the creation of strategic variety and the improvement of financial performance». On the other hand, King & Lakhani (2011) indicate that frequent changes in the context of innovation have made the study of AC more important, a construct that was introduced by Cohen & Levinthal (1990) as a condition to achieve a high innovative competence (Duchek, 2013, 2015), which makes it possible for external knowledge available in the environment to be used within the organization (Schweisfurth & Raasch, 2018), thus becoming «a strong predictor of innovation and knowledge transfer» (Zou *et al.*, 2018, p. 1).

Absorptive capacity is the ability of the organization to identify the value of useful knowledge located in its environment, assimilate it, transform it and integrate it into its knowledge base, and apply it through the processes and actions related to innovation, R&D investment and competitiveness (Cohen & Levinthal, 1990). In this way, its development and maintenance are considered of vital importance for the survival and success of companies, since it contributes to improve, organize and direct knowledge towards the achievement of their goals and objectives (Zahra & George, 2002). Likewise, investment in AC allows for an increase in the ability of a company to anticipate market trends (Cohen & Levinthal, 1994). All this translates into competitive advantages, contributing to the notion that the process of technological innovation requires, the integration of internal and external knowledge with the inventive and creative competence of the organization (King & Lakhani, 2011).

In their seminal work, Cohen and Levinthal (1990) state that more research is required to understand the decision processes that determine the investments of organizations in AC. In this way, since the beginning of the article, works have been developed aimed at consolidating AC theory as a lever of support for researchers and academics dedicated to understanding and explaining the development and evaluation of the organization. Research in different areas related to organizational issues confirm this (see table 1).

Table 1. Research on organizational issues and absorptive capacity

Área	Authors
Knowledge management	Van den Bosch <i>et al.</i> (1999), Minbaeva <i>et al.</i> (2003), Camisón & Forés (2014), Mariano & Walter (2015), Valentim <i>et al.</i> (2016), Qian & Jung (2017).
Innovation processes	Volberda <i>et al.</i> (2010), Kostopoulos <i>et al.</i> (2011), King & Lakhani (2011), Chen & Chang (2012), Cassol <i>et al.</i> (2016), Kang & Lee (2017), Arias <i>et al.</i> (2017), Saiz <i>et al.</i> (2018), Schweisfurth & Raasch (2018), Zou <i>et al.</i> (2018).
Strategic alliances	Hoang and Rothaermel (2005).
Study of foreign subsidiaries	Minbaeva <i>et al.</i> (2003, 2014) and Peltokorpi (2017).
Knowledge flow between regions	Schillaci <i>et al.</i> (2013), Miguélez & Moreno (2015), Ju-knevičienė (2017).
Organizational performance	Lane <i>et al.</i> (2001), Kostopoulos <i>et al.</i> (2011), Marabelli & Newell (2014), Cepeda <i>et al.</i> (2016), Lichtenthaler (2016a), Guisao <i>et al.</i> (2017), Zou <i>et al.</i> (2018).
Systems and information technology	Roberts <i>et al.</i> (2012), Gao <i>et al.</i> (2017), Guisao <i>et al.</i> (2017).
Organizational learning	Lane & Lubatkin (1998), Lane <i>et al.</i> (2001), Lane <i>et al.</i> (2006), Cepeda <i>et al.</i> (2016), Vargas & Muratalla (2017).
Hiring and labor mobility	Leiva <i>et al.</i> (2017).
Family businesses and innovation	Charão & Matos (2017).

Therefore, this investigation aims to carry out a review of the literature about the absorptive capacity construct, in order to discuss aspects related to its origin, meaning, components, levels of analysis, relationship with the individual's cognition and its importance in the development, performance and obtaining of competitive advantages for the organization. Finally, a model of its determining factors is proposed.

From the methodological point of view, this research was conducted under a descriptive approach and with documentary design. The protocol for the selection of bibliographic references began with the definition of the variables under study, in this case absorptive capacity as one of the fundamental components of the dynamic capabilities of the organization. The systematic reading of the fundamental theory was made, as well as the selection of research criteria in order to locate relevant materials in the administrative-managerial area according to the proposed objective. This process was carried out by the review of specialized databases such as InfoTrac, EBSCOHost and ProQuest, which offer full-text articles from refereed and indexed scientific journals which guarantee peer review in terms of content coherence and the rigorous application of methodological guidelines. This resulted in the emergence of 75 theoretical and empirical scientific articles, which were critically analyzed (Viniegra, 2001, Garcés

& Duque, 2007 and Díaz, 2012). Additionally, 5 specialized books were selected, all with the purpose of integrating and substantiating the approach made in the proposal presented on the determinants of the absorptive capacity of organizations.

2. Origin and definition of absorptive capacity (AC)

AC originates in the seminal works of Cohen & Levinthal (1989,1990) who define it as «the company's ability to identify, assimilate and exploit knowledge from the environment» (Cohen & Levinthal, 1989, p. 569). In a later work, they point out that it is the company's ability to recognize the value of new information, assimilate it and apply it for commercial purposes and innovation processes (Cohen & Levinthal, 1990).

Cohen & Levinthal (1989, 1990) indicate that one of the company's primary capabilities are research and development activities that generate useful knowledge necessary for its good performance. This capacity is seen as crucial in the current environmental conditions (Camisón & Forés, 2014), characterized by being complex, changing and competitive.

From Cohen & Levinthal (1990) stems the importance of motivations and individual skills as key factors of AC (Minbaeva *et al.* 2003, 2014). In this regard, they point out that «our perspective implies that the ease of learning, and therefore the adoption of technology, is affected by the degree that a certain innovation is related to the base of pre-existing knowledge of its potential users» (Cohen & Levinthal, 1990, p. 148), for example «personal computers spread more quickly initially among consumers and companies that had previous experience in mainframes or minicomputers» (Cohen & Levinthal, 1990, p. 149). Thus, they consider that individuals learn by accumulating knowledge throughout their performance within the organization. In essence, AC revolves around the idea that the accumulated experience of adoption and invention improves the ability to recognize and absorb new high-quality knowledge, as well as to create new and valuable inventions (King & Lakhani, 2011); it is, therefore, a recursive activity.

Cohen & Levinthal (1990) also consider that the organization has a memory that facilitates the storage, recovery and application of associated knowledge both at an individual and organizational level, and that motivates the learning process, giving a vital importance to the cognitive model of the individual. However, they clarify that it not only refers to the sum of the absorptive capacities of its employees, but also implies organizational aspects that include, for example, organizational culture, investment in R&D, human resources practices and policies, and the organizational structure, which is the result of a series of relationships with the environment, strategy, structure, processes and organizational culture, as well as individual motivations and skills to get new knowledge (Lane *et al.*, 2006). In this sense, there are three levels of analysis of absorptive capacity: individual, group and organizational, that are related and coexist in the organization.

Absorptive capacity «plays a key role in innovation and performance, regardless the size of the companies and the level of resources» (Valentim *et al.*, 2016, p. 4), is crucial for the process of creating business knowledge (Charão & Matos, 2017), and plays an essential role so that the company's information technology capabilities influence its end results (Guisao *et al.*, 2017). Thus, companies with high levels of AC can manage external knowledge more efficiently (Escribano *et al.*, 2009). Therefore, it is critical

for any company that seeks to achieve new forms of competitive advantages, superior performance and innovative results in the goods and services it offers according to the demands of the changing environment. It should be noted that AC is based on the fact that the organization does not have enough internal knowledge to improve or develop all its innovation processes (Aguilar-Olaves *et al.*, 2014, Duchek, 2015).

These ideas, therefore, allow AC to be located within the scope of two approaches identified in the theory of the organization: the *vision based on knowledge*, which is one of the derivations of the theory of resources and capabilities, and within the context of external control theories¹ of organization, specifically in the theory of dependence on resources proposed by Pfeffer & Salancik (1978). The latter states that the organization does not have the capabilities or self-sufficiency to produce and control all the resources and services needed to achieve proper functioning, so interchange and interdependence relations with other organizations are needed to obtain them. Within those resources, external knowledge is necessary in order to comply with the different organizational processes.

To synthesize, some definitions of absorptive capacity are presented in table 2.

Table 2. Definitions of Absorptive Capacity (AC)

Authors	Definition
Lane & Lubatkin (1998)	Ability of the company to assimilate and apply the knowledge from another company. That capacity depends on: (1) similarity between the companies; (2) base knowledge; (3) organizational structure; and (4) dominant logic. The latter is located within the framework of cognitive psychology.
Lane <i>et al.</i> (2006)	The company uses knowledge from the environment through three sequential processes: (a) the recognition and understanding of new knowledge through exploratory learning; (b) the assimilation of new knowledge by transformative learning; and (c) the use of assimilated knowledge to generate new knowledge through learning.
Todorova & Durisin (2007)	Capacity of a company to assess, acquire, assimilate or transform and exploit external knowledge in organizational processes.
Schillaci <i>et al.</i> (2013)	Extends the ability to absorb competition among regions or territories, and defines it as the capacity of a region to identify, assimilate and ex-ploit knowledge.
Chang <i>et al.</i> (2014)	Set of skills of the company to acquire, assimilate, transform and exploit knowledge to produce new capabilities.
Garzón (2015)	The ability of the organization to recognize the value of external knowledge (environment), acquire it and assimilate it within the scope of the organization, and apply it in the scope of its operations.

¹ The following theories are located in the external control approach: contingent, resource dependence, institutional and population ecology. They are also part of the adaptation approach.

Authors	Definition
Martinkenaite & Breunig (2016)	Set of sequential processes of exploratory learning, transformer and exploiter in which the individual and organizational skills interact dynamically.
Peltokorpi (2017)	It is the capacity of the subsidiaries, through their members, to absorb, assimilate and use new information available in the multinational company.

3. Absorptive capacity as dynamic capacity of the organization

The theory of dynamic capacity is considered a branch of the theory of resources and capabilities (TRC). This focuses its analysis on the importance of the resources and internal capacities of the organization as the main source of its competitive advantages, paying little attention to the factors of the environment where it operates. It highlights the role played by internal characteristics—resources and capacities—as the key to establishing the policies and strategies of the organization (Zapata & Hernández, 2014, Zapata & Mirabal, 2018). Its beginnings rely on the approaches of Penrose (1959), who proposes that the center of distinctive competencies of the company are the resources—tangible and intangible—that it possesses, and the skills it uses to take advantage of them in the best way. This theory questions the idea that the development of the company depends mainly on the dynamics of the environment, as proposed by the adaptation and external control approach.

However, this epistemological position has been criticized by considering it restrictive and static (v. Gr. González & Hurtado, 2014) and by not paying attention, on the one hand, to the existing dynamics between the organization and the environment (Zapata & Mirabal, 2018), and on the other hand, by giving relevance to the heterogeneity and the characteristics of the resources—valuable, rare, non-imitable and not strategically equivalent—as strategic elements basic for the organization. In this regard, Cruz *et al.* (2009, p.111) state that «such characteristics will not last over the time in the face of changes affecting the factor and/or product markets», or in rapidly changing environments or highly globalized markets, the TRC does not have enough arguments to explain why companies with similar resources do not necessarily achieve the same performance (Chang *et al.*, 2014).

The theory of dynamic capabilities emerges at the end of the nineties, as a way to boost the focus of resources and capabilities in response to the need of organizations to adapt and innovate according to the requirements and dynamics of the environment (González & Hurtado, 2014; Zapata & Mirabal, 2018). Thus, Teece *et al.* (1997) and Teece & Leih (2016) state that dynamic capabilities contribute to the company's integration, construction and reconfiguration of resources and capabilities to provide fast responses to changing environments, and involve higher-level activities that allow it to direct and improve their ordinary capabilities in the search for the production of goods and services adjusted to the demands and circumstances of the environment; and that

they also help in the design and implementation of a business model adapted to these circumstances (Teece & Linden, 2017).

Thus, AC is considered in the literature of dynamic capabilities as one of its main components (Wang & Ahmed, 2007, Valencia-Rodríguez, 2015, Garzón, 2015, Lin *et al.*, 2016, Vargas & Muratalla, 2017; Zapata & Mirabal, 2018). Already Cohen & Levinthal (1990, p. 133) had pointed out that «absorptive capacity not only resides in a single individual but depends on the bonding of a mosaic of individual capacities». It is a construct used to explain the complexity of organizational phenomena through their participation as a dynamic capacity that allows transformation by evolution or change in organizational and innovation processes (Vargas & Muratalla, 2017; Rodríguez & Da Cunha, 2018). AC is then recognized as a dynamic capacity, since through it the company can develop skills of assimilation, learning, transfer and exploitation of external knowledge (González & Hurtado, 2014; Vargas & Muratalla, 2017), which helps reconfigure the ordinary capabilities it possesses (Roberts *et al.*, 2012).

In this regard, Zahra & George (2002) suggest that the acquisition, assimilation, transformation and exploitation of knowledge integrated into the AC construct possess characteristics of dynamic capabilities, since they influence the company to create and deploy the knowledge necessary to build competencies, organizational functions such as marketing, distribution and production that make it possible to deal with turbulent environments. In this way, and following the previous ideas, Verona and Ravasi (2003), Lin *et al.* (2016) and Garzón (2015) show that the ability of companies to acquire new knowledge, assimilate it and integrate it into the existing knowledge base is a determining factor to generate and boost dynamic capacities. In the same order of ideas, Zapata & Mirabal (2018) argue that with AC it is possible for the organization to develop its own capabilities in the processes of production, organization and provision of services. In summary, while a company demonstrates greater AC, it will exhibit more dynamic capacity (Wang & Ahmed, 2007), which is recognized in the nature and generation of competitive advantages (Zahra & George, 2002).

4. Components of absorptive capacity

According to the Cohen & Levinthal model (1989,1990) absorptive capacity has a multidimensional nature that encompasses three capacities: (a) *recognition of the value* of new knowledge—explore knowledge—; (b) *assimilation* of that knowledge that implies understanding it and adding it to the processes and routines of the organization—knowledge transformation—; and (c) *application* of that knowledge to obtain new products—to exploit it. Similarly, Aguilar-Olavés *et al.* (2014) explain that companies go through a sequential process where the potentially valuable knowledge is first recognized (exploratory learning), then that knowledge is assimilated (transforming learning), and finally it is used to innovate and create new knowledge with market value (exploitative learning).

From the component definition of AC in the works of Cohen & Levinthal (1989, 1990), several models have been formulated that agree in a common point: it is a generator of competitive advantages. Below, some of the most relevant are described.

Lane *et al.* (2001). They highlight the critical role of AC during the learning process and interorganizational performance. In this way, they propose three components

in an international *joint venture environment*: ability to understand external knowledge, assimilate it and apply it. The first depends on the existence of links in the fields of action of the companies, the similarity of their problems and the priorities assigned to them. On the other hand, the ability to assimilate external knowledge is related to the flexibility and adaptability implied by a high level of foreign partner training and prior learning that contribute to reducing the ambiguity of new knowledge and its connection with the existing knowledge. Finally, the application of external knowledge implies the ability to disseminate it and integrate it into the activities of the organization.

Zahra & George (2002). Under the idea of a reconceptualization of AC, they offer a change to the original three-dimensional model proposed by Cohen & Levinthal (1989, 1990). In this way, they conceptualize it as «a set of routines and organizational processes that allow the company to acquire, assimilate, transform and exploit external knowledge. These four organizational capacities reinforce each other to generate absorptive capacity» (Zahra & George, 2002, p. 186). These routines that the authors emphasize provide structural, systematic and procedural mechanisms that contribute with the company to create value in their products and obtain sustainable competitive advantages.

The modification of Zahra & George (2002) to the Cohen & Levinthal model (1990) is about the change from three to four dimensions: acquisition, assimilation, transformation and application. (a) Acquisition, identification and recognition of the value of the external knowledge that will be selected and then used in the operations of the company. (b) Assimilation, the ability of the company to absorb and transfer external knowledge. It is achieved through the set of routines and processes necessary to analyze, interpret and understand the knowledge acquired. (c) Transformation, the ability of the company to develop and improve the processes and routines that facilitate the transfer and combination of existing knowledge from a new one. This is obtained by incorporating or eliminating knowledge or interpreting it differently. And (d) application or exploitation, which «is based on routines that allow the company to refine, expand and take advantage of existing skills or create new competencies by incorporating the knowledge acquired and transformed into its operations» (Zahra & George, 2002, p. 190).

Zahra & George (2002, p. 191) with the argument that «the organization can acquire and assimilate knowledge, but not necessarily have the ability to transform it and exploit it to generate benefits», group the four dimensions into two categories: «potential absorptive capacity» (PACAP), and «realized absorptive capacity» (RACAP). PACAP considers the processes by which the company can absorb external knowledge through its acquisition and assimilation capacity, but its transformation and application is not automatically guaranteed (Kang & Lee, 2017); while RACAP incorporates processes that use external knowledge for the purposes of the organization, achieved through their transformation and exploitation skills. Supporting this argument, Cassol *et al.* (2016) explain that PACAP is an instrument to acquire and assimilate knowledge at a «relatively dormant» level, until there is a real reason for its use, becoming RACAP.

Todorova & Durisin (2007). They propose four components: (a) recognition of the value of knowledge, take up the initial idea of Cohen & Levinthal (1990); (b) acquisition; (c) transformation or assimilation; and (d) exploitation. Recognition of the value of knowledge is considered a step prior to its acquisition, an issue that places it within

the acquisition process (Lane & Lubatkin, 1998, Zahra & George, 2002, Volberda *et al.*, 2010, Duchek, 2013, 2015). This ability to recognize the value of new knowledge is an important component of AC since its assessment is not automatic, it is biased and needs to lead to absorption, so «the ability to learn, that is, to absorb external knowledge depends on the ability to adequately assess new knowledge» (Todorova & Durisin, 2007, p. 777). Regarding assimilation or transformation—proposed by Zahra & George (2002)—, points out that the knowledge that the organization tries to absorb can advance and retreat between assimilation and transformation processes before they are successfully incorporated into their knowledge structures for further exploitation and application.

Forés & Camisón (2008) and Camisón & Forés (2014). They propose four different but complementary dimensions of AC: acquisition, assimilation, transformation and exploitation. Acquisition is conceptualized, starting from the ideas of Lane & Lubatkin (1998) and Zahra & George (2002), as «the ability of a company to identify, assess and acquire critical external knowledge for its operations» (Forés & Camisón, 2008, p. 37). On the other hand, assimilation is addressed as the company's ability to absorb external knowledge, which can be operational through the «routines and processes that allow the company to analyze, process, interpret and understand information obtained from external sources» (Forés & Camisón, 2008, p. 37). Transformation is the ability to develop and improve internal routines that facilitate the transfer and combination of prior knowledge with those already acquired. Finally, exploitation is considered as the competence of the company to apply new knowledge in organizational processes.

Lichtenthaler (2016b) describes three main components: (a) Exploration of knowledge, the process by which external useful knowledge is identified and acquired through different mechanisms for scanning the environment. In this activity, the dynamism of the environment—changes in knowledge, markets and technology— has a positive effect on the technological and market orientation during this exploration process (Lichtenthaler, 2016b), allowing the company to adapt to the latest developments in the different fields of action. (b) Retention of knowledge refers to the maintenance and reactivation of knowledge in the organization over the time. (c) Exploitation of knowledge, consists of the transformation of knowledge into new products and services. In summary, Lichtenthaler (2016b) points out that this proactive orientation of the organization constitutes a motivating element of the organizational processes.

5. Determinants and measurement of absorptive capacity

Absorptive capacity can be influenced by various external and internal knowledge sources (Van den Bosch *et al.*, 1999, Todorova & Durisin, 2007), such as prior knowledge, accumulated through experience, basic competences and shared common language, which facilitate and promote the recognition of the value of information, its assimilation, transformation and application (Todorova & Durisin, 2007, Mariano & Walter, 2015). It also depends on the training of the members of the organization and their accumulated knowledge (Roberts *et al.*, 2012), the investment and intensity of R&D, as well as the existence of organizational units devoted to research activities, the number

of workers with university degrees with a high profile for R&D, the number of patents and the proportion of scientific and technical personnel in relation to the total number of employees (Escribano *et al.*, 2009; Kostopoulos *et al.*, 2011; Valentim *et al.*, 2016), all of which is combined in different forms of measurement and quantification of the AC, which have been studied in various qualitative and quantitative research (Duchek, 2015, Valentim *et al.*, 2016).

In Table 3, some determinants of AC are briefly described.

Table 3. Works on Determinants of Absorptive Capacity (AC)

Autor	Determinantes
Van den Bosch <i>et al.</i> (1999)	(1) <i>Organizational form</i> . The <i>functional structure</i> has a high potential for efficiency due to the economy of scale in the use of resources, but low flexibility in the process of absorbing knowledge, since it is more adapted to stable environments with markets and products with relatively long-life cycles. The <i>division</i> structure has more autonomy in operational terms and more direct contact with its environment. They suggest that this type of structure has a high potential for the flexibility of knowledge absorption due to its greater ability to function in dynamic environments. And the <i>matrix</i> forms have high flexibility for the absorption of knowledge by their ability to share it among the units that make up the projects.
Forés & Camisón (2008)	<i>Internal and external determinants</i> . <i>Internal</i> : knowledge of the company, culture of innovation and learning, organizational design open to learning, knowledge management systems, age and size of the company. <i>External</i> : degree of turbulence of the environment, existence of technological opportunities, knowledge characteristics of other companies and geographical distance.
Vega-Jurado <i>et al.</i> (2008)	(1) <i>Organizational Knowledge</i> : The set of skills, experiences, training and information that the company has, and has accumulated as a result of the processes of acquisition, learning, generation and application. (2) <i>Formalization</i> : Increases the efficiency in the acquisition of knowledge when establishing patterns of behavior; that is, it allows acting with low supervision, and facilitates the creation of organizational memory. (3) <i>Mechanisms of social integration</i> : Formal and informal associated with administrative practices, such as: rotation of personnel, team building, quality circles and methodologies to solve problems of participation and integration that facilitate the transfer, transformation and exploitation of knowledge.

Autor	Determinantes
Schillaci <i>et al.</i> (2013)	<p>(1) <i>Human Resource Skills</i>: Related to their level of knowledge, experience and training, which facilitates access to the knowledge of the environment.</p> <p>(2) <i>R&D Investment</i>: Volume of financial resources used in the acquisition of technology, knowledge, equipment or any other resource to execute research projects.</p> <p>(3) <i>Organizational Structure</i>: its adequate design facilitates the ability of the company to organize and stimulate the transfer of knowledge through all the units and people that are part of it.</p>
Aguilar-Olaves <i>et al.</i> (2014)	<p>They classify the determinants according to their <i>potential absorptive capacity (PACAP)</i> and <i>absorptive capacity (RACAP)</i>. In the first, they identify the external sources of knowledge: clients, competitors, consultants, university institutions, research center and congresses. On the other hand, the activities that stimulate RACAP: implementation, application, conversion and re-coding of innovative effort, technological processes, and the introduction of new products or improvement of existing ones.</p>
González & Hurtado (2014)	<p>The authors identified the following indicators: (a) <i>Acquisition phase</i>: Investments in R&D, in technology transfer and in design engineering. (b) <i>Assimilation phase</i>: cooperation with suppliers and institutions to carry out scientific, technological and innovation activities. (c) <i>Transformation phase</i>: formation of employees, investment in technical assistance and consulting. (d) <i>Exploitation phase</i>: registration of intellectual property, improvement in the quality of products or services, or expansion of its offer.</p>
Duchek (2015)	<p>The attitudes and preferences of the actors in the organizational processes are determinants of AC. Deviations from formal rules are important conditions for the flexible absorption of knowledge and, therefore, for high levels of AC. It means that the management must accept that deviations from the rules may be necessary and, in some cases, encouraged.</p>
Lichtenthaler (2016b).	<p>(1) The technological and proactive orientation of the company towards the market affects positively the processes of exploration, retention and exploitation of the AC.</p> <p>(2) The dynamism of the environment has a positive moderating effect on the relationship of the company with the degree of technological and proactive orientation towards the market, and on the level of exploration, retention and exploitation of knowledge.</p>
Zou <i>et al.</i> (2018).	<p>The authors perform a meta-analysis on the concept of absorptive capacity and locate two fundamental determinants: <i>the size and age of the company</i>. From this analysis, they find a positive relationship for small businesses and negative for large companies. On the other hand, the relationship is negative for old companies and not significant for new ones.</p>

6. The cognition of the individual and absorptive capacity

From the cognitive psychology, Qian & Jung (2017) argue that absorptive capacity is an effective mechanism to solve the problems of information and knowledge filters during the process of recognizing their effective value for the organization. These filters can be explained within the framework of cognitive theory through processes, biases and cognitive maps that, as a whole, shape the individual's cognition and cognitive capacity.

Cognitive processes allow understanding how knowledge is selected, organized, transformed, stored and used through the perception, interpretation, attention, thought, memory and language of individuals (Neisser, 1981, Banyard *et al.*, 1995). On the other hand, cognitive biases are tendency to think, perceive or remember in a particular way (Banyard *et al.*, 1995), so that the individuals responsible for making strategic decisions depend to a large extent on some judgments or cognitive biases—mental predispositions—to simplify or reduce tasks and decisions in complex situations (Zapata & Canet, 2009).²

Maps or cognitive schemes, besides representing a wealth of knowledge, experiences and images of the world, also suggest an active structure for the search, purification and interpretation of the information used to direct and create in the mind of the individuals the perceptions of the environment that surrounds them (Zapata & Canet, 2009). It constitutes a cognitive structure composed of expectations learned from experience and stored in the memory, and therefore helps people to simplify, filter and efficiently manage information, as well as direct courses of action under a complex and uncertain context (Gioia, 1986; Banyard *et al.*, 1995; Hodgekinson *et al.*, 2004).

Child (1997) argues that the exercise of strategic activity and organizational design implies a prior assessment of the environment by those who lead the organization. This evaluation is carried out through cognitive filters that occur during perception (Milliken, 1987, Child, 1997, Walton and Dawson, 2001, Zabkar *et al.*, 2013). In this way, Weick (1979) points out that organizations only recognize their environment through the « perception process » of those who direct them, being the product of an abbreviated, generalized and correctable organization of the different experiences within the mind that serve as initial frame of reference for the action, transformed into maps and cognitive biases³ (Zapata *et al.*, 2015), that then influence those perceptions (Zapata & Canet, 2009).

This is how the cognitive vision and the will of the agents define the environment where the company will participate and compete, which configures the voluntarist perspective. It is possible to talk about a cognitive determinism; that is, the will captured by one's own vision and conception of things (Peris *et al.*, 2006), which in essence constitutes the managerial or managerial vision, and inculcated with the way the company should be organized, directed and planned. All this contributes to the formation of the absorptive capacity of the organization.

In summary, the following general proposition (GP) can be formulated:

2 The following theories are located in the external control approach: contingent, resource dependence, institutional and population ecology. They are also part of the adaptation approach.

3 The following theories are located in the external control approach: contingent, resource dependence, institutional and population ecology. They are also part of the adaptation approach.

GP: The processes, maps and cognitive biases, which constitute the cognition of the individual, have a positive and significant effect on the absorptive capacity of the organization.

Finally, the determinants of the absorptive capacity of the organization can be integrated into: cognitive, organizational and environmental.

Figure 1. Determining Factors of absorptive capacity

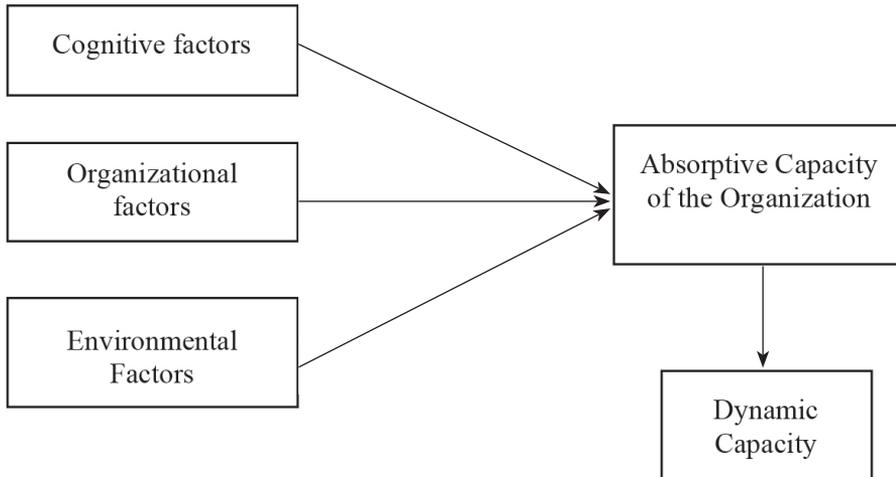


Table 4 shows some of these determining factors.

Table 4. Determining Factors of Absorptive Capacity

Cognitive factors	<ul style="list-style-type: none"> • Cognitive biases • Cognitive maps • Cognitive processes.
Organizational factors	<ul style="list-style-type: none"> • Organizational structure. • Human resources policies. • Culture and strategic orientation towards innovation. • Investments in R&D and technology • Level of staff training. • Leadership styles. • Knowledge and previous experiences. • Formalization degree of organizational routines, innovation processes and knowledge management. • Characteristics of the products that are elaborated and commercialized. • Size and age of the organization. • Development degree of information systems.

Environmental Factors

- Relations and cooperation agreements with other organizations involved with innovation and knowledge development processes (universities, training and research institutes).
- Dynamism degree of the environment and organizational practices (competence, customers, suppliers and associates).
- Government policy linked to innovation and the generation of knowledge.
- Knowledge and technology available in the participants of the organizational environment.
- Characteristics of the products and services demanded by the environment.

7. In conclusion

Through an extensive review of the specialized literature based on theoretical and empirical research, this document has made an attempt to advance in the study and understanding of the absorptive capacity of organizations. From its study and application by different components and forms of measurement, it is observed that it is a construct that contributes to a good extent to understanding the operation and behavior of the organization in an increasingly dynamic, complex and competitive environment, and especially when it comes to the processes of learning, innovation and knowledge management.

In the literature there has been an important emphasis on the idea that AC improves the results of innovation and learning processes of the organization that lead to obtaining competitive advantages. Thus, AC materialized through the search, recognition and acquisition of external knowledge to then assimilate, integrate, transform and apply it in organizational processes is seen as a fundamental activity for the organization to successfully face the demands and changes of the environment. Thus, it plays a crucial role in the learning and performance of the company, becoming a key capacity for its processes of innovation and competitiveness (Oumaya & Gharbi, 2017).

It is noteworthy that although the studies subsequent to the seminal work of Cohen & Levinthal (1990) have preserved the initial spirit of the AC concept, it is noted that the most important change was that of Zahra & George (2002) when associating it with a set of routines and strategic processes developed through orderly and persistent efforts in order to generate dynamic capacities (Forés & Camisón, 2008, Camisón & Forés, 2014). This change is accompanied by the proposal that considers AC divided into two sub-constructs which are not necessarily binding: «Potential absorptive capacity» (PACAP) and «realized absorptive capacity» (RACAP). From these changes stems the idea that AC is a dynamic capacity of the organization, since through it the company can achieve superior performance and competitive advantages with the activities of search, acquisition, assimilation of useful external knowledge, and its transformation, transfer and subsequent application in all the activities of the company. It is highlighted by Saiz *et al.* (2018, p. 290), that «the influence of potential and realized absorptive

capacity is significant on new products and causes effects on internal research and development in different ways».

Thus, AC is considered as a component of the dynamic capacities, becoming a subject of first order study both in academic research and applied in the organizational field.

An important contribution of this research is the proposal of a model of the determining factors of the absorptive capacity of the organization, established in three main ones: cognitive, organizational and environmental, which allow in some way their better systematization and understanding.

It should be noted that the review of the literature indicates there has been progress in the study of the AC with respect to its components, determinants and measurement forms. Similarly, there has been progress in the study on the effects of the cognitive capacity of those who direct the organization, defined by the processes, the maps and the cognitive biases whose conceptual bases are found in cognitive psychology, and that in this work have been identified as cognitive factors. The above is considered a line of research that promises important findings for understanding the behavior of organizations and of those who are part of it, and its link with the absorptive capacity and knowledge management.

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