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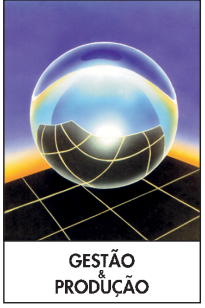

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Absorptive capacity, exploration, and exploitation: an analysis of the companies in Palmas, Tocantins

Capacidade de absorção, exploração e explotação: uma análise em empresas de Palmas, Tocantins

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Abstract: This research is about the relationship between the exploitation, exploration, and absorptive capacity of the organizational knowledge. The three themes are of great importance to the sustainable competitive advantage of organizations. In general, although they are inserted in the discussion of organizational learning, they are still in the evolutionary process regarding antecedents, moderators, and outcomes, as can be observed in the theoretical reference. It has not been possible to identify studies with similar characteristics as the one presented here, i.e., studies linking exploration and exploitation with absorptive capacity, particularly in the Brazilian context. The main objective was to evaluate the degree of association between exploration, exploitation, and absorptive capacity. This study used quantitative research in 100 companies operating in commerce and services sectors, all located in the city of Palmas, Tocantins State. The sector was chosen based on the concentration of commercial and services companies in the city. The informants were the managers who worked in these companies. The questionnaire involved the use of two scales: one scale for the measurement of exploration and exploitation, and the other scale for measuring the absorptive capacity, both validated by early studies. The technique involved structural equation modeling using Partial Least Square-Path Modeling (PLS-PM) software was used for the verification of the principal hypothesis. The concepts of exploration and exploitation were based on six dimensions: organizational knowledge practices, innovation practices, strategic orientation, competition, partnerships, and efficiency. The concept of absorptive capacity was based on four dimensions: porosity, routines and structures, public knowledge, and individual abilities. The results showed that companies had exploitation orientation. Regarding the absorptive capacity, companies had a high relationship with the environment, with routines and with procedures, and with public knowledge. The main hypothesis was confirmed, indicating a positive relationship between exploration, exploitation, and absorptive capacity.

Keywords: Exploration; Exploitation; Absorptive capacity; PLS-PM.

Resumo: *O tema desta pesquisa diz respeito às relações entre as orientações estratégicas de exploitation (explotação) e exploration (exploração) e a capacidade de absorção do conhecimento organizacional. Os três temas discutidos caracterizam-se como de grande relevância para a geração de vantagem competitiva sustentável para as organizações. Em geral, embora inseridos na discussão de aprendizagem organizacional, ainda estão em fase de evolução quanto aos seus componentes relativos a antecedentes, moderadores e resultantes, como poderá ser observado no referencial teórico. Não foi possível a identificação de estudos com características similares às aqui apresentadas, ou seja, estudos que relacionem exploração e explotação com a capacidade de absorção, particularmente no contexto brasileiro. O objetivo principal foi avaliar o grau de associação entre exploração e explotação e a capacidade absorção. Foi desenvolvida uma pesquisa de caráter quantitativo com 100 empresas dos setores de comércio e de serviços sediadas na cidade de Palmas, Estado do Tocantins. A escolha do setor se deu pela concentração de empresas com tal característica na cidade estudada. Foram informantes os gestores que trabalhavam nessas empresas. O questionário aplicado envolveu a utilização de duas escalas. Uma para a mensuração das orientações para exploração e explotação e outra referente à mensuração da capacidade de absorção do conhecimento, ambas validadas por estudos anteriores. Para a verificação da hipótese principal, a técnica utilizada envolveu Modelagem de Equações Estruturais, mediante o software PLS-PM. Os conceitos de exploração e explotação foram baseados em seis dimensões: práticas de conhecimento organizacional, práticas de inovação, foco estratégico, competição, parcerias e eficiência. O conceito de capacidade de absorção ficou traduzido por duas dimensões: capacidade potencial e capacidade realizada. Os resultados demonstraram que as empresas pesquisadas possuem orientação para explotação. Em relação à capacidade de absorção, as empresas possuíam alto grau de predominância de relacionamento com o ambiente, rotinas e procedimentos e conhecimento público. A hipótese principal foi confirmada, indicando uma relação positiva entre exploração, explotação e a capacidade de absorção.*

Palavras-chave: *Exploração; Explotação; Capacidade de absorção do conhecimento; PLS-PM.*

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1 Introduction

The concepts of exploration and exploitation have gained evidence from the seminal paper of March (1991). This paper prevised the change in the degree of competitiveness due to open markets, a factor that contributed to the process of globalization. Absorptive capacity was evidenced by Cohen & Levinthal (1990). The three concepts are of great importance to the sustainable competitive advantage of organizations, as verified by the literature review.

In this sense, those organizations interested in obtaining more advantages than their competitors were challenged to seek new knowledge and manage existing their knowledge base, thereby acquiring a competitive advantage. For that, some organizations began to develop initiatives related to organizational learning that, in the perspective of March (1991), implies efforts in processes related to exploration and exploitation. Also, Cohen & Levinthal (1990), presented their paper on absorptive capacity, advocating its importance in the process of organizational learning.

It is from the perspective of these three concepts – exploration, exploitation, and absorptive capacity – that this article is developed. Thus, the main objective was to evaluate the level of association between exploration, exploitation, and the absorptive capacity of the organization.

This objective is justified because, from the considerations of March (1991) on exploration and exploitation, these concepts are understood in light of the process of organizational learning. So for exploration and exploitation to be developed effectively and efficiently, individual and organizational absorptive capacity is essential.

These three concepts, in general, are inserted into the discussion of organizational learning, and they are still in the evolutionary process related to its antecedents, moderators, and outcomes. It has not been possible to identify studies with similar features to those presented here, i.e., studies linking exploration and exploitation with absorptive capacity, particularly in the Brazilian context. This finding is confirmed by the review of the annals of the national conferences sponsored by ENANPAD (Encontro Nacional da Associação Nacional de Pesquisa em Administração) and the database of dissertations and theses from Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior (CAPES, 2010) between 1999 and 2010.

The review of ENANPAD's annual publications from 2000 to 2011 on the topic of exploration and exploitation revealed only five papers and only four papers on absorptive capacity. Not a single paper was identified that established a joint approach to exploration, exploitation, and absorptive capacity. It is possible to support that the association between these concepts in this study is the first contribution to the academic and practical context, at least in the context of the studies conducted in Brazil. In this way, this study fills part of this gap, which should bring theoretical and practical contributions due to the model developed here. The model presents two scales for the measurement of these concepts and structural equation modeling based on PLS-PM to identify the relationship between them.

After this brief introduction, Section 2 presents the main concepts and theories related to the theoretical framework of this research. Section 3 refers to the methodological procedures used. In Section 4, the results of the survey are presented and analyzed and, finally, Section 5 presents the final considerations.

2 Theoretical framework

2.1 Exploration and exploitation

March (1991) presents exploitation as the efficient use of existing resources and competencies. Exploitation requires stability, standardization, and creation of routines. The actions and activities are related to refinement, choice, production, efficiency, implementation, and execution. Exploitation implies concentration on incremental innovations. Exploration involves the need for constant renewal of skills and resources and demands to disrupt with continuity, rules, and routines. Therefore, the risks are higher, and the return is not always guaranteed. There is a focus on radical innovations. Organizations engaged in exploration can pay high costs due to experimentation, without winning many benefits in the short-term.

Companies focused on exploration tend to present flexible models of coordination which allow them to increase variety, therefore increasing their knowledge base. The ideas generated and the knowledge arising from this learning fit in the selective emergent environment. From the choice of a dominant design, the standards of competitors are eliminated. Thus, the focus of learning of companies changes to exploitation. This new focus on exploitation encourages cost reduction. Technical standards and procedures lead to the search for rents based on economies of scale (Gilsing, 2002).

March (1991) stated that the organizations engaged in exploration could pay high costs due to experimentation without gaining many benefits in the short-term. Those that focus on exploitation can stay in the level below the break-even point. This author argues that exploration and exploitation are related to the knowledge acquisition process carried by the organizations. March's model deals with the concept of "mutual learning"; it seeks to explain the trade-off between exploration and exploitation, and analyzes the relationship between the accumulation and use of

knowledge in organizations. The concept of mutual learning is based on the idea that organizations accumulate knowledge in procedures, standards, rules, and forms learned from its members. At the same time, the individuals in an organization are socialized with the beliefs of this organization. The firm should be able to achieve the best trade-off between exploration and exploitation.

This trade-off is the subject of discussion in research and studies that deal with organizational knowledge and their strategies. There is tension between exploitation and exploration when companies decide the allocation of resources. The trend towards exploitation leads to an unstable equilibrium and possible consequences for long-term survival. Therefore, the maintenance of a balance between exploitation and exploration is critical in adaptation and survival systems (March, 1991; Anand et al., 2009).

The exploratory collaboration involves the creation of new competencies through partnerships with universities and research institutes. Exploratory collaboration focuses on the complementarity between technologies and products, such as consumers and suppliers (Faems et al., 2005).

Exploration is a strategy used to conduct research projects and is linked to demand technology that allows firms to meet future market demand. Exploitation is a strategy to drive product development and the search for new technologies and is linked to demand technology that allows current market demand (Jayanthi & Sinha, 1998; Garcia et al., 2003; Geiger & Makri, 2006).

For Lee & Ryu (2002), investing in unknown technological opportunities is exploration, and investing in existing technology is exploitation. Nerkar (2003) adds that the search for technology in the short-term is exploitation, but searching in the long-term is exploration. Argyres (1996) argues that exploration is the expansion of technological capabilities and exploitation is the deepening of technology. He & Wong (2004) define exploratory innovation as technological innovation activities intended to enter into new product areas and markets. Exploitative innovation denotes activities of innovation aimed at improving the product and existing market positions.

Mom et al. (2007) highlight the existence of differentiation in activities geared towards management. Managing exploratory activities, including finding new possibilities concerning products, services, processes, or markets, requires new abilities and new knowledge. The management of exploitation activities includes serving existing customers with existing products and services, which requires current knowledge and the accumulation of experience (Mom et al., 2007).

Several studies relate exploration and exploitation with strategic alliances. Lavie & Rosenkopf (2006) organized the exploration and exploitation of the alliance's function in three domains: "Domain of the function", "domain of structure", and "domain of attributes". The domain of function refers to the nature of the alliance's functions in the value chain. If the domain is for the generation of knowledge, it is an exploratory alliance, but if the domain is to leverage knowledge, it is described as an exploitative alliance. A structural domain refers to a company allying itself with a completely new partner and focusing on the structure of the alliance. When there is a new partner, the alliance is exploratory, but if the alliance is with an old partner, it is described as an exploitative alliance. Attribute domain describes to what extent the attributes of the new organizational partner are different from previous partners, defining the structural partner profile.

The activities of exploitative alliances include manufacturing, marketing, or supply agreements, which are typical of market knowledge and products. Exploratory alliances are usually established to explore new technological opportunities (Hagedoorn & Duysters, 2002). To invest in the main operation of a company and establishing an alliance to ensure complementary assets is exploitation; to invest in the R&D of new technologies is exploration.

Several researchers have sought to develop scales to measure both exploration and exploitation. McGrath (2001) makes use of a multi-item scale to measure exploration and exploitation and emphasizes the search for new technological and market knowledge.

Popadiuk (2012) has developed a six-dimensional instrument to measure the two concepts: knowledge practices, innovation practices, organizational efficiency, strategic orientation, partnership, and competition. Popadiuk (2012) identified that the first four dimensions are more related to characteristics of the internal environment, and the other two are related to the external environment.

2.2 Absorptive capacity

For Cohen & Levinthal (1990), the absorptive capacity can be defined as the ability to acquire, assimilate, and apply new knowledge. The premise of the concept is that the organization needs prior knowledge, aiming at assimilating and using new knowledge.

The absorptive capacity of an organization will depend on the absorptive capacity of its members. To understand the sources of the absorptive capacity of a company, it is necessary to focus on the structure of communication between the

external environment and the organization, as well as between the subunits of the organization and the distribution of competencies within the organization. A sufficient level of knowledge is required to ensure effective communication and interactions between individuals that have different levels of knowledge, will increase the capacity of the organization to make connections and develop innovative partnerships.

The absorptive capacity of an organization is not concentrated in a single individual but depends on a mosaic of individual capabilities. The absorptive capacity is more likely to be developed and maintained as a by-product of routine activity when the domain of knowledge that the company plans to explore is related to its current knowledge base. Absorptive capacity requires the ability to learn and develop problem-solving skills. The ability to learn is the ability to assimilate knowledge to imitate, and the acquisition of problem-solving skills to the ability to create new knowledge for innovation (Kim, 1998; Cohen & Levinthal, 1990).

Lane & Lubatkin (1998) reinforce that a company must devote attention to the management of its capabilities and the management of your physical assets. While competition focuses on knowledge, a company must develop an in-depth understanding of its knowledge, the processes by which it converts its knowledge into its capabilities, and the capability of its resources to meet the demands of its environment. These authors assess that firms that receive knowledge from a partner in an alliance can value, assimilate and apply new knowledge depending on: a) the type of knowledge offered by the firm that transmits the knowledge; b) the similarity of the knowledge between the receiving firm and the sending firm; and c) the familiarity of the organizational problems between them (Lane & Lubatkin, 1998).

Zahra & George (2002) classified absorptive capacity in two dimensions: potential absorptive capacity and realized absorptive capacity. Potential absorptive capacity makes the company open to acquiring and assimilating external knowledge. This implies two main processes: the acquisition and assimilation of knowledge. Acquisition of knowledge refers to the ability of the company to identify, acquire, and assimilate external knowledge; it relates to the processes and routines that allow the company to analyze, process, interpret, and understand the information obtained from external sources. From the management of organizational knowledge, potential absorptive capacity can be related to exploration. The realized absorptive capacity is a function of the transformation and exploitative capabilities of the company. The transformation refers to the ability to develop and improve the routines that combines existing knowledge with newly acquired and assimilated knowledge. Using this perspective, this type of capability reveals components of exploitation.

The literature of knowledge creation gave support to the idea that there is a positive relationship between porous borders of the company and the creation of knowledge. Therefore, the borders related to the flow of people through these limits may facilitate the creation of knowledge (Matusik & Heeley, 2005). Matusik & Heeley (2005) discuss the relationship of the company with the external environment, as well as how individual dimensions contribute to the collective results of knowledge. Studies indicate that the number and type of ties present in a network are positively related to the assimilation of practices and knowledge within the network.

For Matusik & Heeley (2005), the collective knowledge is composed of two elements: a) the components that are the different aspects of the organization's operations or its parts; b) architecture that is how the routines are developed to produce these components. The company's capability to absorb and assimilate external knowledge is influenced by the nature of both elements of its collective knowledge. The authors add that a company's capability to absorb information from its external environment is also a function of the absorptive capabilities of its members. This absorptive capacity is related to the knowledge and practical skills of individuals, their styles of communication, and a shared understanding of their goals. The skills of individuals to acquire and use knowledge is the result of learning experiences in similar tasks and their problem-solving capabilities.

3 Methodological procedures

This research is quantitative, exploratory, and descriptive, using a structured closed questionnaire. The unit of analysis was the company. The informants were managers in the organizations participating in the research. Most of the 100 informants worked in companies that developed activities in the sector of commerce and services. Their exercised functions focused on the commercial area of the companies. Due to the specificity of the Brazilian city and state (Palmas, Tocantins), the economic concentration was the commerce and services sector, and so it has not been possible to obtain a probabilistic sample. The sample was, therefore, classified as convenience sampling.

The questionnaire involved two scales: one for exploration and exploitation and another to measure absorptive capacity. For the measurement

Chart 1. Dimensions associated with exploration, exploitation, and absorptive capacity.

Latent variables	Dimensions
Exploration (Popadiuk, 2012)	Organizational knowledge practices and innovation practices
Exploitation (Popadiuk, 2012)	Competition, efficiency, partnerships, and strategic orientation
Absorptive capacity	Porosity of the boundaries of the company, public knowledge, structures and routines, and individual absorptive abilities

Source: Prepared by the authors.

of exploitation and exploitation, the six-dimensional model developed by Popadiuk (2012) was used (Chart 1). For each dimension, this author defined a set of indicators that were evaluated according to the seven-point scale.

After the pre-test, the questionnaire was completed by the respondents of this study. Most of the respondents completed the questionnaire at the time of the first contact, but around 15% requested that the questionnaire be removed and given to them at another time.

The absorptive capacity was measured by an adaptation of the scale developed by Matusik & Heeley (2005). These authors developed their study to obtain the desired results in a practical context of information technology. Due to the characteristics of the population in Palmas, the scale was adapted to consider the context of the commercial activities of the companies. This scale considers the three dimensions of the model of Matusik & Heeley (2005) and involves sixteen indicators. After the adaptation of the scale, five pretesting were applied to adjust the logic of the questionnaire and the wording of the questions.

The indicators of these constructs are presented in the data analysis stage.

4 Results and analysis

4.1 Results

The scale developed to measure the exploitation and exploration attributes contained seven points. At one extreme, the lowest grade (1) referred to a worst-case assessment of attribute, and other end (7) gave a more favorable assessment (Popadiuk, 2012). For the knowledge practices and innovation practices, a score closer to the 7 value would suggest a predominance on exploration. For all other dimensions, a score closer to the 7 value would suggest a predominance on exploitation.

All questionnaires were fully reviewed to ensure the respondent had not selected the same value repeatedly across the questionnaire, which could indicate the respondent had little interest in contributing to the research. This was done from the transposition of the database. The lines were transformed into columns. In this way, each variable (indicator) became a case, and each respondent became a variable. Thus, it was possible to generate 100 tables representing the 100 informants with a percentage of responses associated with each value of the seven-point scale. As none of the respondents had given the same scale value for more than 80.0% of their answers, no questionnaires were eliminated from the sample.

4.2 Data analysis

From Table 1, considering the results of the dimension knowledge practices and according to March (1991) and the classification adopted by Popadiuk (2012), it can be verified that the companies surveyed were predominantly explorative.

From Table 2, it can be observed that the responses focused on values greater than 5. It highlighted two of the indicators, 'focus on completely new products or processes' (4.99) and 'focus on radical product innovations' (3.87). Although apparently contradictory, a possible explanation of the difference between the average values of these two indicators is the understanding of the informants. The understanding of a new product, for example, can simply due to the change of the season of the year. This does not necessarily mean radical innovation.

Among the results presented in Table 3 are two indicators that had larger averages: 'competition in the local market' (4.94) and 'price-based competition in the local market' (4.94). The results obtained in these indicators identify that the orientation of companies, to this dimension, is predominantly for exploitation.

Table 4 confirms that most responses focused on values greater than 5. This corresponded to an average percentage of 79.0% and mean of 5.46. The indicators of this scale assessed the strategic focus in the present and the short-term. According to the theoretical framework, this means an approach tending to exploitation.

Table 5 highlights two of the indicators: 'transparency in joint efforts with partners' obtained the highest percentage (71%) and 'level of dependency on outside

Table 1. Level of knowledge practices (n = 100).

Knowledge practices Cronbach's Alpha: 0.879	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Volume of new ideas generated	14	23	63	4.92
Use of new sources of knowledge from partners	20	19	61	4.84
Existing knowledge in databases	19	19	62	4.85
Use of knowledge already in place in the company	9	11	80	5.26
Sharing in-house knowledge	12	18	70	5.00
Individual learning processes	15	23	62	4.85
Collective learning processes	13	20	67	4.89
Building up team capacities	15	23	62	4.84
Personnel development intensity	17	17	66	4.70
Appreciation of individual knowledge	13	27	60	4.77
TOTAL	**14.7**	**20.0**	**65.7**	**4.89**

Sources: Research data.

Table 2. Level of innovative practices (n = 100).

Innovative practices Cronbach's Alpha: 0.883	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Focus on completely new products or processes	17	21	62	4.99
Prototypes development	32	23	45	4.20
Product innovation rate	19	21	60	4.79
Marketing techniques innovation	17	27	54	4.88
Opening up new distribution channels	29	21	50	4.50
Focus on radical product innovation	38	28	34	3.87
Focus on radical technology innovation	29	24	47	4.35
Ceaseless quest for new markets	16	25	59	4.79
Development of new products and services	33	20	47	4.34
Aggressive participation in technology-based alliances	36	11	53	4.32
TOTAL	**26.6**	**22.1**	**51.1**	**4.50**

Source: Research data.

Table 3. Level of competition perceived (n = 100).

Competition (4.44) Cronbach's Alpha: 0.931	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Rate of emergence of new competitors	14	15	71	4.48
Existence of substitute products or processes	31	18	51	4.35
Competition in the local market	14	22	64	4.94
Price-based competition in the local market	22	16	62	4.94
Fierce competition in company sector	33	22	45	4.35
Existence of promotion war in company sector	35	22	43	4.37
Competition covers company offers easily	45	18	37	3.92
Price-based competition is the high point of the sector	33	26	41	4.18
TOTAL	**28.3**	**19.8**	**51.7**	**4.44**

Source: Research data.

Table 4. Level of strategic focus (n = 100).

Strategic focus (5.46) **Cronbach's Alpha index: 0.**736	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Strategic view focused on the present	2	19	79	5.53
Strategies focused on the short-term	10	11	79	5.40
TOTAL	**6.0**	**17.7**	**79.0**	**5.46**

Source: Research data.

Table 5. Level of partnerships (n = 100).

Partnerships (4.70) Cronbach's Alpha: 0.941	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Local relationship with outside partners	17	16	67	4.90
Level of dependence on outside partners	33	23	44	4.18
Use of contracts in relationships with outside partners	30	20	50	4.26
Transparency in joint efforts with partners	18	11	71	5.09
Duration of outside partnerships	15	15	7	5.05
Sharing knowledge with partners	16	22	62	4.82
Concern with establishing outside partnerships	22	16	62	4.75
Number of outside partners that the company has	21	29	50	4.54
TOTAL	**21.5**	**19.0**	**59.5**	**4.69**

Source: Research data.

Table 6. Level of efficiency (n = 100).

Efficiency (5.53) **Cronbach's Alpha: 0.**89	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Creation of detailed routines	10	23	67	5.04
Importance of efficiency	5	10	85	5.70
Focus on performing activities	4	10	86	5.71
Concerns with gains of scale	13	14	73	5.41
Organizational control mechanisms	6	20	74	5.37
Focus on costs	4	12	84	5.88
Focus slanted towards production	9	12	79	5.63
TOTAL	**7.2**	**14.4**	**78.3**	**5.53**

Source: Research data.

partners,' which obtained the lowest percentage (44%). In this sense, as the average values tended to have larger scores, the orientation of this dimension is predominantly for exploitation. This finding is consistent because commercial and service activities tend to rely on a partner network built by suppliers and other market agents.

The assessment of the degree of efficiency, according to Table 6, allowed the identification of the average value on the seven-dimensional scale, at 5.53. Two indicators are highlighted: 'focus on performing activities' (5.71) and 'focus on cost' (5.88). This indicates that, for the dimension efficiency, the orientation is exploitative.

4.2.1 Results relating to specific goals associated with the absorptive capacity

Table 7 presents the results related to the level of prevalence of the company's relationship with the external environment. It turns out that most of the responses focused on values greater than 5. Questions about this dimension referred to the implementation of activities and how this company's relationship narrowed with the external environment, mainly the aspects related to the team, its way of working, and its interaction with its partners.

Table 8 presents the results related to public knowledge of the sector. In this dimension, the company should compare itself with its main competitor, evaluating aspects such as operating systems, business process, customer specifications, and technical communication protocols.

The results showed that public knowledge of the sector is high, especially in the aspects of customer specifications and technical communication protocols. A possible explanation for the high percentage of responses above a score of 5 in this dimension may be because the activities of commerce and services have its standards. Therefore, it is common knowledge that acts in these two sectors.

Table 9 presents results related to routines and structures to increase absorptive capacity. Organizational routines are inherently capable of

change, and this can be seen in several aspects raised in this research. In addition, there were also interesting results in 'exploring the best upcoming technical information within the area' (4.67); in addition to being repetitive routines, they allow changes. They can still be defined as recognizable patterns of interdependence between repetitive actions, but cannot be understood as static or immutable objects (Feldman & Pentland, 2003).

Table 10 differs to previous results: there is a high percentage of answers below 5. A possible explanation for the low percentage in the 'High' category (35.8%) may be due to the same reasons presented in previous tables: the type of research activity.

Table 7. Level of predominance of the relationship of the company with the external environment (n = 100).

Relationship of company with the external environment (porosity) (4.28) Cronbach's Alpha: 0.810	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
The development of activities is:				
Assigned to a specific group or team	30	30	40	4.05
Made by meetings of the group or team	22	25	53	4.54
Assigned to tasks requiring the permanent interaction with the workers in the sector	3	17	52	4.27
TOTAL	**27.6**	**24.0**	**48.3**	**4.28**

Sources: Research data.

Table 8. Level of predominance of knowledge of the public sector (n = 100).

Public knowledge (5.12) Cronbach's Alpha: 0.892	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
Knowledge of operating systems compared with its main competitor	15	20	65	5.02
Knowledge of peculiarities of the commercial process of the main competitor	15	17	68	5.11
Knowledge of customer specifications of the main competitor	9	19	72	5.21
Knowledge of technical communication protocols of the main competitor	17	9	74	5.14
TOTAL	**14.0**	**16.2**	**69.7**	**5.12**

Source: Survey data.

Table 9. Level of predominance of the routines and structures associated with the transfer of organizational knowledge.

Routines and structures of the company (4.79) Cronbach's Alpha: 0.898	**Low (1, 2, 3)**	**Average (4)**	**High (5, 6, 7)**	**Average**
In the commercial area:				
We have clear division of roles and responsibilities to perform technical tasks	16	21	63	4.81
We have the management expertise to absorb new technical knowledge	8	23	69	4.93
We know we can explore the best upcoming technical information techniques within the area	14	33	53	4.67
We know we can help solve problems related to technical tasks	12	2	63	4.76
TOTAL	**12.5**	**25.50**	**62.0**	**4.79**

Source: Research data.

Table 10. Level of predominance of individual abilities for absorptive capacity of organizational knowledge.

Individual abilities (4.04) Cronbach's Alpha: 0.884	Low (1, 2, 3)	Average (4)	High (5, 6, 7)	Average
Percentage of workers with:				
Information about state-of-the-art technical practices	35	30	35	3.94
A shared vision of what the area is seeking to achieve	26	36	28.0	4.07
A common communication style about technical issues	31	29.0	40.0	4.03
The skills needed to perform technical tasks	31	34.0	35.0	4.02
Technical competencies to absorb new technical knowledge	32	27.0	41.0	4.14
TOTAL	**31.0**	**31.2**	**35.8**	**4.04**

Source: Research data.

4.2.2 Results referring to the objectives related to exploration and exploitation associated with the absorptive capacity

To answer this question, this research used the PLS-PM structural equation software (Hair et al., 2005). The objective of this technique was to examine the validity and discriminant validity of the convergent constructs: exploration, exploitation, and absorptive capacity (Anderson & Gerbing, 1998; Henseler et al., 2009). The model involved two reflective second-order latent variables (Jarvis et al., 2003), according to the literature review, as the set of indicators presented in the previous tables.

The first second-order latent variable was named 'exploitation', derived from four other first-order latent variables: 'efficiency', 'competition', 'strategic orientation', and 'partnerships'. The second second-order latent variable, named 'exploration,' originated from two first-order latent variables: 'knowledge practices' and 'innovation practices'.

The absorptive capacity was characterized as having three sets of variables: a relationship with the external environment (porosity) and both the collective and individual dimensions of knowledge (Matusik & Heeley, 2005). In the first group, the authors characterize the relationship based on the idea of 'the firm border porosity' and use three indicators to measure this construct. The second group, on the collective dimension, was characterized by the concepts of 'public knowledge relevant to industry' and the 'existence of structures and routines for knowledge transfer;' four indicators are used for each construct. The third group had focused on the individual composed of five indicators.

In this research, the model was composed of 51 indicators. These indicators and their respective factor loadings were considered significant at the 5% level. (Table not shown due to the limitation of words for this article). Similarly, for the second-order constructs of exploitation and exploration, a second-order latent variable called 'absorptive capacity' was created. For the analysis of convergent validity, three criteria have been adopted, as proposed by Hair et al. (2005): factor loadings greater than 0.7, average variance extracted (AVE) greater than 0.5, and t-values greater than 1.96 (or $p < 0.05$). Although 13 indicators have stayed relatively below the acceptance limit suggested by these authors, this study preferred to let them in the model so to not change the original scale developed by Popadiuk (2012) for the measurement of exploitation and exploration.

The analysis of AVE (Table 11) is also a statistic that reinforces the convergent validity. Except for the latent variables 'knowledge practices' and 'innovation practices', that were very close to the threshold value of acceptance for all remaining latent variables, the statistic was considered adequate.

Reliability, measured by Cronbach's Alpha, and composite reliability also proved adequate, with values above 0.7.

Through examining Table 11, we discover that all factor loadings were highly significant ($p < 0.0001$) and, other than strategic orientation, the other latent variables showed factor loadings greater than 0.7. This shows that, for this criterion, the model was appropriate regarding convergent validity and so was confirmed by the values of the AVE whose values exceed 0.50, except knowledge practices (0.491) and innovation practices (0.491). However, these are very close to the minimum desirable threshold.

Although the factor loading for strategic orientation was below the value ideally suggested by Hair et al. (2006, p. 112), these authors present a table showing a rule of acceptance from factor loadings based on sample size and statistical significance.

For a sample of 250 cases, the acceptable value is 0.35. With a sample of 100 cases, the acceptable value would be 0.55. Therefore, the value of the factor loading verified for strategic orientation can be considered, in this case, acceptable.

As the AVE is the result of the arithmetic mean of the sum of squares of factor loadings, and the factor loading for strategic orientation was 0.563, it contributed to the value of 0.466 for the AVE associated with a second-order latent variable exploitation. However, as both the Cronbach Alpha for strategic orientation (0.736) and the factor loading for first-order indicators were adequate (Table 12), it was decided to maintain this dimension in the model because of its importance in the context of the business environment.

Table 11. Statistics of convergent validity and reliability.

Latent Variable	1	2	AVE	3	4	5
Exploration - second order	-	-	0.699	0.822	-	-
. Knowledge practices	0.865	25.722	0.491	0.904	0.879	4.89
. Innovation practices	0.806	22.570	0.491	0.905	0.883	4.50
Exploitation - second order	-	-	0.466	0.776	-	-
. Competition	0.730	11.139	0.677	0.943	0.931	4.44
. Strategic orientation	0.563	5.586	0.791	0.883	0.736	5.46
. Efficiency	0.710	7.682	0.606	0.914	0.890	5.53
. Partnerships	0.715	9.931	0.709	0.951	0.941	4.69
Absorptive capacity	-	-	0.651	0.882	-	-
. Porosity of limits of company	0.772	15.415	0.727	0.888	0.810	4.26
. Public knowledge	0.783	14.654	0.757	0.925	0.892	5.12
. Routines and structure	0.851	19.398	0.766	0.929	0.898	4.79
. Individual abilities	0.819	25.396	0.684	0.915	0.884	4.04
Recommendation	**> 0.70**	**> 1.96**	**> 0.50**	**> 0.70**	**> 0.70**	**-**

1 = Factor loading; 2 = t-statistic of *student (t-value*); 3 = Composite reliability; 4 = Cronbach's alpha; 5 = Mean. Source: Prepared by the authors.

Table 12. Correlations between latent variables of the first and second orders.

Dimensions for exploration and exploitation	1	2	3	4	5	6
1. Knowledge Practices	**0.700**					
2. Innovation practices	0.401	**0.700**				
3. Competition	0.256	0.454	**0.823**			
4. Strategic orientation	0.437	0.452	0.307	**0.889**		
5. Efficiency	0.717	0.448	0.273	0.510	**0.778**	
6. Partnerships	0.232	0.325	0.313	0.194	0.267	**0.842**
Correlations between latent variables of the first order						
Dimensions for absorptive capacity	**7**		**8**	**9**		**10**
7. Porosity of the limits of the company	**0.853**					
8. Public knowledge	0.471		**0.870**			
9. Routines and structure	0.643		0.519	**0.875**		
10. Individual abilities	0.510		0.519	0.563		**0.827**
Correlations between latent variables of the second order						
Dimensions of first order	**Absorptive capacity**		**Exploration**		**Exploitation**	
Absorptive capacity	**0.807**					
Exploration	0.595		**0.836**			
Exploitation	0.437		0.682		**0.682**	

The square roots of the AVE are inserted into the main diagonal to characterize the discriminant validity; Correlation between exploration and exploitation equals 0.682 ($p < 0.0001$); All correlations are significant at the 5% level (n = 100, power = 0.8, two-tail) and significant at the level of 1%, calculated by G*Power3-(Buchner et al., 2006).

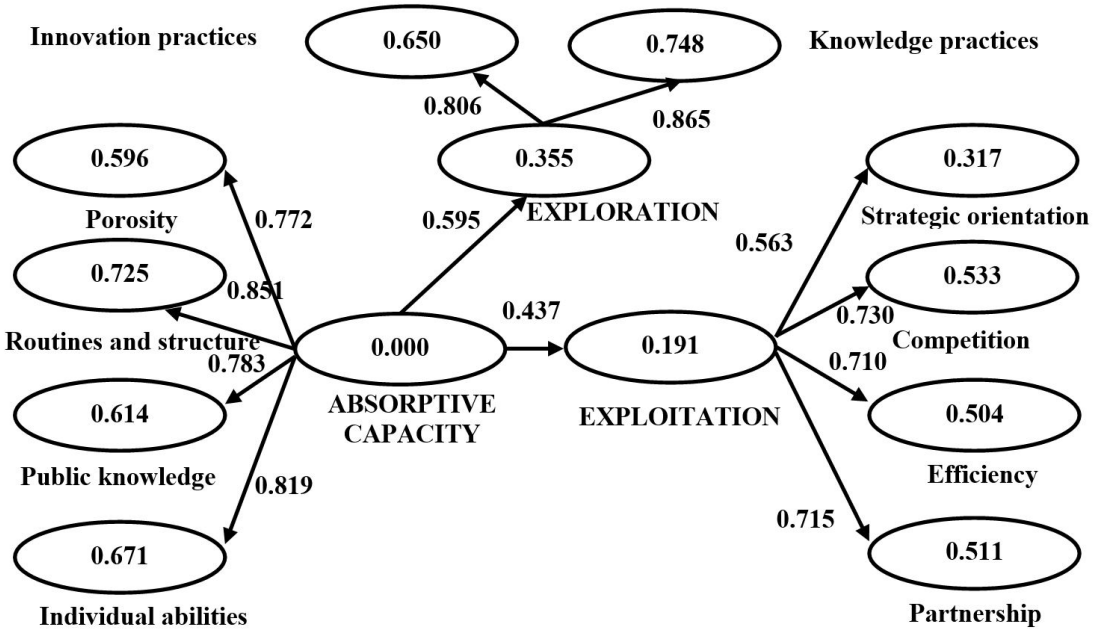

Figure 1. Coefficients of the measurement and structural model. Source: Research data.

For the analysis of discriminant validity, two criteria were used: factor loadings in the focal construct larger than the factor loadings on other constructs; this was also used to verify the correlations between latent variables, whose values must be less than the square root of AVE indices for each construct (Fornell & Larcker, 1981). Results from Table 12 indicate that they are lower than the AVE (the main diagonal), revealing discriminant validity.

It should be noted that the correlation between the efficiency dimension with the knowledge practices was 0.717 and could impact the discriminant validity. However, Netemeyer et al. (2003) argue that if the disattenuated correlation is less than 1, the validity is maintained. So as the disattenuated correlation, obtained by the ratio between the correlation and the square root of the product of the respective values of Cronbach's Alpha resulted in 0.810, it was considered that the discrimination was valid.

The absorptive capacity has a coefficient of explanation for exploitation of 0.437, and for exploration, the coefficient was 0.595. Both values are significant at the 1% level. Therefore, the principal hypothesis of this research was confirmed. Figure 1 summarizes the structural coefficients and measurements.

5 Final considerations

From the essential theme of this research involving three constructs of organizational strategy – exploration, exploitation, and absorptive capacity – the main objective was consistent in assessing the level of association between exploration, exploitation, and absorptive capacity.

Among the set of indicators relating to innovation practices, it can be identified that there was a concern regarding entirely new products and processes, the incessant search for new markets, product innovation and the opening of new distribution channels. While companies may be focused on completely new products and processes, that does not mean radical innovation. This fact can be explained by the type of activity inherent in the commerce and service. The informant may have understood that a change in a season of the year reflects into new products.

The strategic orientation of the surveyed companies comprises a view focused on the present, with search results for the short-term; this is consistent with this type of company. Around eight in 10 informants revealed that their companies are focused on the present and short-term results. Therefore, these companies were predominantly focused on exploitation. The intensity of the partnerships increases when companies make decisions to focus their activities more towards exploitation; these results appear to be consistent with this type of research activity. The commerce sector demands a high level of connection with its partners, whether suppliers or other agents of its chain of business.

Efficiency is a condition present in all discussions concerning the concept of exploitation. Due to other results identified in this research, mainly on strategic orientation and short-term results, the efficiency dimension, the values associated with the assessment of the seven indicators were the largest of all of the dimensions, revealing a strong orientation towards exploitation in these companies.

In the first dimension of absorptive capacity, was identified a high degree of relationship with the external environment, demonstrating concern for various aspects that increase the porosity of the company with the external environment. For this reason, it is important that the development of activities in networks be carried out through the formation of groups and teams and interactions between them (Matusik & Heeley, 2005; Goes & Park, 1997; Kogut & Zander, 1992).

The level of prevalence of this dimension in the companies suggested high results, demonstrating that there is capacity to absorb new technical knowledge, the clear division of roles and responsibilities to run them, and the resolution of problems that arise on these tasks. The results also demonstrated in this dimension that public knowledge of the sector is high, especially in the aspects of customer specifications and technical communication protocols. A possible explanation for the high percentage of these results may be because the activities of commerce and services have its standards. Therefore, it is common knowledge that acts in these two sectors.

A company's ability to absorb information from its external environment is also a function of the absorptive capacity of its members. This absorptive capacity is related to the knowledge and abilities of individuals in technical practices, their communication style, and their shared understandings.

Analysis by structural equation modeling could identify that the measurement model adopted was adequate regarding convergent and discriminant validity. The analysis of discriminant validity based on the cross-loadings allowed this study to determine that each indicator had the highest load factor in its latent variable. Also, it was identified that the correlations between latent variables were smaller than the square roots of the AVEs from the respective latent variables (Fornell & Larcker, 1981), except for the dimension efficiency. However, as the disattenuated correlation was less than 1, the discrimination was considered valid. The principal hypothesis of this research was confirmed; exploration and exploitation are positively related to absorptive capacity.

The main limitation of this study is the size of the sample and its delimitation to the state of Tocantins, focusing primarily on its capital, the city of Palmas. However, while an exploratory sample, it means that the sample allowed the research to meet its proposed objectives.

Another limitation refers to the scale used to measure absorptive capacity. As exposed in the methodological part of this research, this scale suffered an adjustment. It is important to note that the original scale was used for a study carried out in companies whose focus was computers and was adapted to this research.

Future applications of the model used in this research could be conducted with companies located in other geographic regions, segmenting the sample, and the analysis of economic activity. Additionally, the level of analysis could involve groups participating in processes of partnerships with suppliers of services.

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