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Original Article

Absorptive capacity: towards individual or organizational themes

Capacidade absortiva: rumo a temas individuais ou organizacionais

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ABSTRACT

Purpose: This study evaluates the relationship between Individual Absorptive Capacity, Social Integration Mechanisms and Organizational Absorptive Capacity. This study provides empirical evidence about the conceptual absorptive capacity (ACAP) model through examining the full process systematically. Two groups of moderating variables were studied—namely, social integration and appropriability—to examine their impact on the process.

Design/methodology/approach: This study employed a longitudinal study on metal mechanic companies in Brasil by using 427 survey responses and Structural Equation Modeling (SEM). Data analysis was performed considering: i) Cronbach's alpha; ii) Composite Reliability; iii) Average Variance Extracted (AVE); iv) Fornell and Larcker criteria; v) Evaluation of Pearson Coefficients of Determination (R2); vi) Effect Size (f2) or Indicator of Cohen; vii) Predictive Validity (Q2); and viii) Student's t-test. Following the estimation of the structural model (path coefficients) using the Partial Least Squares method via SmartPLS software version 3.2.8.

Findings: The study confirms that social integration mechanisms are required from organizations to create a positive environment for individuals to develop knowledge in the organizational and individual absorptive capacity levels. Social integration mechanisms can have a direct or moderator effect on the dimensions of the ACAP.

Originality/value: This study provides support to the learning theory and to the organization-learning concept. It also reveals empirical evidence that the social integration mechanisms play a key role in facilitating both individual and organizational knowledge transfer process. The findings of this study provide functional suggestions and highlight areas for future research.

Keywords: Absorptive capacity; Microfounds; Organization-learning; Cognitions individuals; Organizational knowledge; Social integration Mechanisms

RESUMO

Objetivo: Este estudo avalia a relação entre a Capacidade de Absorção Individual, os Mecanismos de Integração Social e a Capacidade de Absorção Organizacional. Este estudo fornece evidências empíricas sobre o modelo conceitual de capacidade de absorção (ACAP) por meio do exame sistemático de todo o processo. Dois grupos de variáveis moderadoras foram estudados, a saber, integração social e adequação, para examinar seu impacto no processo.
Concepção/metodologia/abordagem: Este estudo é longitudinal sobre empresas metal mecânicas no Brasil, utilizando 427 respostas a inquéritos e Modelação de Equações Estruturais (SEM). A análise dos dados foi realizada considerando: i) Alfa de Cronbach; ii) Fiabilidade Composta; iii) Variância Média Extraída (AVE); iv) Critérios Fornell e Larcker; v) Avaliação dos Coeficientes de Determinação de Pearson (R2); vi) Tamanho do Efeito (f2) ou Indicador de Cohen; vii) Validade Preditiva (Q2); e viii) Teste t do aluno. Seguindo a estimativa do modelo estrutural (coeficientes de percurso) usando o método Partial Least Squares através do software SmartPLS versão 3.2.8.
Descobertas: O estudo confirma que são necessários mecanismos de integração social das organizações para criar um ambiente positivo onde indivíduos desenvolvam conhecimentos nos níveis de capacidade de absorção organizacional e individual. Os mecanismos de integração social podem ter um efeito direto ou moderador sobre as dimensões do ACAP.
Originalidade/valor: Este estudo fornece apoio vital à teoria da aprendizagem e ao conceito de organização-aprendizagem. Este estudo revela provas empíricas de que os mecanismos de integração social desempenham um papel fundamental na facilitação do processo de transferência de conhecimento individual e organizacional.

Palavras-chave: Capacidade absortiva; Microfundos; Organização-aprendizagem; Cognitivo individual; Conhecimento organizacional; Mecanismos de integração social

1 INTRODUCTION

In turbulent times where the business environment suffers intense competition, Small and Medium Enterprises (SME's), in order to remain in the market and expand their competitive potential, are forced to innovate. For that, several processes are implemented, among them, the knowledge absorption process. The absorptive capacity (ACAP) is the capacity of a company to recognize the value of external knowledge, assimilate it, transform it and apply it to produce an organizational capacity (Cohen & Levinthal, 1990). As it is considered an organizational-level capacity, which consists of processes and routines (Zahra & George, 2002), absorptive capacity is relevant for formulating organizational strategies to enable renewing capacities and, therefore, to collaborate so that the companies adapt to external trends (Cappellari, Welter, Hermes, & Sausen, 2019).

Within the absorptive capacity studies, there were contradictions about the assumptions that form the basis of the construct. The microfoundation lens came to help detail the absorptive capacity to construct (Volberda, Foss, & Lyles, 2010), thus increasing understanding of how individuals' actions, interactions, and organizational mechanisms shape the absorptive capacities of SMEs. ACAP studies have been increasingly interested in how SMEs develop ACAP due to its specificities and importance for the global economy (Jimenez, Angelov, & Rao, 2012). Regardless of the country in which they are located, SMEs face problems related to their survival or obtaining a competitive advantage (Khalique, Isa, Shaari, & Ageel, 2011).

Micro-foundations are the individual and organizational factors that determine the creation of routines and capabilities at the organization level (Felin, Foss, Heimeriks, & Madsen, 2012). In response to this, research has begun to advance in understanding absorptive capacity from an individual-level perspective (Lowik, Kraaijenbrink & Groen, 2012). Elg, Ghauri, Child, & Collinson (2017) stated that a set of micro-foundations improves the company's ability to perceive and adapt to local differences and supports a variety of routines that help deal with the challenges of different organizational contexts (Balle, Oliveira, & Curado, 2020).

Briel, Schneider, and Lowry (2019) argue that because the dimensions of the knowledge absorption process require the exchange of information with partners, social integration mechanisms (MIS) influence the effectiveness of this process. Although social integration is a multidimensional construct (Knight & Eisenkraft, 2015), most research on absorptive capacity has treated social integration mainly as a "black box," without clarifying the MIS influence the absorptive capacity of knowledge at the individual and organizational level.

Hart, Gilstrap and Bolino (2016), Martinkenaite and Breunig (2016), and Schweisfurth and Raasch (2018) propose that research be conducted using a micro-foundations approach to discover the influence of actions and agency of individuals on absorptive capacity (ACAP). Empirically, the role of social integration mechanisms in

ACAP has been investigated by few studies (Cuervo-Cazurra & Rui, 2017; Yao & Chang, 2017; Vega-Jurado & Schmutzler, 2017; Enkel, Heil, Hengstler, & Wirth, 2017), but not enough for an understanding of whether these mechanisms can influence ACAP. Antecedents, as prior knowledge and experiences and social networks, the effects of these antecedents need to be further examined empirically (Zhao & Anand, 2009). Although individual absorptive capacity (ACAP) is mentioned in the literature as an essential element for organizational absorptive capacity, few studies have investigated this influence. Volberda, Foss and Lyles (2010) came to the conclusion that the individual level precedes the organizational level in the knowledge absorption process and this relationship is neglected in the literature.

Based on the above arguments, this article aims to evaluate the relationship between Individual Absorption Capacity, Social Integration Mechanisms, and Organizational Absorption Capacity in Small and Medium Enterprises. Thus, examining the micro-foundations of absorptive capacity could undoubtedly provide new insights into the relationships in small and medium-sized companies between Individual Absorptive Capacity, Social Integration Mechanisms, and Organizational Absorptive Capacity.

2 LITERATURE REVIEW

2.1 Individual Absorptive Capacity

As indicated by (Felin & Foss 2005), organizations are formed by individuals, and without them, they cannot exist. Thus, individual absorptive capacity forms the basis for organizational absorptive capacity and can be leveraged by organizational mechanisms such as coordination (Jansen, Bosch, & Volberda, 2005) or socialization (Todorova & Durisin, 2007). It can be considered that the successful exchange and transfer of knowledge depend on the willingness of individuals and corporations to participate in innovation processes. Thus, knowledge is easily transferred between sources and recipients, with experiences and knowledge bases with similar

characteristics, backgrounds, and circumstances (Phelps, Adams, & Bessant, 2007). The role of an organization is to develop decision-making structures and intra-firm relationship networks through which individual absorptive capacities can be harnessed and deployed (Tortoriello, 2015). Some research has noted the lack of a micro-foundation-based approach to discover the actions and agency of individuals in ACAP (Schweisfurth & Raasch, 2018). Therefore, it is not enough to develop unique abilities and skills to absorb new knowledge.

In this context, requirements (of individual and organizational resources), barriers (lack of acceptance), and conditions must be considered as well as competence, willingness and motivation to increase individual absorptive capacities and promote innovation (Schweisfurth & Raasch, 2018). Although some evidence suggests that individuals play a crucial role in innovation management (Tian & Soo, 2018), recent conceptual and empirical studies on absorptive capacity have begun to investigate the individual level and its central role in new knowledge integration companies.

Nowak and Paton (2018) believes that application capabilities can be culturally or systemically sustained, enabling and guiding individuals to realize their capabilities towards a specific innovation outcome. Absorptive capacity processes are challenging, but absorption efforts, especially at the individual level, are worthwhile (for the individual, the group, and the organization). Implementing and encouraging innovation activities that promote engagement among individuals will increase the absorption of new knowledge and facilitate the individual's capabilities and interconnections (Yildiz, Murtic, Zander, & Richtnér, 2019). Individual commitments are essential to ensure the absorption of new external knowledge and can allow for deeper exploration of individuals' capacities (Zuñiga-Collazos, Castillo-Palacio, & Padilla-Delgado, 2019).

2.2 Organizational Absorptive Capacity

Cohen and Levinthal (1990) considered ACAP individuals as the main foundations of organizational ACAP. The authors argue that the actions of individuals contribute

to each organizational dimension of ACAP in different ways. First, individuals interact with the external environment and thus recognize and acquire new knowledge. Organizational absorptive capacity depends on individual abilities and the organization's abilities to transfer knowledge across clearly defined and identified boundaries and sub-units (Cohen & Levinthal, 1990). The organizational ACAP literature also suggests that ACAP is a learning routine for an organization that allows innovation by integrating knowledge resources, generating new knowledge, new products, and new business processes and routines (Cohen & Levinthal, 1989, 1990; Eisenhardt & Martin, 2000).

Organizational ACAP is a multidimensional, latent, and intangible construct (Camisón & Forés, 2010; Flatten, Engelen, Zahra, & Brettel, 2011). Therefore, as a central aspect of the capacity for organizational absorption and learning, knowledge is not absorbed equally between organizations, as its internalization differs in each of them (Hotho, Becker-Ritterspach, & Saka- Helmhout, 2012). A higher level of absorptive capacity makes the company more dynamic dedicated to innovation, as it will be more likely to notice and investigate the opportunities presented in the environment (Escribano, Fosfuri, & Tribó, 2009; Vega-Jurado & Schmutzler, 2017) in their study on the analysis of the determinants of organizational ACAP stated that management practices regulate the development of a company's internal knowledge and provide distinct characteristics that distinguish organizational knowledge from the individual knowledge of its employees.

2.3 Social Integration Mechanisms

Vega-Jurado, Gutiérrez-Gracia, & Fernández-de-Lucio (2008), based on the conception and considerations of Zahra & George (2002), considered that MIS could be defined as techniques that reduce the barriers of information exchange within the organization. Such techniques are established as formal or informal activities, according to the degree of systematization. In other words, formal activities are established by the organization through procedures and rules that adjust them, such as training

programs and job rotation among employees. Informal activities, in turn, occur without being regulated but can support individuals in the growth of organizational actions. Organizational ACAP is a multidimensional, latent, and intangible construct (Camisón & Forés, 2010; Flatten, Engelen, Zahra, & Brettel, 2011).

Therefore, as a central aspect of the capacity for organizational absorption and learning, knowledge is not absorbed equally between organizations, as its internalization differs in each of them (Hotho, Becker-Ritterspach, & Saka-Helmhout, 2012). A higher level of absorptive capacity makes the company more dynamic dedicated to innovation, as it will be more likely to notice and investigate the opportunities presented in the environment (Escribano, Fosfuri, & Tribó, 2009; Vega-Jurado & Schmutzler, 2017), in their study on the analysis of the determinants of organizational ACAP, stated that management practices regulate the development of a company's internal knowledge and provide distinct characteristics that distinguish organizational knowledge from the individual knowledge of its employees.

MIS is not always directly observable (Gross, 2009; Hedström & Ylikoski, 2010). *Social integration mechanisms* are the processes and routines that promote social integration among the members of a group. Thus, MIS are the links between the actions of individuals and the group as a whole (DiStefano, Peteraf, & Verona, 2014). MIS includes providing incentives and a supporting organizational infrastructure that facilitates the teaching of complex knowledge and the position of individuals within the network of relationships (Tortoriello, 2015).

Based on expert interviews with project members as the primary data source, (Enkel, Heil, Hengstler, & Wirth, 2017) carried out an in-depth analysis of several cases from various Inter-organizational projects. The findings indicate that different types of MIS on learning outcomes also affect the ability to bridge gaps in process and product technology. Furthermore, they suggest that it is not just the extension but also the interaction of MIS that involves internal and external absorptive capacity routines that allow project members to explore, transform, and explore distant

knowledge. Another interesting point to note is that MIS across organizational boundaries becomes a vital issue for organizations that want to leverage the knowledge of external partners for innovation purposes, an approach in which researchers and practitioners are increasingly interested (Preston, Chen, Swink, & Meade, 2017; Terjesen & Patel, 2017).

2.4 Research hypotheses and theoretical model

Hayton and Zahra (2005) indicated that ACAP in SMEs depends on the diversity of knowledge among employees, especially when the number of employees is small. This indication implies that SMEs can increase their ACAP by attracting staff with complementary knowledge and experience. Individual absorptive capacity forms the basis for organizational absorptive capacity and can be leveraged by organizational mechanisms such as coordination (Jansen et al., 2005) and socialization (Todorova & Durisin, 2007). Rhee (2008) supports the assumption that individuals' knowledge and experience are essential antecedents to knowledge absorption and that this applies to SMEs).

Wang, Wang and Horng's (2010) study of SMEs in Taiwan's bicycle industry showed that breadth and depth of owners' knowledge are essential for SME ACAP. Qian and Acs (2013) argued that entrepreneurs who start a new business to develop ACAP need scientific knowledge to understand and develop their invention and market or business knowledge to create and operate a new company (Su, Ahlstrom, & Cheng, 2013) confirmed that employees of companies seeking to develop corporate entrepreneurship must develop specific individual skills that allow them to integrate existing knowledge with new ones and thus recognize, evaluate and obtain entrepreneurial opportunities. Thus, the following hypotheses are presented:

H1: The Individual Absorption Capacity positively impacts the Organizational Absorptive Capacity.

By expanding the concept of Cohen and Levinthal (1990) and re-elaborating the ACAP construct, Zahra and George (2002) gave special attention to the social

integration necessary for adequate organizational absorption capacity. The authors realized that the potential absorption capacity is only possible when it is mediated by social integration mechanisms, which establish themselves as a link that allows the company to recognize, assimilate, transform and apply knowledge. Cohen and Levinthal (1990) argued that an organization's ACAP is not the mere sum of the ACAP of its members but depends on communication and coordination structures to assimilate and integrate knowledge. An organization needs structures and mechanisms to build connections and shared meanings to spread knowledge internally.

Social Integration Mechanisms (MIS) are fundamental to ACAP, as they are related to knowledge transfer and diffusion processes between and within organizations (Todorova & Durisin, 2007). Camisón and Fóres (2010) highlighted that interaction between individuals plays an essential role in distributing knowledge. This interaction brings us to the fact that the absorptive capacity is specific to each organization. Although many of them work in the same environment and under the same conditions, they can contain different competencies, procedures, and performances.

Martinkenaite and Breunig (2016) stated that an organization needs structures and mechanisms to build connections and shared meanings to spread knowledge internally. In a study of MIS and external partners carried out in Hong Kong, Briel et al. (2019) inferred that different social integration mechanisms are essential for different stages of knowledge absorption and can mitigate the challenges associated with the absorption of distant, tacit, and complex knowledge. Distel (2019) stated that a company's absorptive capacity is not just the sum of its employees' cognitions and behaviors. However, it also depends on the organizational mechanisms of individual contributions to form a collective outcome.

Therefore, there is empirical support to present the hypothesis that MIS is necessary to ensure the assimilation, dissemination, and application of knowledge within an organization to create new products, services, and processes.

H2: Social Integration Mechanisms influence the Organizational Absorptive Capacity.

Freeman, Hutchings, Lazaris and Zyngier (2010) state that individual absorptive capacity is influenced when managerial capacity uses pre-existing relationships and the ability to build partnerships within the company or between companies to establish trust between individuals, which, in turn, will facilitate knowledge transfer. Therefore, managers need to use relational resources, that is, organizational mechanisms, to increase their own ACAP and collaborators. Jones, Macpherson and Thorpe (2010) suggest that establishing systems, structures, and routines that facilitate knowledge sharing in organizations will increase individuals' learning capabilities and the company as a whole, thus freeing key managers from day-to-day responsibilities.

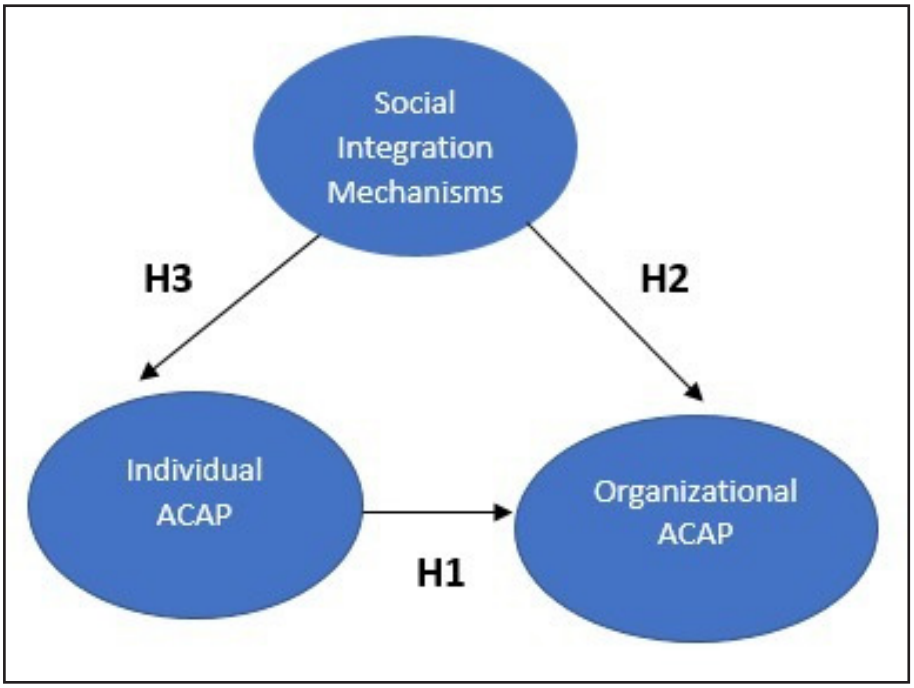
Rejeb-Khachlouf, Mezghani, and Quélin (2011) found that the diversity of personal ties in the relationship network of SME employees had a positive effect on these individuals' ACAP. This finding suggests that the relational capacity of managers and employees is a necessary individual competency to increase individual ACAP in SMEs.

Mechanisms increase the breadth of knowledge exchange (coordination) and promote its efficiency (socialization, systems). Thus, the diversity of sources of ideas and high uncertainty should be combined with the diversity of knowledge bases used to expand the individual ACAP (Pihlajamaa, Kaipia, Säilä, & Tanskanen, 2017). Enkel, Groemminger, and Heil (2018) explored how social integration mechanisms translate into learning and collaborations within and across organizational boundaries, acting directly to increase individuals' knowledge. Thus, based on the above argumentation, the hypothesis is presented:

H3: Social Integration Mechanisms influence the Individual Absorptive Capacity.

From the proposal of the hypotheses studied in this article, in Figure 1, the theoretical state model is presented.

Figure 1 – Theoretical research model



Source: Elaborated by the authors (2021)

The research is classified below, and the methodological steps used throughout the study are described.

3 METHODOLOGY

The methodological procedures used quantitative research and the survey technique to achieve the research objective. The survey was conducted in four companies in the metalworking sector in the state of Santa Catarina. In these companies, the objective was to research the perception of professionals, with some degree of decision-making, in the following sectors: i) marketing; ii) sales and services; iii) operations; iv) project management; v) engineering; vi) production; vii) finances; and; viii) human resources.

The sample resulted in 417 questionnaires. According to the G*Power 3.1.9.4 software, considering the complexity of the model, median f2 = 0.15 and Power = 0.80, the minimum sample should be 68 companies. Therefore, the sample is statistically adequate for conducting the research. Tang, Kacmar and Busenitz (2012) validated

that the instrument collected data on individual absorptive capacity (individual ACAP). Researchers such as (Lowik, 2013; Samo & Hashim, 2016) used the same questionnaire in their studies. The instrument consists of 15 statements coded for data analysis as Q1|-|Q15. For data collection on social integration mechanisms, this research used the instrument validated by Jansen, Bosch and Volberta (2005), which was similarly applied by (Mom, Bosch & Volberda, 2009; Engelen, Kube, Schmidt, & Flatten, 2014). The instrument has 27 assertions that were coded as Q16 |-|Q42.

For data collection on organizational absorptive capacity (organizational ACAP), the instrument validated by Flatten, Engele, Zahra and Brettel (2011) was used. Lau and Lo (2015) and Ali and Park (2016) also used this instrument. The instrument has 14 assertions coded as Q43 |-|Q56. All instruments had a 7-point Likert scale, where 1 represented totally disagree, and 7 totally agree.

Data were collected on-site in November 2019. Data analysis was performed considering: i) Cronbach's alpha; ii) Composite Reliability; iii) Average Variance Extracted (AVE); iv) Fornell and Larcker criteria; v) Assessment of Pearson Coefficients of Determination (R2); vi) Effect size (f2) or Cohen's Indicator; vii) Predictive Validity (Q2); and viii) Student's t-test. Then, the estimation of the structural model (path coefficients) using the Partial Least Squares method via SmartPLS software version 3.2.8.

4 RESULTS

4.1 Descriptive Analysis

The characterization of the sample is presented below. The following will be presented: the gender of the respondents; the age; the company's operating time; the number of companies where they worked for more than six months before working in the current company; the level of education; the sector in which the company operates.

Of the respondents, 92% are men, that is, of the 427 respondents, 393 are male, and 8% of respondents, 34 are female. When analyzing age, 40% are between the age

group of 21 to 30 years. A greater concentration of individuals aged between 21 and 40 years old, making up 76% of the workforce. With less participation, employees over 40. With 5% for employees over 50, 6% for employees under 20, and 13% for employees between 41 and 50 years of age.

The company's years of experience profile highlights employees with more than five years in the organization. Another observable fact is that most of them worked in up to two companies only, demonstrating experience and indicating alignment with the organizational culture. The most representative schooling is high school education with 47% of participation, 11% have completed elementary school, 34% have completed higher education, 8% have a lato sensu graduate degree, and only 1% of the analyzed population has a graduate degree stricto sensu.

As for company years, general data show that 25% of respondents have been with the company between 1 and 3 years, 21% are between 5 and 10 years, 21% are between 3 and 5 years, 16% are over ten years, and 17% have been with the company for less than one year. As for the number of companies operating before the current company, 37.7% of respondents worked in just one company, 29% in two, 17% in three, and only 16% of employees worked in more than four companies of the departments of origin of each respondent, 44% of respondents came from the production sector of the companies analyzed. In contrast, 20% of respondents come from the mechanical engineering sector, and 12% from the operations sector, 10% from the sector project management, 8% from the marketing, sales, and services sector, 3% from the financial sector; and 3% from the HR sector. Once the descriptive analysis is completed, the statistical analysis is then demonstrated.

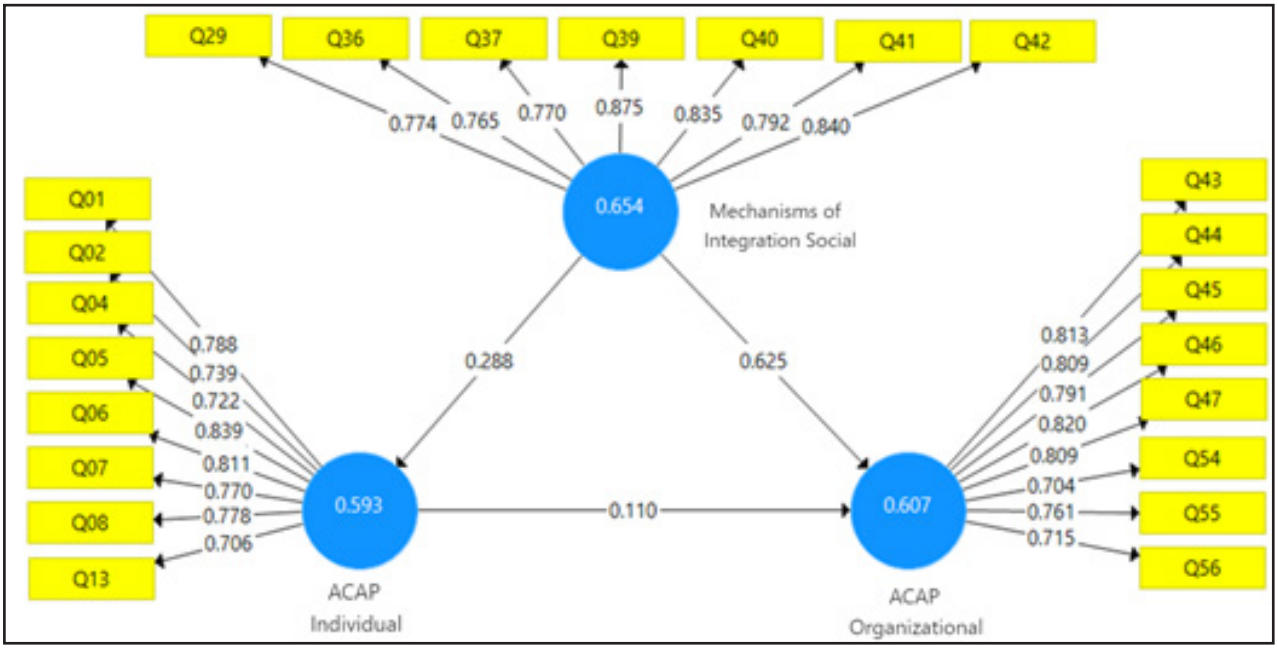
4.2 Structural Equation Modeling

The collected data went through the Partial Least Squares – PLS analysis method, where the data were processed through Structural Equation Modeling (SEM), presented in two macro steps. The first, called "Measurement Model Evaluation,"

presents the following procedures: Cronbach's Alpha, Composite Reliability, Extracted Mean-Variance (AVE), and Fornell and Larcker Criterion.

On the other hand, the second stage, called "Evaluation of the Structural Model," will comprise the subsequent statistical tests: Assessment of the Pearson Coefficients of Determination (R2); Effect Size (f2) or Cohen Indicator; Predictive Validity (Q2); Student's t-test and Path Coefficient. Below is shown in Figure 2, the structural equation model resulting from the analysis performed in the SmartPLS software bringing the values of Average Variance Extracted for the latent variables, path coefficients between the latent variables, and the factor loadings of the observable variables.

Figure 2 – Structural equation model



Source: Research Data (2021)

Starting the first part of the analysis, Evaluation of the Measurement Model, Table 1 registers the results for the tests of Cronbach's Alpha, Composite Reliability, and Mean-Variance Extracted (AVE).

Observing Table 1, it can be seen that all the constructs used had results close to 1.0. The results demonstrate the reliability of the measurement instrument, as it is noted that Cronbach's Alpha and Composite Reliability meet the minimum acceptance

criteria (Cronbach's Alpha> 0.70 and Composite Reliability >0.70) (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). The AVE values, all above 0.5 for the latent variables, indicate sufficient convergent validity for the model (Henseler, Ringle, & Sinkovics, 2009).

Table 1 – Measurement model analysis

Construct	Cronbach's Alfa	Composite Reliability	(AVE)
Individual ACAP	0.902	0.921	0.593
Organizacional ACAP	0.907	0.925	0.607
Social Integration Mechanisms	0.911	0.929	0.654
Reference value	>0,6	>0,7	>0,5

Source: Research Data (2021)

The results guarantee the consistency of the model concerning the reliability of the answers obtained. The results are shown below in Tables 2, and 3 bringing the results for the discriminant validity of Fornell and Larcker.

Table 2 – discriminant validity fornell

Discriminant Validity - Fornell	Individual ACAP	Organizational ACAP	Social Integration Mechanisms
Individual ACAP	0.770		
Organizational ACAP	0.290	0.779	
Social Integration Mechanisms	0.288	0.656	0.808

Source: Research data (2021)

Table 3 – Discriminant validity Larcker

Discriminant Validity - Larcker	Individual ACAP	Organizational ACAP
Organizational ACAP	0.331	
Social Integration Mechanisms	0.311	0.706

Source: Research data (2021)

For discriminant validity, the square roots of the AVE values of each construct were compared with the (Pearson's) correlations between the constructs (or latent

variables). The square roots of the AVEs must be larger than the correlations of the constructs (Fornell & Larcker, 1981). For Fornell and Larker, the correlations between the latent variables are smaller than the square root of the AVE, confirming the discriminant validity according to the Fornell-Lacker criterion. The results in Tables 2 and 3 show that the latent constructs or variables are independent of each other, according to the criterion of Hair et al. (2014).

Once the Assessment of the Measurement Model is completed, and the model's reliability is certified, the next step is the Assessment of the Structural Model. Thus, the results of the following items are listed: Assessment of Pearson Coefficients of Determination (R2); Effect Size (f2) or Cohen Indicator; Predictive Validity (Q2); Student's t-test and Path Coefficient. Starting the analysis, Table 4 brings the results for the Pearson (R2), Stone-Geisser (Q2), and Cohen (f2) coefficients.

Table 4 – Pearson Coefficients (R2), Stone-Geisser (Q2) E Cohen (F2)

Latent Variable	R2	Q2	f2
Individual ACAP	0.083	0,047	0,471
Organizational ACAP	0.442	0,259	0,493
Social Integration Mechanisms		0,536	0,536

Source: Research Data (2021)

R2 adequately assesses the portion of the variance of the endogenous variables of the structural model, and the results indicate the quality (large, medium, or small effect) of the adjusted model. For social and behavioral sciences, Cohen (1988) suggests that R2=2% be classified as a small effect, R2=13% as a medium effect, and R2=26% as a significant effect. After checking Table 5, it is concluded that the effect of the globally considered constructs is significant for the overall structural consistency of the model.

The Stone-Geisser predictive validity indicator (Q2) assesses how closely the model approaches what was desired, that is, the quality of the model's prediction. The evaluation criterion is that the values obtained must be greater than zero (Hair

et al., 2014). When checking the results in Table 5, it is clear that the results obtained are all with values above 0. Thus, the predictive validity of the endogenous variables is legitimized.

When considering the Effect Size (f2) or Cohen's Indicator, obtained by the inclusion and exclusion of constructs from the model (one by one), it can be observed how much each construct was helpful for the model adjustment. Values of 0.02, 0.15, and 0.35 are considered as a small, medium, and significant effects, according to Cohen (1988). Thus, the effect of individual ACAP on Organizational ACAP is positive but with a moderate effect. On the other hand, the Social Integration Mechanisms also had a positive effect, solid. Next, the path coefficients and the student t-test are evaluated. Table 5 shows the data obtained for the SEM.

Table 5 – Assessment of hypotheses

Hypotheses	Path	Student t test	Load	Conclusion
H1	Individual ACAP -> Organizational ACAP	2,845	0,110	Supported
H2	Social Integration Mechanisms -> Organizational ACAP	18,330	0,625	Supported
H3	Social Integration Mechanisms -> Individual ACAP	6,407	0,288	Supported

Source: Research Data (2021)

Smart PLS 2.0 presents t-test values where values above 1.96 correspond to p-values ≤ 0.05 (between -1.96 and +1.96). The results correspond to a probability within this 95% range and outside this 5% range in a normal distribution). Therefore, the values observed for the constructs used are above the reference value of 1.96, demonstrating that the correlations and regression coefficients are significant.

For the interpretation of path coefficients, see Table 6. These are interpreted as the betas of simple or ordinary linear regressions (Ringle, Silva & Bido, 2013). These coefficients, typically in the range of -1 and +1, assess the importance of paths and allow researchers to interpret the total effect of construction, defined as the sum of direct

effects and all indirect effects (Hair, Black, Babin, Anderson, & Tathan, 2009). In this research, it is verified, in Table 5, that the path coefficients are positive, corroborating the student t-test in support of all hypotheses.

Next, the results obtained in item 4.1, Descriptive analysis, and item 4.2, Structural equation modeling, will be discussed.

5 DISCUSSION

In recent decades, organizations have been on a path to develop a successful relationship with the mechanisms between individual and associated issues with organizations, so one of the essential pillars of this relationship is organizational sustainability, which aims to preserve the social, cultural, economic, and environmental components in which the organization operates (Stock, Greis, & Fischer, 2001; Sun & Anderson, 2010).

H1: The Individual Absorption Capacity positively impacts the Organizational Absorption Capacity - supported

Cohen and Levinthal (1990, p. 131) argue that 'the absorptive capacity of an organization will depend on its individual members' absorptive capacities. Subsequently, other researchers have recognized the importance of individuals at different stages of organizational knowledge absorption. The absorption of organizational knowledge is conceptualized as a result of the organization's characteristics or its environment, where it is generated by the ability of individuals to absorb knowledge (Rothaermel & Alexandre, 2009; Zhang, Li, Li, & Zhou, 2010).

Schulze, Brojerdi, and Krogh (2014) state that common knowledge among organizational members is relevant for absorbing organizational knowledge. It allows them to understand each other's knowledge needs, coordinate their knowledge transfer activities, and build organizational absorptive capacity. The support for hypothesis 1 aligns with the perspective of micro-foundations because it assumes that the absorptive capacity is associated with the knowledge and cognitions of individuals.

In day-to-day operations, the companies studied to demonstrate that the construction of organizational absorptive capacity is developed through the knowledge acquired by their employees. Ter Wal, Criscuolo and Salter (2017) states that individuals go through the process of searching and identifying valuable knowledge and engaging in greater assimilation and exploration of new knowledge in their companies (Tu, Vonderembse, Ragu-Nathan, & Sharkey, 2006).

This research provides meaningful information about the development of organizational absorptive capacity. It proves to be an aggregated phenomenon at the organizational level, proving that individuals collaborate throughout the ACAP process, as also verified by Distel (2019). By validating the hypothesis, it can be stated that, in the surveyed companies, organizational ACAP is based on the individual's ability to identify valuable knowledge in the environment. Employee motivation and commitment are both necessary for the successful absorption of organizational knowledge. Previous research has shown that autonomy is positively related to an individual's intrinsic motivation to engage in knowledge transfer, which increases organizational ACAP (Foss et al., 2009). In addition, individuals' prior knowledge and experience and the underlying educational level of employees appear to help ACAP and speed of learning (Park & Harris, 2014). Looking at the sample of employees surveyed, we find that 42% of them have at least higher education, which confirms the authors' statement.

Finally, thinking of the assimilation dimension, current research indicates that individuals who take on a guardian role that combine external research with assimilation efforts help achieve innovation by building a potential ACAP. Gatekeepers help create a pool of external knowledge that generates the potential for internal use through engagement in assimilation activities (Ter Wal et al., 2017).

Before discussing hypotheses 2 and 3, it is imperative to point out that organizational and individual capacity depends very strongly on interactions between individuals and groups within the organization. Consequently, we affirm that to develop the absorption of organizational and individual knowledge, according to the findings

of this research, organizational mechanisms that create a positive environment for individuals are required. These organizational mechanisms can be called social integration mechanisms. They promote knowledge absorption by bringing people together and promoting the connection and shared meanings among the employees of an organization throughout the entire knowledge absorption process.

H2 - Social Integration Mechanisms influence the Organizational Absorption Capacity. – Supported

Micro-foundations lenses can give new directions in understanding how individuals' actions, interactions, and participation in the organizational process, together with organizational mechanisms, shape the SME's ACAP. The proof of hypotheses 2 and 3 gives us these insights. Jansen, Bosch and Volberda (2005) state that the more significant this participation, the greater the ability and motivation of these individuals to acquire and assimilate external knowledge so that organizational ACAP can be implemented.

In line with the authors above, intra-organizational social integration mechanisms, such as job rotation, participation in decision-making, team meetings, and short-term visits, can reduce barriers to knowledge absorption among employees and, thus, positively influence the absorptive capacity of an organization. The research confirmed what the authors claim when they found that social integration mechanisms, some mentioned by them, impact individual and organizational ACAP. The importance of internal relationships for the absorption of external knowledge is also discussed by Ebers and Maurer (2014). They state that organizational mechanisms, such as internal relationships, trust in the relationship between individuals, improve communication and exchange of information, causing organizational absorptive capacity to occur effectively.

Peltokorpi (2017) and Kim and Wemmerl (2015) reinforced that intra-organizational social integration mechanisms positively influence the organizational absorption capacity. Hutabarat & Pandin (2014) highlighted the company's internal

mechanism; Peltokorpi (2017) reinforces the findings when he states that interpersonal networks help the transfer of knowledge between sectors. Informal meetings and open dialogues between employees and managers can be other social integration mechanisms (Kianto & Andreeva, 2014). Previously, Todorova and Durisin (2007) already argued that social integration mechanisms could have a direct or moderating effect on the dimensions of the ACAP. Therefore, the literature reinforces the result achieved when testing hypothesis 2, suggesting that social integration mechanisms are essential for organizations to develop ACAP.

H3: Social Integration Mechanisms influence the individual's Absorption Capacity. – Supported.

In order to justify the validation of hypothesis 3, it is crucial to recognize that the organizational context has the function of enhancing the individual absorption capacity. This function means that individuals interact within the organizational context in order to assimilate and apply knowledge. In this direction of thought, social integration defines shared reference maps between individuals, thus enabling an effective exchange of knowledge (Zhang, Zhao, Xiande, Lyles, & Guo, 2015)

In this sense, it is observed that social integration mechanisms in this research (task rotation, connectivity, task rotation, among others) impact the individual absorptive capacity. As stated by Peltokorpi (2017), training is a social integration mechanism that promotes social integration. Training establishes shared codes and vocabularies that allow individuals and groups to understand knowledge, thus promoting knowledge exchange and pooling (Collins & Smith, 2006). Shared representations of tasks, equipment, work relationships, and situations among group members contribute to team cognition (Mohammed & Dumville, 2001).

Vegt (2002) and Vegt, Bunderson and Kuipers (2010) state that social integration is reflected in elements such as group cohesion and attraction of members to the group, leading to better absorption of individual individuals knowledge. For example, social gatherings are social integration mechanisms that promote affective, social

integration between individuals. Social meetings encourage individuals to share their experiences (Liu, Hernandez, & Wang, 2014), helping them identify attitudes, beliefs, and value similarities that strengthen cohesion (Woehr, Arciniega, & Poling, 2013). Such cohesion motivates individuals to invest time, energy, and effort in sharing knowledge (Reagans & McEvily, 2003).

In line with the results found by the authors above, research shows that social integration mechanisms impact the individual's absorption capacity. Lewin, Massini & Peeters (2011) had already ratified this relationship when they pointed out the importance of intra-organizational social integration mechanisms to build connections and shared meanings among the employees of an organization. According to the authors' statement and what was found in this research, companies use social integration mechanisms among the organization's members. The latter had a positive impact on the individual ACAP.

In this way, the validation of hypothesis 3 is related to what happens in the studied companies, social interactions between different individuals, which can be understood that management provides an organizational environment where these interactions can happen (Hörbe, Moura, Machado, & Campos, 2021). Social integration mechanisms provide the necessary structure for the exchange of knowledge among its members, increasing the absorption of knowledge between them (Nagati & Rebolledo, 2012).

Felin et al. (2012) is based on the concept of micro-foundations, which includes individuals' actions and interactions and organizational processes and structures.

Collaborative knowledge absorption only works when individuals who possess valuable knowledge trust other group members and wish to share knowledge with them (Reinholt, Pedersen, & Foss, 2011; Chirico & Salvato, 2016). Positive affect influences the willingness to share knowledge and helps others understand it, positively influencing the recognition of valuable knowledge (Hayton & Cholakova, 2012).

The validation that social integration mechanisms influence individual absorptive capacity, corroborated by the research presented, allows us to recognize that

managers implement social integration mechanisms so that employees can exchange information (Zaluski, Hedlund, Cordeiro, & Sausen, 2022). This activity will influence the increase of individual ACAP. The attitude of managers empowers and motivates individuals to acquire, assimilate, transform and apply knowledge.

6 CONCLUSION

The survey results prove that individual ACAP positively impacts organizational ACAP. In addition, for us to transform the individual ACAP into organizational ACAP, the MIS is of fundamental importance and must be implemented by the management of companies, but specifically in this study, the SMEs.

This article offers some contributions to the literature on social integration mechanisms, individual and organizational absorptive capacity. First, the focus is on social integration mechanisms and their link to capabilities. When we analyze these links, we seek to clarify a positive relationship between mechanisms and capabilities. Second, we also indicate that individuals form the basis of absorptive capacity at the organization level in SMEs. Absorptive capacity is based on individuals and groups within organizations, i.e., the ability to absorb knowledge. It depends on individual capabilities and therefore depends on structures that connect the capabilities of individuals and teams. Third, the research reinforces previous research, focusing on SMEs, which recognized the importance of intra-organizational mechanisms of social integration to facilitate the absorption of knowledge within an organization. The latter is the main contribution and prompts further research to clarify, in more detail, the effects of MIS on individual and organizational ACAP.

The findings can help SME managers understand the importance of MIS in the development of absorptive capacity. Moreover, MIS can help manage the company, focusing on organizational mechanisms and providing capabilities, expertise, and knowledge to individuals and organizations. From the results, it was observed that social integration mechanisms play a central role in facilitating the process of knowledge transfer, both individual and organizational.

Among the limitations of this research, it is considered the choice of the cross-section in the year 2019. In this way, the results can be influenced according to the context of each organization at the appropriate moment. In addition, the research focused on a relatively small sample of companies in the metal mechanic sector in the state of Santa Catarina, and it is not possible to generalize the results to the same sector or other sectors of the economy. Although the research has limitations in its development, they can be considered research gaps for future studies, initially, with the continuation of the investigation at other moments in time. Thus, it is suggested to periodically replicate the instrument used in this research with companies in the metal mechanic sector in future moments.

Another limitation is the fact that the analyzes are restricted to the sample surveyed for convenience. It is expected to replicate the data collection instrument in other scenarios to investigate whether the hypotheses proposed in this study are verified. A greater understanding of how MIS affects ACAP can contribute to how organizations should be structured and organized and which combinations of MIS lead to better absorption of the ACAP dimensions. Further insight into the importance of ACAP's four dimensions to innovation strategies and their relationship to MIS would provide managers with insights on how to structure their organizations to achieve flexibility and efficiency.

As we conceptualize knowledge absorption at the individual and organization level, future research can adopt multilevel perspectives looking at groups or teams and compare the absorption capacity of different organizations and different groups within the same organization. In this sense, it is also worth studying the interactive effects of social integration mechanisms at the group level or those studied in this research (individual or organizational) with each of the absorptive capacity dimensions. This deeper understanding will have important implications for the design of social integration mechanisms and for organizational initiatives to promote their absorptive capacity.

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2. Development of hypotheses or research questions (empirical studies)	√		√
3. Development of theoretical propositions (theoretical work)	√	√	
4. Theoretical foundation / Literature review	√	√	
5. Definition of methodological procedures	√	√	√
6. Data collection	√		
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