

Possibilities of Knowledge Absorptive Capacity Research in the Field of Business Administration

ABSTRACT

The central objective of this study is to present an overview of the absorptive capacity construct applied in researches of the field of business administration. For this, the origins and conceptualizations of the absorptive capacity were analyzed; the main analysis units in which the construct has been applied have identified the main antecedents, the results of the construct and the analytical dimensions of the absorptive capacity. This research contributes to the development of studies on business strategies regarding absorptive capacities, as well as the identification of 'universal' components of absorptive capacity that can be used for analysis in other types of organizations.

Keywords: absorptive capacity, units of analysis, antecedents, resulting, analytical dimensions.

1. INTRODUCTION

The concept of absorptive capacity has been considered as one of the most relevant approaches that emerged in the strategy literature focused on organizational knowledge in recent years (Lane, Koka & Pathak, 2006). This concept can be perceived as a capacity that an organization (inserted in a given economy) has to take advantage of and absorb the information coming from the external environment, as well as the available resources (Tu, Vonderembse, Ragu-Nathan, & Sharkey, 2006).

In this sense, the relationships that are established between the field of organizational strategy and the search for the internalization of knowledge have resulted in several academic research combining different concepts that orbit this theme. Therefore, there are studies that identify environmental monitoring practices, highlighting the elements in strategic behavior, according to the research by (Beal, 2000). In addition, the conception of learning processes influence in practice, behavior of strategy and knowledge flows (Volberda, Foss, & Lyles, 2014; Choi & Park, 2017).

The diffusion of the absorptive capacity construct, understood as the set of skills aimed at the identification, internalization and organizational application of knowledge obtained in the external environment has been constituted, more recently, as an important theoretical framework to understand the strategic results, such as flexibility and innovation (Zahra & George, 2002; Lane et al., 2006; Todorova & Dursin, 2007)

In this sense, the absorptive capacity can be understood as the possibility of transforming a new knowledge into something useful through evaluation processes, such as identifying and selecting information considered valuable. Processes aimed at assimilation, visualized in the transformation of knowledge into a new useful knowledge. And finally the application, which refers exclusively to the use of knowledge (Cadiz, Sawyer, & Griffith, 2009).

This put, the central objective of this study is to present an overview of the absorptive capacity construct applied in surveys of the field of business administration. And specific objectives were: i) to describe the origins and conceptualizations of the absorptive capacity; ii) identify the main units of analysis; iii) highlight the background; iv) score the main results of the concept; v) illustrate the analytical dimensions of the absorptive capacity.

From a theoretical point of view, this proposal is justified because of the intended connection between the elements, concepts and approaches that are present in the research that involves the absorptive capacity. Moreover, due to its clipping under the main units of analysis that the research on absorptive capacity has been developed and in the various locus of research. In addition, the main contribution of this article was to identify 'universal' components of the absorptive capacity that can be used for analysis in other types of organizations and that may be adjusted according to the specificities of each one of them.

2. ORIGINS AND CONCEPTUALIZATIONS OF THE ABSORPTIVE CAPACITY

The concept of absorptive capacity had its foundations in the area of economics, discussed in the forefront in the scenario of economic development, foreign investment focusing on how emerging countries absorb resources from other nations. Adler (1965) points out that the central idea of this discussion was to understand if the absorptive capacity of emerging countries was greater than the resources that were made available to them and could have consequences in the format and expansion of external aid programs. Discussions on this theme come from the 1960s. Adler (1965) emphasized the need to ascertain the premises behind the understanding of absorptive capacity, in order to understand its application in emerging countries policy and the main national and international sources of resources available to these countries, as well as to discuss the factors that set limits on absorptive capacity. Thus, in this scenario, absorptive capacity is understood as a capacity that a nation possesses to use and absorb resources and investments from external sources (Adler, 1965; Tu et al., 2006; Murovec & Prodan, 2009).

It is worth noting that some studies on absorptive capacity are considered pioneers mainly for coining this terminology, such as Mallakh and Kadhim (1977) and Yousefi and Joy (1982), published by the *Rivista Internazionale di Scienze Economico e Commerciali*, in addition to the paper by Kedia and Bhagat (1988) on technology transfer among nations. These studies corroborate the studies proposed by Adler (1965) and also present as common attributes to examine the concept of absorptive capacity in the area of economy emphasizing its applicability in a scenario of economic development of nations and the absorption of these by external resources. In addition, it is perceived that these studies have as a level of analysis the macroeconomic aspects.

In the 1990s, one of the main works on the subject of absorptive capacity (Cohen & Levinthal, 1990) was published. These authors sought to adapt the assumptions surrounding the concept, which was born in the macroeconomics, to the organization's environment and the level of analysis would be the business organizations. In this reconceptualization, Cohen and Levinthal (1990) define the absorptive capacity as the capacity of an organization to recognize the value of new external information, to assimilate it and to apply it for commercial purposes. However, it is worth emphasizing that the premise of this approach is present in the need of the organization to acquire a prior knowledge aimed at the assimilation and use of the new knowledge. For this reason, the absorptive capacity of a company depends in particular on the absorptive capacity of the subjects that constitute it.

In work published by Cohen and Levinthal (1990), they refer to another article published in 1989. This article follows a chain focused on organizational learning and emphasize the need for companies to identify, assimilate and apply external knowledge. Therefore, the authors bring a reflection about external knowledge, pointing out that it is important for generating innovation along with the capacity that the organization over time acquires to produce new knowledge (Cohen & Levinthal, 1989).

Another pioneering work on the absorptive capacity that dates back to the early 1990s is the study developed by Moussa and Schware (1992). The central aim of this study was to emphasize the absorptive capacity of technology by a country, examining the way African government agencies are able to absorb information technologies.

In Mowery and Oxley (1995) it is possible to verify the position of these researchers who consider the organizations that are sensitive to the characteristics of the learning environment that act, as well as the bond that exists between the absorptive capacity and a variety of abilities that translate into the necessity to deal with the tacit elements of knowledge transfer processes and with the frequent need to change technology processes for use by the organization.

Lane and Lubatkin (1998) contribute to the understanding of the absorptive capacity bringing the notion of relative absorptive capacity. In this way, they proposed a reformatting of this construct at the level of the organizations delimiting it for a learning in the dyads. In other words, they consider the interorganizational level taking as reference that the capacity of a company to learn with another company is concomitantly defined by the set of particularities linked to each organization. In the same

vein as Cohen and Levinthal (1990), Lane and Lubatkin (1998) understand that absorptive capacity is a 'capacity' that organizations possess to recognize and capture the value of external knowledge, to assimilate it, and to themselves.

In the late 1990s, Van Den Bosch, Volberda and Boer (1999) developed an aggregate model of coevolution of absorptive capacity based on the concept of path dependence and the environment in which knowledge was found. They argue that the absorptive capacity, according to the definition proposed by Cohen and Levinthal (1989, 1990), is a function of the environment that the company competes and the way the organization manages it. Otherwise, if the environment changes, the organization must react to this change. However, if the reaction is not effective, the organization will need to adopt or implement another strategy. Therefore, after these considerations the authors define the absorptive capacity as the 'capacity' that covers the evaluation, acquisition, integration and commercial use of a new external knowledge.

In an attempt to improve the concept of absorptive capacity, initially studied by Cohen and Levinthal (1989, 1990), which consider three study variables (acquisition, assimilation and exploitation), Zahra and George (2002) promote an improvement in the concept of absorptive capacity by incorporating another dimension called 'transformation'. The authors configure this dimension as being a set of routines and organizational processes through which organizations acquire, assimilate, transform and apply (exploit). This new conceptualization presents two characteristics that contributed to the advancement of the definition of the absorptive capacities. The first one is to point out that the absorptive capacity is visualized as a dynamic capacity allocated in the routines and processes of the organization and allowing to analyze variables such as levels of stocks and flows of a company and relate them to the creation of sustainable competitive advantage. The second characteristic suggests that the four steps (acquisition, assimilation, transformation and exploitation) present in this definition are components of the absorptive capacity, have their combinatorial nature and are interdependent.

According to Zahra and George (2002) it is possible to understand the absorptive capacity of an organization as a dynamic capacity that allows the organization to develop and aggregate enough knowledge to generate other organizational capacities. That said, we can understand that the dynamic capacity of an organization is also shaped by the potential absorptive capacity in its potential and realized dimensions. In the potential dimension are the capacities of acquisition and assimilation of knowledge and in the potential dimension are present the capacities transformation and exploitation of knowledge (Zahra & George, 2002).

Taking as a reference the concept proposed by Zahra and George (2002), other similar studies in the first decade of the 2000s were also developed. For example, Malhotra, Gosain, and Sawy (2005) understand the absorptive capacity as a set of routines and processes relevant to the organization through which organizations acquire, assimilate, transform and exploit knowledge in order to generate dynamic capacities. The authors also note that the sharing of knowledge in interorganizational relations, if executed efficiently, can promote a better absorptive capacity with the links of the supply chain. The work of Matusik and Heeley (2005) evaluated that the absorptive capacity can be effective through the organization's relations with the external environment, structural factors, routines of knowledge as source of creation of value and the absorption of individual abilities. For these authors, these three elements make it possible to determine if the organization can efficiently absorb and assimilate knowledge from the external environment.

Khoja and Maranville (2010) consider that everything in the company comes from the culture. Therefore, these authors directed the research in the analysis of the relation between culture and the absorptive capacity. The findings of this study reinforce the influence of values and cultural practices on absorptive capacity. They also reiterate the meaning of the concept of absorptive capacity and understand that for companies to obtain sustainable competitive advantages, it is necessary to intensify the search for knowledge and generate capacities to acquire and assimilate external knowledge (Khoja & Maranville, 2010).

As the concept of 'absorptive capacity' has grown exponentially in the number of publications in the main periodicals in Administration in the first decade of the 2000s, mainly due to Zahra and

George's (2002) reconceptualization of this concept at the organizational level initially performed by Cohen and Levinthal (1989, 1990). Even though there are some congruent and antagonistic directives for the study of the absorptive capacity. This article is based on the model elaborated by Zahra and George (2002), since other researches that approach this concept are only variants of a conceptual model already existent in the works of these authors together with the seminal work of Cohen and Levinthal (1989, 1990).

3. UNITS OF ANALYSIS OF THE ABSORPTIVE CAPACITY

In the studies on absorptive capacity it is possible to observe several levels of analysis, such as: i) macroeconomic level; ii) intra-organizational level; iii) interorganizational level; iv) organizational level; v) individual level.

At the macroeconomic level are several studies that aim to investigate the absorptive capacity of a nation, country or region, industry, industry, etc. In this paper we will focus on the work of (Adler, 1965; Mallakh & Kadhim, 1977; Mowery & Olexley, 1995; Harvey, Skelcher, Spencer, Jas, & Walshe, 2010). Regarding the level of intraorganizational analysis, the focus of the study is concentrated on the absorptive capacity of organizational or subsidiary units (Tsai, 2001; Frost & Zhou, 2005), in groups of people (Cadiz et al., 2009), and knowledge transfer between departments of organizations, where they are visualized as subsets that encompass an organization (Gupta & Govindarajan, 2000).

Regarding the interorganizational level, we consider the importance of the collaborative relationships between companies and, therefore, work that has this level of analysis, we return to investigate how organizations absorb knowledge from another organization in different scenarios, taking as an example, acquisition processes, mergers, networks and strategic alliances (Lane & Lubatkin, 1998; Lane, Salk, & Lyles, 2001; Malhotra et al., 2005; Schildt, Keil, & Maula, 2012; Choi, Jean, & Kim, 2019; Liu & Yang, 2019). Jiménez-Barrionuevo, García-Morales and Molina (2011) point out that this type of unit of analysis has received little attention from researchers compared to intraorganizational and organizational levels.

Jiménez-Barrionuevo et al. (2011) argue that the level of organizational analysis is characterized by having a high development of research and studies about the absorptive capacity. In addition, it is considered one of the most important levels to understand the conceptual bases of the knowledge absorptive capacity by organizations, since learning is a phenomenon that extends beyond the individual level and is only institutionalized when at the organizational level (Pawlowsky, 2001). The main studies with this focus seek to analyze the organization as a whole avoiding to include in the scope of the research analysis of business units (intraorganizational level) and mergers, acquisitions and alliances (interorganizational level). We can cite some important researches that approach this unit of analysis, as examples of works stand out Van Den Bosch et al. (1999); Zahra and George (2002), Lee, Liang, and Liu (2010); Delmas, Hoffmann, and Kuss (2011); Fernhaber and Patel (2012); Forés and Camisón (2016); Xie, Wang and Zeng (2018); Li et al. (2019); Wang et al. (2019); and Yang and Tsai (2019). Finally, it is important to point out the importance of research at the individual level as a fundamental antecedent of the knowledge absorptive capacity for organizations (Chou, 2005; Vinding, 2006). Figure 1 shows a synthesis of the absorptive capacity analysis units with their respective prisms.

Figure 1 - Units of analysis of the absorptive capacity

Units of Analysis	Research Focus	References
Macroeconomic	Analysis of the absorptive capacity of countries, industries, sectors, <i>etc.</i>	Adler (1965), Mallakh and Kadhim (1977); Mowery and Oxley (1995).
Intraorganizational	Analysis of the absorptive capacity of groups, departments and business units.	Gupta and Govindarajan (2000), Tsai (2001), Cadiz et al. (2009).

Interorganizational	Analysis of how an organization absorbs knowledge of another organization.	Lane, Salk and Lyles (2001), Lane and Lubatkin (1998), Malhotra et al. (2005).
Organizational	Analysis of the absorptive capacity of organizations in general.	Cohen and Levinthal (1990); Van Den Bosch et al. (1999); Zahra and George (2002); Flatten et al. (2011); Forés and Camisón (2016); Xie et al. (2018); Li et al. (2019); Wang et al. (2019); Yang and Tsai (2019).
Individual	Analysis of the absorptive capacity of individuals.	Chou (2005); Vinding (2006).

Source: authors.

4. BACKGROUND OF THE ABSORPTIVE CAPACITY

Van den Bosch, Van Wijk, and Volberda (2003) show that the antecedents of the knowledge absorptive capacity (also called influence factors) is a subject not explored by empirical research within this theme. The work of Daghfous (2004), referring to the seminal works of Cohen and Levinthal (1989, 1990), provides a basis for holistic understanding of the antecedents that influence the knowledge absorptive capacity. For this, Daghfous (2004) distinguished these antecedents in two groups: i) internal background and; ii) external background. The literature points out that these factors can impact the knowledge absorptive capacity both negatively and positively. Thus, in order to bring this discussion to the present section we used the division proposed by Daghfous (2004).

4.1 Internal background of the absorptive capacity

From the point of view of the *internal background* of the knowledge absorptive capacity, Daghfous (2004) points out that the main factors are: i) the level of education of the employees; ii) the previous knowledge base of the organization; iii) investments in R&D; iv) age and size of organization; v) the presence of gatekeepers.

Regarding the level of education of an organization's employees, it is important to note that it has a high influence on the knowledge absorptive capacity. Thus, for Cohen and Levinthal (1990), Daghfous (2004), and Chou (2005), the greater the investment in education and corporate training for individuals, the greater the tendency to assimilate and use new knowledge. Vinding (2006) and Schmidt (2010) consider that, because the absorptive capacity of a company is linked to the absorptive capacity of its respective members, the way and the educational level to be achieved with the formation of the organization's people have impact on the level of the company's absorptive capacity. This can be proven by researches such as Chan (2003) and Bido, Godoy, Araujo, and Louback (2010) in the field of organizational learning. They have empirically proven that for learning at the level of organizations it is necessary that it occurs first at the individual level, then at the level of the group and therefore at the level of the company, and this learned knowledge can be institutionalized or not. In this sense, Rothwell and Dodgson (1991) argue that for an organization to have access to knowledge that is beyond its borders, it is necessary to have specialist people and the expertise in that type of knowledge that the organization intends to acquire. In addition, according to Daghfous (2004) and Gebauer, Worch and Truffer (2012) the skills already acquired provide new forms of creations by developing ideas from new and past combinations of knowledge. It is worth to say that one way of assessing the level of education in organizations is to look at the number of employees who hold university education together with the proportion of individuals the field of scientific research and professional with technical specialization in comparison with the number of total employees from the company (Vega-Jurado, Gutierrez-Gracia, & Fernandez-De-Lucio, 2008; Spanos & Voudouris, 2009; Grimpe & Sofka, 2009; Sun & Anderson, 2010).

Cohen and Levinthal (1990), Kim (1998), and Zahra and George (2002) look at the organization's 'stocks of knowledge' and its relation to absorptive capacity. And, therefore, a previous basis of knowledge is formed by all the knowledge acquired and agglomerated throughout the lifetime of the organization. In this sense, prior knowledge of the organization ends up having a positive

influence on the absorptive capacity, because it defines the degree of capacity in the realization of the activities of recognition of the value of new knowledge, assimilation, transformation and commercial application (Cohen & Levinthal, 1990). In addition, Cohen and Levinthal (1990) and Knoppen, Sáenz, and Johnston (2011) comment that prior knowledge (called internal knowledge of the organization) is of fundamental importance in the growth and acquisition of new knowledge due to organization, through of their employees, to have experienced learning experiences and as a result of these experiences the explicitness of this knowledge, through the establishment of a common language. It is for these reasons that the previous knowledge base is considered an important internal antecedent that can affect absorptive capacity (Forés & Camisón, 2016).

As reported in the section discussing the units of absorptive capacity analysis, seminal studies on this theoretical approach at the organizational level focused attention on the role of Research & Development (R&D) investments by addressing two key roles that organizations have when they stimulate research and development in innovative capacity (Chang, Gong, Way, & Jia, 2012). These essay assignments are present in an effective absorptive capacity along with the process of generating knowledge and innovations. In addition, Spithoven, Clarysse, and Knockaert (2010) emphasize the use of the R&D context for investigations into the absorptive capacity of organizations. From Daghfous (2004), capital investments in R&D are constantly being discussed in organizations because of their essential role in improving employee skills. For this reason, Daghfous (2004) and Jolly and Thérin (2007) consider that the relationship between R&D and the knowledge absorptive capacity tends to be two-way. In other words, absorptive capacity tends to influence the R&D guideline and emphasis, while R&D investments therefore tend to impact the effectiveness of the absorptive capacity (Daghfous, 2004; Vinding, 2006; Jolly & Thérin, 2007; Vega-Jurado et al., 2008; Wang et al., 2019).

Daghfous (2004) considers that the size and age of the organization can compromise the effectiveness of the company's absorptive capacity and, therefore, can also be considered an internal background. Lee and Sung (2005) developed a survey that included high-tech organizations and the results indicated that the size, measured by the number of employees, was significantly linked to R&D practices, which in turn, as Cohen and Levinthal (1990) and Vega-Jurado et al. (2008) ends up being used as a variable to measure the absorptive capacity of a company. However, another study by Liao, Welsch, and Stoica (2003) advises that, in parallel with large-scale organizations, smaller organizations are better able to respond to changes and the incorporation of innovations. This is because these types of organizations have more flexible characteristics regarding the structure, hierarchy and the management of the business as a whole (Delmas et al., 2011).

Daghfous (2004) draws attention to the presence of what is called gatekeepers and emphasizes the importance of the role they play as an internal antecedent of the company in determining absorptive capacity. The main assignment of gatekeepers is to decrease communication gaps and disagreements between suppliers and users of knowledge. In this sense, Vinding (2006) argues that the generation of a common language that is understood by all the different sectors and the members involved enriches the absorptive capacity of an organization through processes of transfer and /or sharing of knowledge. The seminal work of Cohen and Levinthal (1990) looks at the presence of at least two forms of gatekeepers. The first gatekeeper is one that acts as a border 'lock' on the input of external knowledge into the organization by transforming the necessary intra-organizational knowledge into an available knowledge through an easier model for the individuals in the organization and, in addition connecting the company with the external sources of knowledge. The second gatekeeper concerns the interface between the organization and the external environment. Therefore, the mission of this type of gatekeeper is to delineate the knowledge considered important from the external environment and modify it so that it can be understood by the subjects of the company (Cohen & Levinthal, 1990; Lichtenthaler, 2009; Armstrong & Lengnick-Hall, 2013; Bertrand & Mol, 2013). It is worth mentioning that in addition to verifying the knowledge and importing it into the company, the gatekeeper as an interface mechanism can act in the forwarding of information to the external environment showing the company with a more promising perspective.

It is important to bring up the discussion that the internal background of the knowledge absorptive capacity is not restricted only to the level of education of the employees, the previous knowledge base of the organization, investments in R&D, the age and size of the organization and the presence of gatekeepers. The literature also points to other events linked to the internal environment of organizations that act as factors influencing the absorptive capacity. These factors are exemplified as the events that stimulate or demand a company to respond to internal impulses, such as periods of crisis in organizations due to insufficient performance or even to more significant events that require the formulation or improvement of strategies of the organization (Cohen & Levinthal, 1990; Kim, 1998; George, Zahra, Wheatley, & Khan, 2001; Zahra & George, 2002; Jansen, Van Den Bosch, & Volberda, 2005; Easterby-Smith, Graca, Antonacopoulou, & Ferdinand, 2008; Lee et al., 2010). For Zahra and George (2002), when these factors present more comprehensive and regular characteristics, companies tend to look for new external knowledge and, for that reason, when the proportion of one of these factors increases, companies adopt strategies to allocate resources indispensable extras to foster the capacity to acquire and assimilate the knowledge produced in the external environment.

4.2 *External background of the absorptive capacity*

From the point of view of the external background of the knowledge absorptive capacity, the literature indicates that the main factors are: i) relationship with other organizations; ii) external knowledge.

Levinson and Asahi (1995) and Van Den Bosch et al. (1999) mention that the relationship with other organizations is characterized as one of the factors that impact on the absorptive capacity of a company's knowledge. Thus, the establishment of relationships between organizations affects the ability of the company to identify, value and absorb the new knowledge coming from the external environment (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Lewin, Massini, & Peeters, 2011; Liu & Yang, 2019). According to Yli-Renko, Autio, and Sapienza (2001), as the interaction repeats, it tends to increase the ability of companies to acquire and evaluate the importance of knowledge coming from other organizations. Cockburn and Henderson (1998) and Hodgkinson, Hughes, and Hughes (2012) bring another point to consider when discussing the relationship of the company with other organizations. They are the connections with the external sources of the public and private type, since these types of organizations can contribute positively to the absorptive capacity of the organizations. Some surveys, such as that of Waalkens (2006), found in Dutch construction organizations that the face-to-face relationship with the physical proximity between companies encourages the sharing and evolution of knowledge in the quest for innovation. Another prominent research is that of Hodgkinson et al. (2012) who have revealed the predominance of some dimensions through learning mechanisms and how absorptive capacity has clear and distinct effects on moderation under different management contexts besides examining the market orientation in the context of the organization.

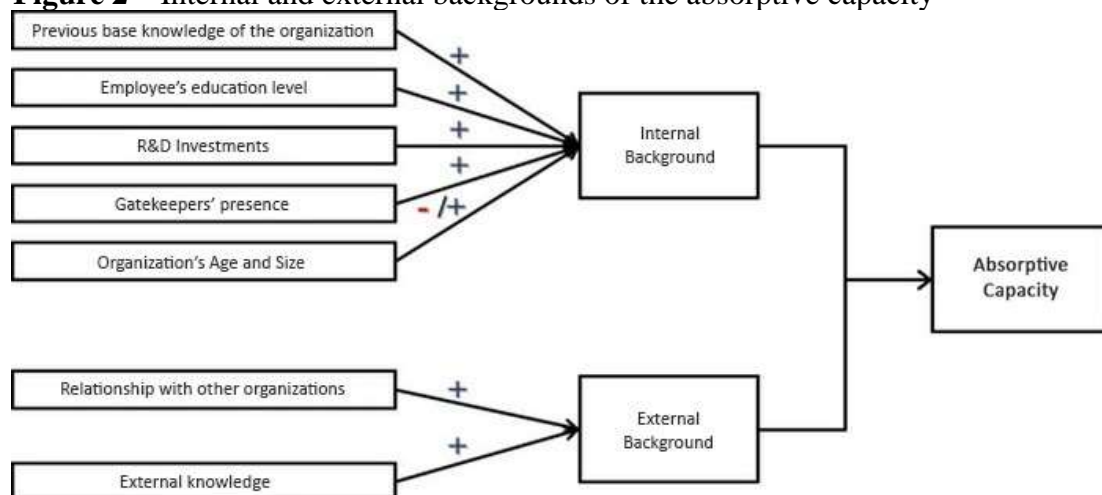
Daghfous (2004) argues that knowledge from external sources is seen as an essential factor for absorptive capacity. This is present in the assumptions of theoretical approaches involving knowledge management, given that a company cannot survive alone and there is a need for interaction with the external environment, for example with suppliers, buyers, stakeholders, *etc.* (Kogut & Zander, 1992; Grant, 1996; Nonaka & Takeuchi, 2003; Easterby-Smith & Prieto, 2008; Xie et al., 2018). Daghfous (2004) understands that the knowledge coming from outside the organization, in a way, represent new resources that allow to improve the knowledge absorptive capacity by the organizations. In this case, it is necessary to cite Tsai's (2001) research in 24 business units of a petrochemical company and 36 business units of a food manufacturing company, which, based on a network perspective on organizational learning, argue that organizational units can produce more innovation and perform better if they occupy core positions in the network. This may allow more access to new knowledge developed by other units. And, therefore, the absorptive capacity of the units ends up being a determining factor in the replication of a new knowledge. In addition, the interaction between the absorptive capacity and the position of the companies in the network is

positive and significant in the innovation and performance of the business unit (Tsai, 2001). In Waalkens (2006) the results were verified based on a research done with companies of the segments of architecture and engineering in the low countries, and the data evidenced that the knowledge of the suppliers of the chain and of the own competitors is essential for the development of innovation of these types of organizations.

In Lane et al. (2006) there is a distinction between two preponderant goals of organizations' knowledge absorptive capacity. The first objective consists of the different characteristics of the knowledge that permeate the internal environment of the company. The second objective is associated with the peculiarities of external knowledge that influence the acquisition, assimilation, transformation and applicability by the company. Otherwise, the particularities of knowledge, from the standpoint of Lane et al. (2006), have been examined in research as both mediating and independent variables that affect the acquisition, assimilation and application of external knowledge by the organization. Lane et al. (2006) also point out that the main characteristics of the researched knowledge are 'know what', which includes studies focused on the content of knowledge and elements of 'tacitness' approaching tacit knowledge in organizations.

As with internal background, external antecedents are not restricted only to relationships with other organizations and externally acquired knowledge. Therefore, there are other elements linked to the environment where the company is positioned that can also influence the absorptive capacity of the organization. Zahra and George (2002) already mentioned that these factors stimulate or demand the organization to attend the new scenarios that are configured in the external environment. In Kim (1998), crises in the sectoral environment, even if this type of event is not desired, is seen with good perspective by the author because the organization has to intensify efforts to obtain and assimilate new skills in order to generate new knowledge and thus, expand the level of absorptive capacity (Zahra & George, 2002; Harvey et al., 2010). Zollo and Winter (2002) and Sun and Anderson (2010) corroborate that sectoral or industry crises are seen as a warning sign of harming the organization's existence and thus prove to be beneficial in encouraging learning by leading to seeking, to obtain and internalize external knowledge. Volberda et al. (2010) using the term 'environmental turbulence' also agree that crises arising from the competitive environment are a factor in the scenario that tends to affect absorptive capacity. Figure 2 summarizes the main internal and external antecedents of the knowledge absorptive capacity.

Figure 2 – Internal and external backgrounds of the absorptive capacity



Source: authors.

5. RESULTING FROM ABSORPTIVE CAPACITY

Much of the research carried out indicates innovation as one of the main results of the knowledge absorptive capacity. In the review of the literature by Lane et al. (2006), innovation is seen as a consequence of organizational learning and is therefore continually viewed as a product of

absorptive capacity. Lane et al. (2006) further emphasize that studies on this theme recommended that absorptive capacity helps in the continuity, speed and relevance of an innovation, and in addition, innovation in organizations results in the production of knowledge that restoration as a derived part of the absorptive capacity.

Even the studies considered seminal by Cohen and Levinthal (1989, 1990), absorptive capacity had already been linked to innovation effects and, since 1990, several studies have sought to examine how absorptive capacity allows organizations to produce effective results in innovation (Stock, Greis, & Fischer, 2001; Tsai, 2001; Jansen et al., 2005; Murovec & Prodan, 2009; Tseng, Pai, & Hung, 2011; Wang & Han, 2011; Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2011; Forés & Camisón, 2016; Xie et al., 2018; Choi et al., 2019; Yang & Tsai, 2019). Some research has indicated innovation in more generic theoretical models, such as Cohen and Levinthal (1990), Huang and Rice (2009) and Fabrizio (2009), other studies have investigated the relationship between absorptive capacity and innovation performance as the case of Vinding (2006), Fosfuri and Tribó (2008), Kostopoulos et al. (2011), and Wang and Han (2011), while other studies have evaluated the peculiar consequences of innovation (Li et al., 2019). At this point, Murovec and Prodan (2009) explored the influences of absorptive capacity on the perception of innovation typologies. The results of the research of these authors revealed that the absorptive capacity is positively associated with the innovation of products visualized through the growth of the supply of goods and services together with a greater participation of market share. In addition, it also had a strong association with regard to process innovation through the improvement of production versatility, expansion of production capacity and reduction of inputs and energy as a function of the units produced (Murovec & Prodan, 2009).

From the point of view of process innovation, Lane et al. (2006) point out that research on this subject has shown that absorptive capacity tends to increase the speed and frequency of innovations and implementations in the essences processes, due to these types of innovations are designed based on the knowledge structure already present in the organization. On the other hand, the authors point to the reality that few researches emphasize the search for associations between absorptive capacity and radical innovation. Lane et al. (2006) believe that little empirical evidence for this type of research can exist because radical innovation involves a large pool of knowledge that combines in technology.

In this sense, we highlight the empirical research of Jansen et al. (2005) that aimed to try to fill this gap. The authors examined how absorptive capacity may be able to focus on exploration-oriented innovation and on innovation for exploitation. In other words, how the absorptive capacity could influence innovations that seek knowledge outside the organization and innovations whose knowledge used comes from the own sources generated in the organization itself. Another research, the study of the semiconductor industry by Le Masson, Cogez, Felk, and Weil (2011), tried to contribute to overcome the paradox in doing research with absorptive capacity and radical innovation investigated as the absorptive capacity can influence radical innovation. The results of the study suggest avoiding limitations of absorptive capacity with prior knowledge, since both the knowledge and elements of creativity together with the strategies to acquire external knowledge are associated with radical innovation (Le Masson et al., 2011).

In addition to innovation, another result of absorptive capacity is organizational performance (Wang et al., 2019). Zahra and George (2002) argue that theoretical research seeks to indicate that the consequences of business performance may be linked to the knowledge absorptive capacity. In contrast, other researchers have ascertained more accurate (variable) measures of performance organizations, such as Tsai (2001) who studied the financial performance of business units and that of Kostopoulos et al. (2011) who analyzed the performance at the most macro organizational level. At the interorganizational level, some research is focused on the relationship between organizational performance and innovation as a result of firms' ability to absorb knowledge (Lane & Lubatkin, 1998; Lane et al., 2001; Xia & Roper, 2008; Liu and Yang, 2019). As an example, the research by Wang and Han (2011) was aimed at revealing the complex relationships between the characteristics of knowledge, absorptive capacity of the company and the results of innovation in Chinese small and

medium enterprises. The results showed that only some characteristics of knowledge had negative effects on innovation performance. Most of the characteristics of knowledge have a positive effect on innovation along with the relation between the characteristics of knowledge and innovation are more revealed when the company has greater absorptive capacity (Wang & Han, 2011).

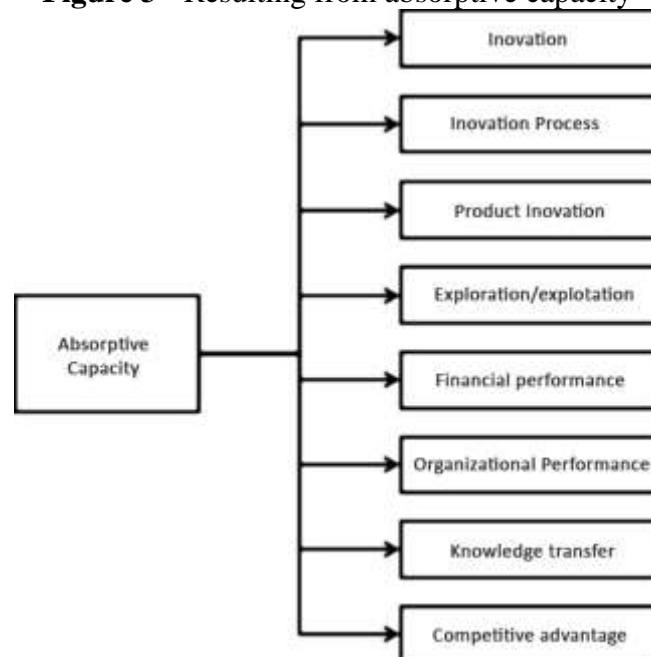
Another example of research that uses performance is the work of Tseng et al. (2011), whose objective was to discuss whether the three sources of knowledge (input, spillover and knowledge absorptive capacity) can actually increase innovative performance of companies in the design industry of Taiwan. The findings of this research had a certain similarity with the research of Wang and Han (2011) demonstrating that the input of knowledge is positively related to the innovation performance. The spillover is positively partial to the innovation performance. And the ability to absorb knowledge is positively related to the performance of innovation (Tseng et al., 2011).

Brettel, Greeve, and Flatten (2011) in a study that aimed to study the influence of absorptive capacity on market performance and financial performance tested the model and the findings indicated that absorptive capacity is relevant both for market performance and for financial performance. It still warns as a result, in which the literature on 'relative absorptivity' showed no significant effects, but it might be necessary to analyze if the relations would have been of greater relevance. For future research, the authors indicated that there may be curvilinear relationships and (and if confirmed) integrate them into theoretical models.

Still considering the knowledge absorptive capacity and its relation with performance, it is verified that the literature still presents a certain deficiency in discussing the absorptive capacity from an exclusive perspective of the operational performance. Some works such as those by Cohen and Levinthal (1990), Lane and Lubatkin (1998) and Zahra and George (2002) mention that organizations that efficiently develop this capacity allow the application of external knowledge in order to achieve the goals planned by the organization. In Spender (1996) and Van Den Bosch et al. (1999) analyzed that the company's ability to incorporate new knowledge into its operations can be compromised by the absorptive degree of the subjects involved with the main routines.

To summarize the theoretical development about the result of the knowledge absorptive capacity performed in this section and look for structure the literature on this subject, in Figure 3 are presented briefly some of the factors resulting from absorptive capacity.

Figure 3 - Resulting from absorptive capacity



Source: authors.

6. ANALYTICAL DIMENSIONS OF ABSORPTIVE CAPACITY

During the process of reviewing the absorptive capacity, it was possible to verify some research that portrays multidimensionality of this construct. However, these researches used different dimensions along with different conceptual content and definitions. Therefore, it is verified the absence of a common understanding for the definition of the component dimensions of the absorptive capacity construct (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Zahra & George, 2002; Todorova & Durisin, 2007; Camisón & Forés, 2010; Jiménez-Barrionuevo et al., 2011; Xie et al., 2018; Li et al., 2019).

Zahra and George (2002) proposed a new conceptualization of the absorptive capacity construct, following the theoretical assumptions of the dynamic capacities approach along the lines of Eisenhardt and Martin (2000), who argued that organizational changes occurred through processes and routines and considered knowledge as a critical success factor for organizations responded to environmental demands. In this way, Zahra and George (2002) have improved for four constructs of procedural nature, they are: i) acquisition; ii) assimilation; (iii) processing and; (iv) exploitation. Moreover, these dimensions the authors agglomerated into two more macro dimensions, which they called 'potential absorptive capacity' (encompassing the dimensions of acquisition and assimilation of knowledge) and 'absorptive capacity' (encompassing the dimensions of transformation and exploitation of knowledge).

This new conceptualization presents two characteristics that contributed to the advancement of the definition of the absorptive capacities. The first one is to point out that the absorptive capacity is visualized as a dynamic capacity allocated in the routines and processes of the organization and allowing to analyze variables such as levels of stocks and flows of a company and relate them to the creation of sustainable competitive advantage. The second characteristic suggests that the four stages (acquisition, assimilation, transformation and exploitation) present in this definition and that are components of the absorptive capacity have their combinatory nature, that is, their formation can generate dynamic capacities for the organization.

With regard to potential absorptive capacity, one can understand how the organization's ability to acquire and assimilate knowledge in the external environment that is relevant to its routines and processes. The dimension of 'acquisition' is defined as the ability of the organization to recognize, attribute value and acquire sufficient external knowledge for their respective operations. In the acquisition context, Zahra and George (2002) understand that the intensity and speed of the efforts made by knowledge-oriented organizations are determinant conditions for the quality of the knowledge acquisition capacity inherent to the organization. Therefore, the directing of efforts has an influence on the ways in which the organization moves to obtain external knowledge.

Present in the potential absorptive capacity, the dimension 'assimilation' is directed directly to the question of routines and processes of the organization, in order to allow the understanding, analysis and interpretation of information from external sources. Szulanski (1996) and Zahra and George (2002) emphasize that knowledge from the external environment presents specificity in a given context. Therefore, only the companies that are inserted in and interact in this environment can understand it and replicate it.

The potential absorptive capacity seeks to explore two fundamental elements of the flow of organizational knowledge: i) consciousness; (ii) the ability to respond to those elements. In other words, it can be understood that the organization should not be restricted to possessing knowledge, but must have a readiness to take action in order to seek them and implant them in the routines and processes. Therefore, the components that form the potential absorptive capacity have a tendency to identify if the organization has a favorable environment along with efficient processes and routines so that the next level is executed with excellence (Zahra & George, 2002; Liao, Welsch, & Stoica, 2003).

This level, as mentioned in this section, consists of the absorptive capacity realized. It involves the dimensions of 'transformation' and 'exploitation' of knowledge. Regarding 'transformation', Zahra and George (2002) refer to the ability to develop and improve routines that facilitate the integration

of existing knowledge with assimilated knowledge. In this way, this type of capacity enables organizations to identify how to adapt the new knowledge to specific demands.

On the dimension of 'exploitation', it is present in the organization's ability to apply external knowledge to achieve the objectives (Lane & Lubatkin, 1998). However, for Van Den Bosch et al. (1999) and Spender (1996), the company's ability to incorporate new knowledge in its operations is constantly exploited, creating new products or services. Zahra and George (2002) emphasize that social integration mechanisms are necessary conditions to facilitate the sharing and the exploitation process of a possible knowledge. Therefore, there are two types of mechanisms: i) the informal, oriented the networks of relationships between the subjects; ii) the formal, characterized by the coordination of the functional activities of the organization. Zahra and George (2002) argue that the use of social integration mechanisms reduces the gap between the potential absorptive capacity and absorptive capacity, raising the level of efficiency. It is worth mentioning that integration capacity mechanisms can also reduce the inherent barriers to knowledge sharing and transfer, increasing the degree of efficiency of assimilation and transformation.

Some researchers have appropriated the proposed conceptualization of Zahra and George (2002) and have used these dimensions in their researches with the purpose of operating the construct in empirical studies (Jansen et al., 2005; Lane et al., 2006; Camisón & Forés, 2010; Flatten et al., 2011; Jiménez-Barrionuevo et al., 2011; Noblet, Simon, & Parent, 2011; Forés & Camisón, 2016; Wang et al., 2019; Yang & Tsai, 2019).

As discussed, one of the alternatives for measuring the absorptive capacity is to ascertain the dimensions that are components of the construct. However, since there is no unanimity about the dimensions of this construct, it has been measured in different ways over the years. Among the various possibilities, one of the choices is to measure it by means of variables that affect the absorptive capacity. In other words, they use proxy-type variables as a function of this type of variable to indirectly measure the variable that the researcher intends to study, and therefore, is used when the object of study is difficult to measure or observe.

Cohen and Levinthal (1990), Stock et al. (2001), Tsai (2001) and Zahra and Hayton (2008) conceptualize absorptive capacity as a multidimensional construct, but from the point of view of their operationalization they do it as a one-dimensional construct. An example of this assertion can be seen in Cohen and Levinthal's (1990) work that conceptualized the absorptive capacity as a construct measured by the dimensions of recognition and value attribution to external knowledge, assimilation of knowledge, and ultimately exploitation or application of knowledge. However, in their operationalization they grouped these three dimensions from the conceptual discussion into a single dimension by measuring it as the variable 'R&D Effort'. In the view of Jiménez-Barrionuevo et al. (2011), some research has measured the absorptive capacity using variables that result in other variables directly linked to R&D. In this sense, it can be verified that these variables can be the percentage of technical and professional employees due to the number of employees, R&D expenses and the number of patents of the organization, R&D activities aimed at creating new knowledge, presence of physical structure or research laboratories of the organization, the regulation of internal R&D tasks, the existence of an own research department, political relations with public research institutes, technical training of employees, among others (Mangematin & Nesta, 1999; Petroni & Panciroli, 2002; Frost & Zhou, 2005; Vega-Jurado et al., 2008; Chen, Qiao, & Lee, 2014).

In this same line, the research by Nieto and Quevedo (2005) applied a quantitative research that contained indicators on the level of knowledge and expertise of the company, strategic positioning, company interaction with the external environment, differences and overlaps involving the bases of knowledge. However, for this study Nieto and Quevedo (2005) do not measure the absorptive capacity through the procedural dimensions, and the indicators used measure the factors that affect the absorptive capacity leaving aside the procedural elements.

Inspired by the absorptive capacity literature and the preexisting conceptual models, Camisón and Forés (2010) constructed and validated two scales. One of the scales was intended to measure the potential absorptive capacity and the other the absorptive capacity. Through the use of multivariate statistical techniques such as exploratory and confirmatory factor analysis, the authors grouped the

indicators in their respective dimensions and verified a high statistical correlation between these dimensions of the construct.

Similar to the study of Camisón and Forés (2010), another research that aimed to develop an instrument and measure the absorptive capacity construct is the work of Jiménez-Barrionuevo et al. (2011). These authors measured the absorptive capacity as a multidimensional construct constituted by the 'potential' and 'realized' dimensions and their respective processes (acquisition, assimilation, transformation and exploitation of knowledge), as proposed in the theoretical development of Zahra and George (2002). Thus, to measure the acquisition process, indicators of respect, trust, interaction, friendship and reciprocity in the relationship between two companies were used. In order to measure the process of assimilation of knowledge, indicators such as similarity, compatibility, common language and complementarity were used. Aimed at measuring the process of knowledge transformation in the company, the authors used indicators about meetings, transmission, flow, time, communication and documents. Finally, to measure the exploitation process, the indicators on the use of knowledge and responsibility were used.

In the course of the research, Jiménez-Barrionuevo et al. (2011) prove from the statistical point of view that the indicators trust, interaction, reciprocity, respect, common language, friendship, similarity, compatibility and complementarity are grouped in the factor absorptive potential, which is formed by the processes of acquisition and assimilation of knowledge. On the other hand, the documents indicators, time, communication, transmission, flow, meetings, application and responsibility make up the factor of absorptive capacity that is formed by the processes of transformation and exploitation of knowledge. Therefore, this alternative of measurement that the work Jiménez-Barrionuevo et al. (2011) proposes offers a good fit of the model to measure the absorptive capacity construct. The scale has proved interesting to measure the ability of companies to acquire, assimilate, transform and exploit knowledge, as well as scale dimensions to the absorptive capacity is a valid and reliable measure, making it suitable for use in the future scientific community results.

Flatten et al. (2011) created and validated a questionnaire that measures the absorptive capacity as a multidimensional construct with German companies. The authors acknowledge that the processes of acquisition, assimilation, transformation and exploitation of knowledge are dimensions to measure the absorptive capacity of a company. Therefore, appropriate indicators were used for each dimension. Taking as an example the measurement of the process of acquisition of external knowledge, three indicators were statistically validated; four indicators were validated for the measurement of the knowledge assimilation process; four indicators were validated for the measurement of the knowledge transformation process; three indicators were validated to measure the knowledge exploitation process.

When considering the intergenerational level, Arnold, Benford, Hampton, and Sutton (2010) sought to measure the absorptive capacity of employees in the supply chain. To that end, these researchers used metrics that were previously elaborated and validated by Malhotra et al. (2005), which included indicators about the operational efficiency of the supply chain business partners and also about the commercial relationships that enable the development of knowledge within of companies. Still further to Arnold et al. (2010), the absorptive capacity of the supply chain is based on the premise that each participant in the chain has its own absorptive capacity made possible to acquire and assimilate new knowledge in a way that is possible the involvement in the exploitation in knowledge with other participants in the chain.

Nagati and Rebolledo (2012) proposed a research whose objective was to analyze the relation between the relative absorptive capacity (Lane & Lubatkin, 1998) and the operational performance of suppliers of a supply chain. Using structural data equation modeling, the survey was applied to 218 Canadian manufacturers who have a more intrinsic relationship with one of their customers. To measure relative absorptive capacity, the authors used the knowledge that is shared through organizational routines and the overlapping of knowledge bases. The findings of this study pointed to the influence of the sharing of routines in the transfer of knowledge between client and supplier in the chain. In addition, knowledge transfer acts as a mediator between the sharing of routines and the

supplier's operational performance. However, as far as overlapping of knowledge bases is concerned, there is no significant association between this dimension of relative absorptive capacity and knowledge transfer (Nagati & Rebolledo, 2012).

In Cadiz et al. (2009) the measurement of absorptive capacity was at the group level focused on a context of communities of practice. The authors analyzed three dimensions: i) evaluation; ii) assimilation; (iii) exploitation. In relation to the evaluation dimension, the authors took as indicators parameters that dealt with the recognition and the filtering of the information; in the assimilation dimension the indicators were based on the metamorphosis of new knowledge for useful knowledge and; in the exploitation dimension the indicators were based on the usability of knowledge.

In Elbashir, Collier, and Sutton (2011) research, it was proposed to measure the organization's absorptive capacity in the organization through two dimensions: i) the absorptive capacity of the operational managers; ii) the absorptive capacity of top management teams, whose metrics were created from the previous knowledge considered relevant to the company together with the intensity of the effort. In addition, the construct was operationalized through the four forms of knowledge creation (socialization, externalization, combination and internalization) of Nonaka and Takeuchi (2003). In this sense, for Elbashir et al. (2011) the absorptive capacity was conceptualized as being an ability to generate knowledge.

According to Van den Bosch et al. (2003), there is still a certain lack in the development of metrics and research that show the conceptual and operational differences in the measurement of the absorptive capacity construct itself, the measurement of its backgrounds and the measurement of its consequences.

7. CONCLUSION

This paper provides an overview of the absorptive capacity construct from research in the field of business administration. As categories of analysis were analyzed different aspects, such as the origins and conceptualizations of absorption capacity; the main units of analysis; the antecedents and resulting from the concept; as well as the analytical dimensions of absorption capacity. As a result, when evaluating the different studies selected, it was evidenced that, within this theme, deficiencies are still found in certain aspects. Given this, meeting the consolidated results as well as the identified gaps, this article presents contributions different.

This research contributes to the development of studies on business strategies linked to the boundaries of absorptive capacities, highlighting that interorganizational relationships continue to be a field of interest for the development of new studies. In addition, this research has broadened discussions and debates on the consequences of absorptive capacity, either in terms of organizational performance or in different types of innovation. Thus, the reflection of this article also provides relevant elements that can be used to evaluate the processes related to understanding the benefits arising from the evolution of the absorption capacity construct. Finally, it is important to highlight the need for the development of metrics and empirical research that highlight the conceptual and operational differences in the measurement of the absorptive capacity construct itself, also including the measurement of their antecedents and consequences and other mediating or moderate constructs of this relationship.

The results of this theoretical research should be weighed by its limitations. The concept characterization approach is not related to an empirical research, ie, no primary data were used for a discussion of the merits of particular definitions for specific purposes. However, considering the proposed objective, based on a consistent categorization, whose ultimate purpose is to expose research avenues, the study advances in the systematization of the absorption capacity construct, so as to encompass its different specificities, from concepts to results. For future studies, in addition to the gaps already identified, an empirical investigation is suggested considering the impacts of the knowledge absorption capacity model on the different types of innovation (product innovation, process innovation, marketing innovation and organizational innovation) in organizations operating in different markets.

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