THE EFFECTS OF ORGANIZATIONAL LEARNING AND ABSORPTION CAPACITY ON THE PERFORMANCE OF PRODUCT INNOVATION IN SMALL AND MEDIUM-SIZED ENTERPRISES

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Abstract

**Objective:** Verify the moderating role of absorptive capacity in the relationship between organizational learning and the performance of product innovation in small and medium-sized companies (SMEs).

**Methodology:** The research has a descriptive quantitative approach using the survey method and questionnaires applied to 233 owners of small and medium-sized companies (SMEs). Data were analyzed using the Smart-PLS software using the structural equation modeling technique.

**Originality:** The research used a quantitative and descriptive approach to investigate product innovation performance in the SMEs' field. Investigations into the performance of innovation in SMEs are still a limited and little-explored field in Brazil (Manthey et al., 2017; Davila, Varvakis, North, 2019). Another prominent factor was that the absorptive capacity does not act as a moderator in the relationship between organizational learning and product innovation performance, which goes against the assumptions present in the literature.

**Main results:** The results showed that organizational learning influenced positively the performance of product innovation in the investigated companies, as well as organizational learning positively impacted absorption capacity. However, the moderating role of absorption capacity in the relationship between organizational learning and product innovation performance has not been confirmed in the field of study of the investigated SMEs.

**Theoretical/methodological contributions:** The research showed that the capacity of absorption in the investigated SMEs could not moderate, affecting the direction or intensity of product innovation performance.
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This fact represents a counterpoint to the previously published literature that advocates a positive relationship between AC and innovation.

**Social/management contributions:** The purpose of this study was to obtain more information on how SMEs absorb knowledge and transform it to improve the performance of innovations. The understanding of practices to develop the knowledge absorption capacity in SMEs is still configured as a "black box" to be explored.

**Keywords:** Absorptive capacity. Organizational learning. Performance of product innovation. Small and medium enterprises. Structural equation modeling.

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**Resumo**

**Objetivo do estudo:** Verificar o papel moderador da capacidade absorviva na relação entre a aprendizagem organizacional e o desempenho da inovação de produtos em pequenas e médias empresas (PMEs).

**Metodologia:** A pesquisa possui abordagem quantitativa descritiva com uso do método survey e aplicação de questionários em 233 proprietários de pequenas e médias empresas (PMEs). Os dados foram analisados no Software Smart-PLS com a técnica de modelagem de equações estruturais.

**Originalidade:** A pesquisa investigou o desempenho da inovação de produto no campo de estudo nas PMEs usando uma metodologia de natureza quantitativa com abordagem descritiva. As investigações sobre o desempenho da inovação em PMEs ainda é um campo limitado e pouco explorado no Brasil (Manthey, et al., 2017; Davila, Varvakis, North, 2019). Outro fator de destaque foi o fato de a capacidade de absorção não atuar como moderadora na relação entre a aprendizagem organizacional e o desempenho da inovação de produto, o que se contrapõem aos pressupostos presentes na literatura.

**Principais resultados:** Os resultados mostraram que a aprendizagem organizacional influencia positivamente o desempenho da inovação de produtos nas empresas investigadas, bem como a aprendizagem organizacional impacta positivamente a capacidade de absorção. No entanto, não se confirmou o papel moderador da capacidade de absorção na relação entre a aprendizagem organizacional e o desempenho da inovação de produtos no campo de estudo das PMEs investigadas.

**Contribuições teórico-metodológicas:** A pesquisa apontou que a capacidade de absorção, nas PMEs investigadas, não é capaz de moderar, afetar a direção ou a intensidade, do desempenho da inovação de produto. Isto representa um contraponto à literatura até então publicada que defende uma relação positiva entre CA e o desempenho da inovação.

**Contribuições sociais/gerenciais:** O presente estudo teve por finalidade a obtenção de maiores informações sobre como as PMEs absorvem conhecimentos e os transformam para melhorar o desempenho de inovações. A compreensão das práticas para desenvolver a capacidade de absorção de conhecimento em PMEs ainda se configura como uma “caixa preta” a ser explorada.

**Palavras-chave:** Capacidade de absorção. Aprendizagem organizacional. Desempenho da inovação de produto. Pequenas e médias empresas. Modelagem de equações estruturais.

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**Resumen**

**Objetivo del estudio:** Verificar el papel moderador de la capacidad de absorción en la relación entre el aprendizaje organizacional y el desempeño de la innovación de producto en las pequeñas y medianas empresas (PyME).

**Metodología:** La investigación tiene un enfoque descriptivo cuantitativo utilizando el método de encuesta y cuestionarios aplicados a 233 propietarios de pequeñas y medianas empresas (PYMES). Los datos se analizaron utilizando el software Smart-PLS utilizando la técnica de modelado de ecuaciones estructurales.

**Originalidad:** La investigación investigó el desempeño de la innovación de producto en el campo de estudio en PYMES utilizando una metodología de carácter cuantitativo con enfoque descriptivo. La investigación sobre el desempeño de la innovación en las pymes es todavía un campo limitado y poco explorado en Brasil (Manthey, et al., 2017; Davila, Varvakis, North, 2019). Otro factor destacado fue el hecho de que la capacidad de absorción no actúa como moderador en la relación entre el aprendizaje...
organizational and the performance in innovation of product, which contradicts the suppositions present in the literature.

**Principales resultados:** Los resultados mostraron que el aprendizaje organizacional influyó positivamente en el desempeño de la innovación de productos en las empresas investigadas, así como el aprendizaje organizacional impactó positivamente la capacidad de absorción. Sin embargo, no se ha confirmado el papel moderador de la capacidad de absorción en la relación entre el aprendizaje organizacional y el desempeño de la innovación de productos en el campo de estudio de las PYMES investigadas.

**Aportes teóricos/metodológicos:** La investigación mostró que la capacidad de absorción, en las PyME investigadas, no es capaz de moderar, afectar la dirección o intensidad del desempeño de la innovación de producto. Esto representa un contrapunto a la literatura publicada anteriormente que aboga por una relación positiva entre CA e innovación.

**Aportes sociales/gerenciales:** El propósito de este estudio fue obtener más información sobre cómo las pymes absorben el conocimiento y lo transforman para mejorar el desempeño de las innovaciones. La comprensión de las prácticas para desarrollar la capacidad de absorción de conocimiento en las PYMES aún se configura como una “caja negra” por explorar.

**Palabras clave:** Capacidad de absorción. Aprendizaje organizacional. Desempeño de la innovación de productos. Pequeñas y medianas empresas. Modelos de ecuaciones estructurales.

**1 Introduction**

In a scenario where instability and change prevail, generating innovation is essential for small and medium-sized companies (SMEs). Such ability offers added value to the product/service and the customer (Cassol, Cintra, Ruas & Oldoni, 2016; McDowell, Peake, Coder & Harris, 2018). The development and implementation of knowledge-based resources guided by organizational learning processes become relevant for companies to obtain sustained competitive advantage and profitability (Cohen & Levinthal, 1990). However, absorption capacity (AC) becomes necessary because it assesses its ability to identify, assimilate, transform and exploit valuable external knowledge for its processes or operations to obtain a competitive advantage (Escribano; Fosfuri & Tribo, 2009).

Innovation in SMEs is conceived as an individual and collective learning process that aims to find new ways of solving problems, depending on the company's capacity to absorb knowledge. New knowledge is developed, distributed, and used (Alegre & Chiva, 2008). Thus, organizational learning processes would be at the origin of the development of specific AC capabilities (acquisition, assimilation, transformation, and application) (Lane; Koka & Pathak, 2006; Camisón & Forés, 2010; Sun & Anderson, 2010; Gebauer, Woroch, & Truffer, 2012).

We observed that the speed of response and the ability to adapt to market demands allow SMEs to take advantage of their "size" advantages through innovation (Leal-Rodríguez & Albort-Morant, 2016; Rosenbusch & Brinckmann, 2011). Recent studies indicate that innovative activities are particularly challenging for small and medium-sized enterprises.
(SMEs) due to their severe financial constraints and information asymmetries (Barbaroux, 2014; Limaj & Bernroider, 2019).

The organizational learning capacity might not be enough to achieve high levels of product innovation performance. The company needs to have other organizational capabilities (Fernández-Mesa, Alegre-Vidal, Chiva-Gómez & Gutiérrez-Gracia, 2013), for example, the capacity to absorb knowledge. Although previous research has revealed a strong correlation between absorptive capacity and organizational learning, CA's moderating role in facilitating product innovation performance has not been thoroughly examined in the context of SMEs (Martínez-Sánchez, Vicente-Oliva, & Pérez-Pérez, 2020). Investigations on the performance of innovation in SMEs are still a limited and little-explored field in Brazil (Manthey, Verdinelli, Rossetto & Carvalho, 2017; Davila, Varvakis, North, 2019).

SMEs differ in their response and susceptibility to pressure from the external environment and, as such, the specific focus on organizational learning and innovative performance of SMEs is very critical (Chang; Hughes & Hotho, 2011; Tian, Dogbe, Pomegbe, Sarsah & Otoo, 2021). Thus, this research seeks to answer: What is the influence of absorptive capacity on the relationship between organizational learning and product innovation performance in SMEs? In this perspective, the research objective was to understand if the absorption capacity can enhance organizational learning and, consequently, increase product innovation performance in small and medium-sized companies.

To reach the aim, we used a quantitative survey with questionnaires applied to a sample of 233 owners of small and medium-sized companies located in the western mesoregion of Santa Catarina. Data were analyzed using the technique of structural equation modeling using the SmartPLS software. The main results of the research verified the positive influence of organizational learning on the absorption capacity (H1) and the performance of product innovation (H2). The positive impact of absorptive capacity on the performance of product innovation was also confirmed (H3). However, hypothesis H4 was rejected, noting that AC does not affect the direction or strength of the relationship between organizational learning and product innovation performance in the investigated SMEs. The study contributes to developing a better understanding of how organizational learning capacity impacts the product innovation performance of SMEs and how this relationship is moderated by absorptive capacity.

This article is structured from the presentation of introductory chapters, concluded here, theoretical review, and development of research hypotheses. The third chapter presents the
method and the descriptions of the variables. Later the results and discussions are exposed. Finally, the study's final considerations are outlined.

2 Literature review and hypothesis development

Organizational learning plays a vital role in problem-solving, generation/construction of new projects, and appropriation of knowledge (March & Olsen, 1975; Pedler, Burgoyne & Boydell, 1991; Schön & Argyris, 1996; Kim, 1998). The organizational learning capacity is understood from the tangible and intangible resources that a company has and is characterized as a set of skills to obtain a competitive advantage (Alegre & Chiva, 2008).

Organizations need organizational learning to successfully launch new products or services on the market to meet customer requirements and thus obtain better performance and sustainable competitive advantage (Baker & Sinkula, 2002). Thus, the survival of a company depends on its ability to innovate and learn.

Innovation explores knowledge developed within the company and manifests itself through new or improved products, services, or processes (Gronum; Verreynne & Kastelle, 2012). On the other hand, product innovation is a process that includes technical design, research and development (R&D), manufacturing, management, and commercial activities involved in the commercialization of a new (or improved) product (Alegre & Chiva, 2008). Thus, the literature in recent years has made efforts to understand ways to measure the success and failure of new products (Cooper & Kleinschmidt, 1995; Valle; Fernandez & Avella, 2003; Alegre, Lapiedra & Chiva, 2006).

For companies to achieve a positive performance in innovation, it is necessary to understand the dynamics of innovation, a clear definition of the processes that comprise it, and the application of tools to measure it (Hannachi, 2015). However, considering the variety of forms of innovation, initiatives aimed at measuring its performance become very limited due to the lack of equivalence standards. There is a consensus in the literature on the need to adopt a multidimensional approach to measure innovation performance, that is, that it does not only consider financial and objective data (Bakar & Ahmad, 2010; Dewangan & Godse, 2014; Hannachi, 2015; Manthey et al., 2016). In this sense, the present study was based on the subjective understanding of product innovation performance considering its multidimensional format.

The organizational learning process consists of acquiring, disseminating, and using knowledge and is closely related to product innovation performance (Argote, McEvily &
Reagans, 2003; Lemon & Sahota, 2004; Alegre & Chiva, 2008). Scuotto, Del Giudice & Carayannis (2017) investigated 215 small and medium-sized companies from different sectors, both knowledge-intensive and labor-intensive, and found that AC positively affects the innovation performance of SMEs. They also found that innovation performance is related to the process of acquiring external knowledge (Palacios-Marques; Soto-Acosta & Merigó 2015). Moreover, it may be limited because companies cannot independently assess the value of external knowledge (Del Giudice and Maggioni 2014; Carayannis; Depeige & Sindakis, 2014).

Alternatively, Maes and Sels (2014) suggest that small companies may be more adept at implementing innovations due to their reduced bureaucratic processes. However, researchers generally agree that innovation capabilities derive from stocks of knowledge, sharing, and systematization within the company (Maes & Sels, 2014; Roxas et al., 2014), and innovation is a robust predictor of performance in the context of SMEs (Dibrell et al., 2008; Rosenbusch; Battisti & Deakins, 2011). Thus, we propose the first research hypothesis:

**Hypothesis 1a**: Organizational learning positively influences product innovation performance.

To prevent organizational learning from being confused with competence development, this study explores the relationship between organizational learning and innovation within a broad framework, bringing to light the role of knowledge absorption capacity (CA). Absorption capacity (Cohen & Levinthal, 1990) is a learning perspective that has received considerable attention in the organizational literature (Lane et al., 2006; Leal-Rodríguez, Ariza-Montes, Roldan & Leal-Millan, 2014; Huang, Lin, Wu & Yu, 2015).

Some works defend the recursive relationship between Organizational Learning (OL) and absorption Capacity (AC) processes. Therefore, OL processes would be at the origin and development of specific AC capabilities (acquisition, assimilation, transformation, and application) (Lane et al., 2006; Camison & Forés, 2010; Sun & Anderson, 2010; Gebauer et al., 2012). The absorptive capacity (AC) is constituted by a construct that expresses the capacities to appropriate external knowledge, assimilates it to internal knowledge, and transforms and applies them in its products or processes. being structured in the form of routines or practices of work (Zahra & George, 2002; Torodova & Durisin, 2007; Camison & Forés, 2010; Gonçalves, Vieira & Pedrozo, 2014). Thus, AC enables the company to recognize the value of
knowledge and apply it, enhancing innovation, constituting a critical success factor (Wegner & Maehler, 2012; Duchek, 2015).

To sustain their competitive advantage in a highly competitive landscape, SMEs need to learn effectively despite their limited resources. The ability to successfully access and use knowledge is at the heart of absorptive capacity (Saad, Kumar & Bradford, 2017). In the context of SMEs, the absorptive capacity drives the links with other companies (Muscio, 2007; De Jong & Freel, 2010), which can be enhanced by the learning practices present in the company's routines. Thus, the second research hypothesis investigates:

**Hypothesis 2:** Organizational learning positively influences absorptive capacity.

Absorptive Capacity is treated as a corporate model in companies, defined as a set of strategic organizational routines and processes that enable companies to acquire, assimilate, transform and apply knowledge to create dynamic capabilities (Zahra & George, 2002). AC is configured in two stages: i) Potential Absorption Capacity, which comprises the processes of acquisition and assimilation of external knowledge; and ii) Realized Absorptive Capacity, which comprises the process of transforming external knowledge into procedures, practices, routines, projects, prototypes and other internal instruments and the process of applying this knowledge in innovation. This model is supported by several studies (Lane et al., 2006; Todorova & Durisin, 2007; Sun & Anderson, 2010; Gebauer et al., 2012; Patterson & Ambrosini, 2015). To improve their performance, companies must simultaneously develop and manage all ACAP dimensions (Zahra & George, 2002). As the objective of AC is to apply information acquired externally for commercial purposes (Cohen & Levinthal, 1990), AC helps to generate competitive advantage (Zahra & George, 2002; Lane et al., 2006). Thus, the absorptive capacity is linked to the company's ability to access and use the knowledge that is dependent on the sources of knowledge and complementarity and on the company's previous experience available to mobilize, or not, the acquisition of knowledge.

It becomes common for companies to filter the external environment and collect market knowledge from all possible sources (Laursen & Salter, 2006) to improve their performance. Furthermore, the absorption capacity improves a company's performance characterized as an SME (Flatten, Greve, & Brettel, 2011; Tzokas, Kim, Akbar & Al-Dajani, 2015). However, there is still a contradiction among researchers about the role of absorptive capacity in improving the innovative performance of an SME (Bougrain & Haudeville, 2002; Lund Vinding, 2006;
Chandrashekar & Bala Subrahmanya, 2017). With that, we propose the third research hypothesis:

**Hypothesis 3:** Absorptive capacity positively influences product innovation performance.

Over the past 20 years, the focus on innovation has replaced traditional cost-oriented business models, triggering exponential growth in the innovation literature. New topics have emerged (Keupp, Palmié & Gassmann, 2012) to understand innovation performance measures. Thus, product innovation performance surveys are derived from studies on the performance of new products and innovation performance (Cooper & Kleinschmidt, 1995; OECD, 1999; Alegre, Chiva & Lapiedra, 2005; Terziiovski, 2010; Camisón & Forés, 2015; Hannachi, 2015).

Absorptive capacity can serve as an internal moderation mechanism to help firms process new external knowledge. Consequently, the market knowledge process partially generates the combined effect of organizational learning and absorptive capacity in innovation (Hernandez-Perlines, 2018). The absorptive capacity of an individual and sharing knowledge among members is critical for companies (Cohen & Levinthal, 1990). Thus, organizations must develop mechanisms and practices that support or promote the creation of organizational knowledge, establishing a climate conducive to learning (Gomes & Wojahn, 2017) and the development of innovation results (Jiménez-Jiménez & Sanz-Valle, 2011).

As a result, innovation seems to depend on the company's learning capacity, through which new knowledge is developed, distributed, and used (Alegre & Chiva, 2008). The ability to learn has been considered a critical point in an organization’s innovation (Jerez-Gómez, Céspedes-Lorente & Valle-Cabrera, 2005). Some considered the organization's absorptive capacity to be a possible moderator for several determinants of innovation success (Elbashir, Collier & Sutton, 2011; Moilanen, Ostbye & Woll 2014). Thus, the fourth hypothesis of this study proposes:

**Hypothesis 4:** The absorptive capacity acts as a moderator in the relationship between organizational learning and product innovation performance.
3 Method

This study carried out quantitative research through a survey in small and medium enterprises (SMEs). This type of research aims to obtain data on the different characteristics, actions, or opinions of a target population (Freitas, Oliveira, Saccol & Moscavola, 2000) to validate the research hypotheses. The research is characterized by a cross-section, as data collection was carried out in a single moment, describing and analyzing the variables in that context.

3.1 Population and sample

The population corresponds to small and medium-sized enterprises (SMEs) in the trade and services sectors located in the western region of Santa Catarina. Which comprises the microregions of São Miguel do Oeste, Chapecó, Xanxerê, Joaçaba, and Concórdia.

The definition of small and medium-sized business refers to a business company, a simple partnership, an individual limited liability company, and entrepreneurs duly registered in the Registry of Commercial Companies or Civil Registry of Legal Entities (Complementary Law No. 123 of 2006). Many academic studies use quantitative criteria for the evaluation of SMEs, thus avoiding difficulties inherent in the evaluations and comparisons in the sample. Among the quantitative criteria used to classify SMEs, gross revenue (turnover) or the number of employees are used (Leone, 1991). In this research, we chose to use the number of employees criterion to classify companies, as proposed by the Micro and Small Business Support Service (SEBRAE, 2016). The sample consisted of commercial and service SMEs with up to 99 employees.

Table 1

Definition of the size of establishments according to the number of employees

| Size                  | Commerce and Services          |
|-----------------------|--------------------------------|
| Micro enterprise (ME) | Up to 9 employees              |
| Small business (SB)   | From 10 to 49 employees        |
| Medium-sized company  | From 50 to 99 employees        |
| Big companies         | Over 100 employees             |

Source: Sebrae (2016).

For the present study, a population of 32,341 SMEs were identified through the Board of Trade of the State of Santa Catarina and SEBRAE/SC (2016). The sample was probabilistic
since all individuals had the same chance of being chosen, considered a representative sample. We estimated the minimum sample size for the research using the free G*Power 3.1.9 software suitable for research using PLS (Faul; Erdfelder; Buchner & Lang, 2009). We parameterized the tool with statistical power at 0.8, effect size at 0.15, and α at 5% (Hair Jr, Sarstedt, Hopkins, & Kuppelwieser, 2014), obtaining a minimum sample of 68 respondents. However, to have a more consistent model, it is appropriate to double or triple this value (Ringle, Silva & Bido, 2014), requiring a minimum sample of 204 respondents. The initial number of questionnaires collected was 250, but 17 questionnaires were discarded because the companies were not classified as SMEs (due to the number of employees declared). Thus, 233 questionnaires were validated, and this is the final research sample. All survey respondents acted as managers or owners for the investigated companies.

3.2 Scales used

3.2.1 Independent variable

The independent variable of this research is the organizational learning construct and its dimensions from the study by Alegre and Chiva (2008) and validated in Brazil by Padilha, Wojahn, Gomes, and Machado (2016). Such dimensions were used and tested in other studies (Liao & Wu, 2009; Jyothibabu, Farooq & Pradhan, 2010; Camps; Alegre & Torres, 2011; Camps & Luna-Arocas, 2012; Mbengue & Sané, 2013). The dimensions were considered valid and reliable as a way to determine the propensity to learn in companies.

The independent variable focuses on the individual, is composed of its five dimensions: i) experimentation; ii) risk propensity; iii) interaction with the external environment; iv) dialogue; and v) participatory decision-making, totaling 18 variables, as shown in Table 2. For this purpose, the Likert Scale was used, with points ranging from 1 to 7, with one corresponding to "Strongly Disagree" and seven correspondings to "Strongly Agree."
Table 2

Research Indicators Organizational Learning

| Dimension                          | Code | Variables                                                                 |
|------------------------------------|------|---------------------------------------------------------------------------|
| **Experimental**                   |      |                                                                           |
| AOE1                               |      | People working at the institution are supported when they come up with new ideas. |
| AOE2                               |      | Initiatives often receive favorable responses so that employees feel encouraged to generate new ideas. |
| AOE3                               |      | Changing the way you do things is valued in the organization.             |
| AOE4                               |      | Changing the way things are made done is easy in the organization.        |
| **Risk Propensity**                |      |                                                                           |
| AOPR1                              |      | People are encouraged to face new and unknown situations                   |
| AOPR2                              |      | People are allowed to take risks as long as they do not harm the organization. |
| AOPR3                              |      | It is difficult to get resources for projects that involve new and unfamiliar situations. |
| AOPR4                              |      | People can make decisions even if they don’t have all the information they want. |
| **Interaction with external environment** | |                                                                           |
| AOIA1                              |      | It is part of the institution's staff to collect, bring and report information about what is happening outside the institution. |
| AOIA2                              |      | There are systems and procedures for receiving, collecting and sharing information from the outside into the organization. |
| AOIA3                              |      | People are encouraged to interact with the environment: competitors, customers, technology institutions, universities, suppliers, etc. (one or all). |
| **Dialogue**                      |      |                                                                           |
| AOD1                               |      | People are encouraged to communicate.                                      |
| AOD2                               |      | There is free and open communication within the work teams.               |
| AOD3                               |      | Leaders facilitate communication within the organization.                 |
| AOD4                               |      | Cross-functional work teams are common in the organization.               |
| **Participatory decision making**  |      |                                                                           |
| APTD1                              |      | Leaders often involve employees in important decisions.                   |
| APTD2                              |      | The institution's policies are significantly influenced by the point of view of its employees. |
| APTD3                              |      | People feel involved in the main decisions of the organization.           |

**Source:** Padilha et al. (2016).

### 3.2.2 Dependent variable

The variable that depends on the research is product innovation performance, being composed of five dimensions that consider the performance of product innovation in terms of performance: i) financial; ii) market; iii) technical; iv) expected by the customer; and v) strategic, as shown in Table 3. The instrument has 14 variables, and the Likert Scale was used, with points ranging from 1 to 7, with one corresponding to "Strongly Disagree" and seven correspondings to "Strongly Agree." The questionnaire is original from Hannachi's (2015) study and validated in Brazil by Manthey et al. (2016).
### Table 3

**Research indicators product innovation performance**

| Dimension                          | Code | Variables                                                                 |
|------------------------------------|------|---------------------------------------------------------------------------|
| **Performance Market Product Innovation** |     |                                                                            |
| IDM1                               | Sales of innovative products are greater than those provided by the rest of the products. |
| IDM2                               | Innovative products have achieved the goals set in terms of sales.             |
| IDM3                               | Compared to other products, innovative products have achieved superior results in terms of market share. |
| IDM4                               | Innovative products have achieved the goals in terms of market share.          |
| IDM5                               | Innovative products have allowed entry into other markets.                    |
| **Customer performance product innovation** | IDC1 | Customers are satisfied with the performance of innovative products.        |
| IDC2                               | Compared to other products, customer complaints about innovative products are lower. |
| IDC3                               | Innovative products have increased customer loyalty.                         |
| **Strategic Performance Product Innovation** | IDE1 | Innovative products give the company a competitive advantage.              |
| IDE2                               | Innovative products have achieved all the established goals.                 |
| IDE3                               | Innovative products have enhanced the company's reputation.                   |
| **Technical performance product innovation** | IDT1 | The quality of innovative products is better than the rest of the products. |
| IDT2                               | Innovative products are launched on time.                                    |
| IDT3                               | Innovative products are launched within budget development goals.             |

**Source:** Manthey et al., (2016).

### 3.2.3 Moderating variable

The moderation effect occurs when a variable affects the direction or strength of the relationship between an independent and a dependent variable. Moderation is also called the conditional effect (Baron & Kenny, 1986; Prado, Korelo & Da Silva, 2014). In this research, we chose to test the moderation effect because the objective of the research is to understand if AC enhances organizational learning to increase product innovation performance in the investigated SMEs.

The moderating variable in this research is the absorptive capacity composed of four dimensions: i) acquisition, ii) assimilation, iii) transformation and iv) application, containing 14 variables as shown in Table 4. The Likert scale was used, with points ranging from 1 to 7, with one corresponding to "Strongly Disagree" and seven correspondings to "Strongly Agree." The original questionnaire was proposed by Flatten et al. (2011) and adapted and validated for Brazilian companies by Engelman, Fracasso, Schmidt, and Muller (2016).
Table 4

Research indicators absorptive capacity

| Dimension | Cod. | Variables |
|-----------|------|-----------|
| Acquisition | CA1  | Our company searches daily for relevant information in the sector. |
|           | CA2  | Our managers encourage employees to look for information sources in the sector. |
|           | CA3  | Our managers expect employees to handle information beyond the sector. |
| Assimilation | CAS1 | In our company, ideas and concepts are communicated between the different areas. |
|           | CAS2 | Our managers emphasize support between areas of the company to solve problems. |
|           | CAS3 | Our managers demand periodic meetings between the areas to exchange new developments, problems and achievements. |
|           | CAS4 | In our company there is a fast flow of information between areas. |
| Transformation | CT1  | Our employees have the ability to structure and use the knowledge collected. |
|           | CT2  | Our employees use new knowledge as well as prepare this knowledge for other purposes and to make it available. |
|           | CT3  | Our employees are successful in articulating existing knowledge with new insights. |
|           | CT4  | Our employees are able to apply new knowledge in their practical work. |
| Application | CAP1 | Our managers support prototype development. |
|           | CAP2 | Our company regularly reconsiders technologies and adapts them according to new knowledge. |
|           | CAP3 | Our company has the ability to work more effectively through the adoption of new technologies |

Source: Engelman et al., (2016).

3.3 Data analysis procedure

For data analysis, the SPSS software was used to generate descriptive analysis, which sought to understand the profile of the participating companies. Then, assumption tests were performed to perform Confirmatory Factor Analysis (CFA), being necessary to verify compliance with the normality and reliability assumptions of the research (Hair, Black, Babin, Anderson & Tatham, 2005).

Initially, we performed the analysis of the reliability, convergent validity, and discriminant validity of the Smart-PLS 2.0 software model. Subsequently, we performed the Structural Equation Modeling (SEM) test and the moderation test. As for the use of SmartPLS software, we rely on Hair, Ringle, and Sarstedt (2011), who explained that the program provides estimates and parameters that maximize the explained variance ($R^2$ values) of the studied models.

SEM allows us to analyze the relationship between multiple variables simultaneously, whether latent or observed (Hair et al., 2009), in addition to identifying the causal relationship between the variables. Structural equation modeling with partial least squares estimation (PLS-
SEM) in social and behavioral sciences is an excellent possibility for evaluating relationships between constructs, significantly increasing the number of articles published using this method (Souza Bido & Silva, 2019).

4 Results presentation

4.1 Sample profile

When analyzing the profile of respondents, as shown in Table 5, we observe a balance between gender (male and female). Concerning the age group, 84.5% of respondents are over 35, representing a group of young entrepreneurs. Which corroborates the level of education in which 76.4% of respondents have completed higher education and postgraduate studies. Considering the profile of the companies, it appears that 58% have been active in the market for more than six years.

Table 5
Sample Profile

| Variable          | Attribute          | Frequency | %  |
|-------------------|--------------------|-----------|----|
| **Gender**        | Female             | 105       | 45.1|
|                   | Male               | 128       | 54.9|
| **Age**           | Until 25           | 52        | 22.3|
|                   | From 26 to 30      | 86        | 36.9|
|                   | From 31 to 35      | 59        | 25.3|
|                   | From 36 to 40      | 28        | 12.0|
|                   | From 41 a 45       | 4         | 1.7 |
|                   | Over 46            | 4         | 1.7 |
| **Education Level** | Complete high school | 11       | 4.7 |
|                   | Incomplete higher education | 44      | 18.9|
|                   | Complete Higher Education | 119   | 51.1|
|                   | Postgraduate       | 59        | 25.3|
| **Years in the company** | Between 1 and 2 years | 19      | 8.2 |
|                   | Between 3 and 5 years | 79     | 33.9|
|                   | Between 6 and 10 years | 74     | 31.8|
|                   | More than 11 years | 61        | 26.2|

Source: Resource Data (2020).

4.2 Analysis of the structural model

First, the factor analysis was carried out using the normality tests. Thus, the following tests were carried out: Kolmogorov-Smirnov, Kaiser-Meyer-Olkin (KMO), and Bartlett’s Sphericity in the SPSS Software. After the tests, it was verified that the data are standard, having
a p-value of 0.000. The results of the statistical parameters of the KMO test were within the desired range, with a level of 0.913. Bartlett's sphericity was less than 0.100, which once again allows us to confirm the possibility and adequacy of the factor analysis method for data processing.

For the adjustment analyses of the measurement models and the structural model, the SmartPLS Software was used. The SmartPLS algorithm has been configured for seven completion criteria. Path-based weighting was the parameterized system, providing a higher $R^2$ and $f^2$ value relative to endogenous VL. The number of iterations was set to 300, and the initial weights for external indicators were set to 1.0.

The first aspect analyzed is the Convergent Validities, which is obtained through the AVE (Average Variance Extracted) analysis in which the values must be greater than 0.5 (Hair et al., 2014) to admit that the model converges to a satisfactory result. In this way, the betas of the measurable variables were verified. The path betas smaller than 0.7 were observed. It was necessary to exclude the AOIA2 variable (there are systems and procedures to receive, collect and share information from the outside to the inside of the organization) of the Interaction with the External Environment dimension of the Organizational Learning construct. Thus, the AVEs of all constructs were more significant than 0.5.

The second stage of the analysis refers to observing Internal Consistency values (Cronbach's alpha - AC) and Composite Reliability (CC). Thus, AC values between 0.60 and 0.70 are considered adequate in exploratory research, while CC values of 0.70 and 0.90 are considered satisfactory (Hair et al., 2014). Table 6 shows the Convergent Validity, Internal Consistency, and Composite Reliability adequate in all constructs and dimensions of the research.
Table 6

*Goodness-of-fit values of the MEE model after the elimination of VOIs with smaller factor loadings*

| 1º order constructs | 2º order constructs | Nº of Items | AC   | CC   | AVE  |
|---------------------|---------------------|-------------|------|------|------|
| **Absorptive Capacity** | Acquisition        | 3           | 0.843| 0.906| 0.762|
|                     | Assimilation       | 4           | 0.911| 0.938| 0.790|
|                     | Transformation     | 4           | 0.871| 0.911| 0.720|
|                     | Application        | 3           | 0.902| 0.939| 0.836|
| **Organizational Learning** | Dialogue          | 4           | 0.843| 0.895| 0.680|
|                      | Experimental       | 4           | 0.915| 0.940| 0.797|
|                       | Interaction with external environment | 2 | 0.618 | 0.838 | 0.721 |
|                      | Risk Propensity    | 4           | 0.818| 0.879| 0.647|
|                      | Participatory Decision Making | 4 | 0.867 | 0.919 | 0.790 |
| **Product Innovation Performance** | Market Performance | 5           | 0.888| 0.918| 0.693|
|                       | Customer Performance | 3         | 0.703| 0.835| 0.629|
|                       | Strategic Performance | 3         | 0.764| 0.864| 0.680|
|                       | Technical Performance | 3       | 0.824| 0.895| 0.740|
| **Absorptive Capacity** | 14                     | 0.949     | 0.956| 0.611|
| **Organizational Learning** | 18                   | 0.956     | 0.961| 0.594|
| **Product Innovation Performance** | 14                   | 0.939     | 0.947| 0.561|

Source: Resource Data (2020).

The third step is the assessment of Discriminant Validity, which seeks to verify whether the constructs or VL are independent of each other (Hair, Black, Babin, Anderson & Tatham, 2005). In this research, the Fornell-Larcker criterion was used, which aims to compare the square roots of the AVE values of each construct with the (Pearson) correlations between the constructs (latent variables) (Henseler, Ringle & Sinkovics, 2009; Hair et al., 2014). Discriminant validity indicates the extent to which latent variables are independent of each other (Hair et al., 2014). It was found that all AVE values are higher than the other correlations presented, which indicates a discriminant validity between the constructs, as shown in Table 7.
Table 7

Correlation values between VL and square roots of AVE values on the main diagonal (grayed out)

|      | AP  | AQ  | AS  | CP  | EP  | MP  | TD  | DI  | EX  | IEE | RP  | PD  | TR |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| VL   |     |     |     |     |     |     |     |     |     |     |     |     |     |
| AP   | 0.9 |     |     |     |     |     |     |     |     |     |     |     |     |
| Acquisition (AQ) | 0.8 |     |     |     |     |     |     |     |     |     |     |     |     |
| Assimilation (AS) | 0.8 |     |     |     |     |     |     |     |     |     |     |     |     |
| Customer Performance (CP) | 0.6 |     |     |     |     |     |     |     |     |     |     |     |     |
| Strategic Performance (EP) | 0.7 |     |     |     |     |     |     |     |     |     |     |     |     |
| Market Performance (MP) | 0.7 |     |     |     |     |     |     |     |     |     |     |     |     |
| Technical Performance (TP) | 0.6 |     |     |     |     |     |     |     |     |     |     |     |     |
| Dialogue (DI) | 0.8 |     |     |     |     |     |     |     |     |     |     |     |     |
| Experimental (EX) | 0.8 |     |     |     |     |     |     |     |     |     |     |     |     |
| Interaction with the External Environment (IEE) | 0.6 |     |     |     |     |     |     |     |     |     |     |     |     |
| Risk Propensity (RP) | 0.7 |     |     |     |     |     |     |     |     |     |     |     |     |
| Participatory Decision Making (PDM) | 0.7 |     |     |     |     |     |     |     |     |     |     |     |     |
| Transformation (TR) | 0.6 |     |     |     |     |     |     |     |     |     |     |     |     |

Source: Research data (2020).

With the Discriminant Validity, the measurement model adjustments were completed, and the structural model analysis was performed. The first analysis of this second moment is the evaluation of Pearson’s coefficients of determination (R²) in which the portion of the variance of the endogenous variables is evaluated, which is explained by the structural model, indicating the quality of the adjusted model (Ringle et al., 2014). For the area of social sciences, it suggests that R² > 2% is classified as a small effect, R² > 13% as a medium effect, and R² > 26% as a significant effect (Cohen, 1988). According to Table 8, it appears that all constructs have a significant effect.
Table 8

Pearson coefficients of determination (R²)

| 1º First order constructs     | 2º Order constructs                  | R²  |
|-------------------------------|--------------------------------------|-----|
| Absorptive Capacity           | Acquisition                          | 0.847|
|                               | Assimilation                          | 0.912|
|                               | Transformation                        | 0.875|
|                               | Application                           | 0.903|
| Organizational Learning       | Dialogue                              | 0.843|
|                               | Experimental                          | 0.915|
|                               | Interaction with external environment | 0.641|
|                               | Risk Propensity                       | 0.828|
|                               | Participatory decision making          | 0.870|
| Product Innovation Performance| Market Performance                    | 0.891|
|                               | Client Performance                    | 0.704|
|                               | Strategic Performance                 | 0.768|
|                               | Technical Performance                 | 0.825|

Source: Research Data (2020).

In the second stage of assessing the quality of fit of the model, the Predictive Relevance (Q²) or Stone-Geisser Indicator was verified, which assesses the accuracy of the adjusted model, in which evaluation criteria should be values greater than zero (Hair et al., 2014). Furthermore, the effect size (f²) or Cohen's indicator, a value that is obtained by including and excluding constructs from the model (one by one), values between 0.02 and 0.15 are considered small, values between 0.15 and 0.35 are considered medium, and values above 0.35 are considered significant (Hair et al., 2014). Table 9 shows the predictive relevance (Q²) and effect size (f²) of all indicators in the model.
Table 9

Values of predictive validity ($Q^2$) and effect size ($f^2$) indicators

| 1st and 2nd Order Constructs       | CV RED ($Q^2$) | CV COM ($f^2$) |
|------------------------------------|----------------|----------------|
| Absorptive Capacity                | 0,438          | 0,526          |
| Acquisition                        | 0,592          | 0,478          |
| Assimilation                       | 0,652          | 0,598          |
| Transformation                     | 0,387          | 0,501          |
| Application                        | 0,710          | 0,589          |
| Organizational Learning            |                | 0,512          |
| Dialogue                           | 0,547          | 0,448          |
| Experimental                       | 0,648          | 0,606          |
| Interaction with external environment | 0,461          | 0,201          |
| Risk Propensity                    | 0,483          | 0,402          |
| Participatory decision making      | 0,630          | 0,519          |
| Product Innovation Performance     | 0,372          | 0,469          |
| Customer Performance               | 0,472          | 0,272          |
| Strategic Performance              | 0,522          | 0,335          |
| Market Performance                 | 0,576          | 0,516          |
| Technical Performance              | 0,523          | 0,443          |

Source: Resource Data (2020).

In the last stage of the research, the Student’s t-test was done, which aims to understand the causal relationships between the constructs, thus certifying the significance of the relationships and confirming the research hypotheses. It is understood that the relationship is significant, and the hypothesis is confirmed when the relationship between values is above 1.96 (Hair et al., 2005). Thus, from the tests performed, the tests of the research hypotheses are presented as shown in Table 10.

Table 10

| Structural Relationship                | Hypothesis | Structural Coefficient | Standard error | T Test  | P values | Hypothesis |
|---------------------------------------|------------|------------------------|----------------|---------|----------|------------|
| Org. Learning -> Absorptive Capacity   | H1 (+)     | 0,879                  | 0,022          | 40,220  | 0,000    | Confirmed  |
| Org. Learning -> Performance Innovation. Product | H2 (+)     | 0,405                  | 0,088          | 4,629   | 0,000    | Confirmed  |
| Absorptive Capacity -> Performance Innovation. Product | H3 (+)     | 0,510                  | 0,082          | 6,238   | 0,000    | Confirmed  |
| Moderation effect 1 -> Performance Innovation. Product | H4 (+)     | 0,072                  | 0,038          | 1,873   | 0,062    | Rejected   |

Source: Resource Data (2020).
From the results of statistical tests, a discussion about the research findings and the theoretical support of other studies are proposed.

4.3 Discussion of results

The first hypothesis (H1) confirms the positive relationship between organizational learning and the ability to absorb knowledge in the environment of the investigated small and medium-sized companies. The literature provides insights into this relationship since the seminal article by Cohen and Levinthal (1989). However, there is a lack of empirical evidence, especially in SMEs (Koerich, Cancellier & Tezza, 2015; Cassol, Zanesco & Marietto, 2019). Among the resources and capabilities that can be resized, recycled, and adapted to new environmental challenges, we highlight the knowledge resource and the capacities to absorb, transform and apply it. In this way, we can infer that companies can use the appropriation and reconfiguration of knowledge available in the external environment to face periods of instability and change in the market by reconfiguring their internal processes and routines.

The second hypothesis (H2) confirmed the positive relationship between organizational learning and product innovation performance. Organizational learning enables companies to keep pace with the rapidly changing business environment (Mainert, Niepel, Lans, & Greiff, 2018). SMEs have gone through several challenges, such as a recent event called the COVID pandemic, and the sanitary restrictions imposed by governments.

The third hypothesis (H3) confirmed the positive relationship between abortive capacity and product innovation performance. Since the origin of the term absorption capacity, scholars have been seeking to prove the importance of AC to leverage innovation in SMEs (Murovec & Prodan, 2009; Cepeda-Carrion, Cegarra-Navarro, & Jiménez-Jiménez, 2012; Jeon, Hong, Ohm, & Yang, 2015). Based on our results, we confirm that the absorption capacity is crucial for innovation performance in small and medium-sized companies. We can propose that the ability to absorb knowledge allows the company to acquire external knowledge and use it effectively, which affects the company's ability to innovate and adapt to the changing environment while remaining competitive.

In the last hypothesis (H4), we observe that AC did not affect the direction or strength of the relationship between organizational learning and product innovation performance in SMEs. This result is relatively surprising, as we did not identify research investigating the role of CA moderators in the relationship between organizational learning and innovation performance in SMEs. We can speculatively justify this result based on the study by
Naqshbandi and Tabche (2018). They point out that companies often show weak levels of absorptive capacity due to weak investment or limited research and due to inadequate qualification of their employees to engage in innovation-related activities effectively.

We can infer that the process of managing the acquisition of new knowledge and the development of organizational practices and routines in SMEs permeate the “slippery” characteristics of knowledge, such as its dynamic nature and intangibility (Koh & Gunasekaran, 2006). This intangible nature makes knowledge challenging to control (Jung-Erceg, Pandza, Armbruster, & Dreher, 2007), especially in small and medium enterprises. In light of this, the absence of a moderating role for absorptive capacity in this study can be explained since this study did not focus on researching companies that invested in research and development or that were knowledge intensive.

Our results bring new insights into understanding the CA configuration in SMEs located in developing economies. Given the absence of similar studies on the moderating role of AC in the relationship between organizational learning and innovation performance, it is not easy to relate this finding to other results. Han and Li (2015) investigated AC’s moderating role in the relationship between intellectual capital and innovation performance in 217 Chinese small and medium enterprises. They found that the insignificant moderating effect indicates that intellectual capital is immune to the ACAP level. That is, no matter how strong or weak a company's ACAP is, intellectual capital is significantly related to innovative performance.

We note that the literature is not conclusive whether AC is moderating or mediating (Hsu & Wang, 2012). Further investigations on the configuration of AC in small and medium-sized companies from different sectors should be applied to understand the nuances of its influence on innovation performance. From a managerial point of view, companies must be aware of the best practices to access and assimilate external knowledge regarding the improvement of the production process.

5 Final considerations

This research proposed to verify the moderating role of absorptive capacity in the relationship between organizational learning and product innovation performance in small and medium-sized companies. Based on empirical data collected from SME managers, we verified the positive influence of organizational learning on the absorption capacity (H1) and product innovation performance (H2). The positive impact of absorptive capacity on the performance of product innovation was also confirmed (H3). However, our results showed that the
investigated SMEs' absorption capacity could not moderate the learning processes and the performance of product innovation (H4).

Based on our results, we can suggest that the CA processes incorporate aspects related to the configuration of the environment in which the company is located geographically, the network of relationships to which it belongs, the level of training of its employees, management models, and experience of their managers. This study aims to understand better how organizational learning capacity impacts SME product innovation performance and how this relationship is moderated by absorptive capacity.

The contribution to the literature on organizational learning capacity is made by providing evidence of the importance of certain organizational practices that catalyze their effects on SMEs. Organizational learning can be considered an essential determinant of product innovation performance. However, our findings question the role of knowledge absorption capacity in increasing product innovation performance in SMEs.

As practical implications, the results of this study can guide the management of small and medium-sized companies through the evidenced routines. Studies on absorptive capacity and innovation can help managers improve performance, especially in countries with intense economic changes, such as Brazil, where these changes quickly impact SMEs. Decision-making is based on the strategic information and, for this, the absorptive capacity can be decisive in influencing the performance of the product innovation.

We emphasize the possibility of social desirability bias: the bias of timely responses to management practices since individuals want to be seen favorably with their behavior (Leggett, Kleckner, Boyle, Dufield & Mitchell 2003; Krumpal, 2013). The survey was carried out with the managers/owners of the companies, which may imply a particularly favorable bias. The characteristic of SME businesses is that of family management, so there are no other options to be researched other than managers who tend to be the only social individuals, eventually, and the owners responsible for managing the business. Another limitation can be inferred from the specific geographic context, represented by small towns west of Santa Catarina. The findings may not represent the same reality of SMEs present in other regions of Brazil. Future studies can investigate AC considering the geographic context and researching SMEs present in large urban centers.

With respect to the importance of the AC construct in the performance of new companies, little is known about its characteristics in Brazilian companies. Theoretical-empirical studies that analyze the different configurations of AC present in SMEs operating in
Brazil are still relatively scarce, and empirical research that validates the theoretical dimensions of this construct is also rare. Indeed, this lack of theoretical and empirical references reduces the possibilities of employing AC in the management environment of small companies. However, they present opportunities for future research.

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