

The development of innovative capacity as a strategic resource in technology-based incubation activities

Innovative capacity as a strategic resource

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Abstract

Purpose – To identify the instruments and organizational mechanisms that provide the development of the innovative capacities of companies that (i) no longer work with technology-based incubators, and (ii) are associated with the community universities of the state of Rio Grande do Sul.

Design/methodology/approach – Empirical research, qualitative approach and descriptive nature, conducted through multiple case studies in 21 companies from IEBTs in the state of Rio Grande do Sul. Data were organized and analyzed through content analysis.

Findings – Results show that the development of IC occurred through behaviors and skills, routines and processes and mechanisms of learning and knowledge governance that support the development of product, process and behavioral dimensions. It became evident that the companies that are emerging from IEBTs need innovation capacity to survive in the market. These innovations are related to product, process and behavioral innovations.

Research limitations/implications – The study cannot be generalized to other segments, since it was restricted to a set of IEBT egress companies, with specific realities and based on the perception of the managers of these companies.

Practical implications – The mechanisms and instruments for the development of innovative capacity can be used by companies from different sectors to make them more competitive before the current economic scenario.

Originality/value – It is justified by the scarcity of studies related to the dynamic capacity component (DC) elements, constituting a theoretical gap regarding the innovative capacity.

Keywords Innovative capacity, Technology-based companies, Emerging economies

Paper type Case study

1. Introduction

Although the importance of innovation has a consensus in the scientific community, it took years to stand out in the studies of economic growth of countries. It was only with Schumpeter (1934) that the theme was considered as a driving factor for the economy, having a determining influence on theories of innovation. For the author, economic development was determined by innovation, which is a dynamic process in which new technologies replaced the previous ones, in a process of creative destruction.

The first studies on dynamic capacity (DC) were introduced by Winter (1964), and since then multiple efforts have been made to develop this concept (Teece, 2009; Wang & Ahmed,

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2007; Zollo & Winter, 2002). However, this theme became more prominent from the 1990s onwards, with the studies of Teece and Pisano (1994); Teece, Pisano and Shuen (1997) and later Eisenhardt and Martin (2000).

The concept of DC represents an evolution of the resource-based view–RBV (Barney, 1991), answering the gaps left by it, such as the fact that this strategy is not sufficient to guarantee a sustainable competitive advantage (Teece & Pisano, 1994), and not enough to explain how some companies respond quickly to changes in the external environment.

Wang and Ahmed (2007) proclaim that DC is the behavior oriented towards integrating, reconfiguring, renewing and recreating resources and capabilities and, most importantly, upgrading and rebuilding key capabilities in response to changing environments, to achieve and sustain competitive advantage. The authors identified in their studies that DC are composed of three elements: adaptive capacity, absorptive capacity and innovative capacity. This study focuses only on innovative capacity (IC), that consists of the company's ability to develop new products and markets by guiding the strategic alignment towards innovation behaviors and processes.

Given that the economic success of organizations is largely due to their ability to innovate (Tidd, Bessant, & Pavitt, 2008), this study aimed to identify the organizational tools and mechanisms that provide the development of innovative capacities of companies that have been technology-based incubators, linked to community universities in the state of Rio Grande do Sul.

The study adheres to the international research agenda, referring to nascent innovations in organizations located in dynamic environments, where the IEBTs are inserted, and within a context of large institutional voids. Brazil is characterized by a dynamic and complex context with institutional gaps. These occur when institutional arrangements do not allow the full functioning of the market leading to innumerable social inequalities, either due to the absence, weakness or non-fulfillment of the role expected of the institutions that constitute the social fabric (Agostini, 2017).

Disarticulation between innovation systems combined with resource constraints eventually impel companies to seek local cost reduction solutions enhanced by responsive learning with the native market. These situations stem from several institutional shortcomings, including a lack of adequate public policies and political and economic contexts. These voids can be filled by different factors: companies; NGOs; community and technology-based businesses, among others (Agostini, 2017).

The accomplishment of our study is justified by the scarcity of studies related to the component elements of the DC (Eisenhardt & Martin, 2000; Meinelles & Camargo, 2014), constituting a theoretical gap regarding the innovative capacity. The work also seeks to contribute to the discussion of how IC is developed in organizations. By identifying which instruments and mechanisms are conducive to the development of IC, the research contributes to the understanding of how the innovation process occurs in companies, since the development of innovation may assist companies in the elaboration or review of their strategies and innovation management policies.

2. Theoretical framework

2.1 *Dynamic capabilities*

DC theory is a relatively recent topic in academia, and it is a theme of great interest to researchers in the area of Administration in various fields of knowledge, such as strategic management, entrepreneurship, marketing, among others (Meinelles & Camargo, 2014).

The original proposal was the one by Winter (1964). Since then, several authors have been trying to develop the concept of DC (Teece, 2009; Wang & Ahmed, 2007; Zollo & Winter, 2002). Teece, Pisano and Shuen (1990) began this attempt by noting that within a company it

is not just a set of resources that matters, as the RBV (Barney, 1991) had predicted, but also the mechanisms by which companies learn to accumulate new skills and capabilities.

Subsequently Teece and Pisano (1994) continued the above mentioned study and stated that DCs were sufficient to explain why some successful companies were able to present possibility of reaction at the right time by innovating products faster and more flexibly using their managerial capabilities to coordinate and redistribute internal and external competencies.

Moving forward in trying to develop a concept Teece, Pisano and Shuen (1997, p. 516) defined DCs as “the firm’s ability to integrate, build, and reconfigure internal and external resources/competences to address and shape rapidly changing business environments”.

Refining the aforementioned studies, Eisenhardt and Martin (2000, p. 1107) conceptualized DC as resource-using business processes, defined as “the organizational and strategic routines by which firms achieve new resources configurations as market emerge, collide, split, evolve and die”.

There are several DC definitions made by the researchers and although there is a link between them, each author highlights some particular aspect. Thus, it is possible to identify two lines of approach: (1) set of organizational skills, behaviors and capabilities (Andreeva & Chaika, 2006; Collis, 1994; Helfat *et al.*, 2007, Mckelvie & Davidson, 2009–1689); Wang and Ahmed, 2007, and (2) set of routines and processes (Dosi, Faillo, & Marengo, 2008, Eisenhardt & Martin, 2000; Teece, 2009; Winter, 2003; Zollo & Winter, 2002).

Wang and Ahmed (2007) were the authors who developed a DC research model, considering the integration of three capacities: absorptive capacity, as the company’s ability to acquire external knowledge, assimilate it with internal knowledge, creating mechanisms to explore this new knowledge; adaptive capacity, which involves a company’s ability to identify and capitalize on emerging market opportunities and adapt in time to changing environment. Finally, the ability to innovate, which reflects the company’s ability to develop new products and markets by guiding strategic alignment to innovation behaviors and processes.

In this study, the option was to focus on innovative capacity, among dynamic capabilities, as a strategic resource in technology-based incubator organizations, which will be explored in the subsequent section.

2.2 Innovative capacity

The ability to innovate is the ability to transform knowledge and ideas into new products, processes and systems to benefit both the company and its stakeholders (Lawson & Samson, 2001). Innovative capacity is considered a key element that drives companies to success (Hult, Hurley, & Knight, 2004), so as much as company growth and profitability, innovative capacity is a key element in determining the performance of a company (Mitrega, Forkmann, Zaefarian, & Henneberg, 2017; Zaefarian, Forkmann, Mitrega, & Henneberg, 2017). It can be inferred that the ability to innovate implies that, on the one hand, efforts to innovate are internal to the company and, on the other, they require information from external sources.

The study by Mitrega, Forkmann, Zaefarian and Henneberg (2017), whose purpose was to analyze how companies use *Networking Capability* (NC) to manage relationships in order to improve performance in product innovation, indicates that only companies with certain internal capabilities can achieve superior performance. From this perspective, the authors recognize the ability to innovate as one of the most important internal resources, without which the acquisition of knowledge through collaborative innovation networks would be of little value, as the company would be unable to use this resource efficiently.

Under the same theoretical lens, but seeking to understand the effect of the ability to end collaborative relationships on innovation capacity as well as on company performance, the

results presented by [Zaefarian, Forkmann, Mitreça and Henneberg \(2017\)](#) point to the potential impact of relational capacity on product innovation.

[Cassol, Zapalai and Cintra \(2017\)](#) show that it is possible to observe a trend of global competition, in which companies seeking to innovate tend to achieve better results. It is believed that the contribution of these studies is based, firstly, on analyzing the antecedents of IC, respectively, network capacity for relationship management and ability to terminate collaborative relationships, as well as suggesting that resources need to be managed effectively to achieve its value creation potential.

In the present study, innovative capacity will be based on the theoretical model of [Wang and Ahmed \(2004\)](#) that considers five dimensions: product innovation, process innovation, market innovation, behavioral innovation and strategic innovation.

[Table 1](#) presents the definition of these typologies.

2.3 Development of innovative capacity mechanisms and instruments

For [Meirelles and Camargo \(2014\)](#), DC are developed through three elements: behaviors and skills for change and innovation; routines and processes of search and innovation; and learning mechanisms and knowledge governance. As this study will deal only with innovative capabilities ([Wang & Ahmed, 2007](#)), these mechanisms will be considered to identify how innovation capacity is developed in the set of companies considered as the object of this study. A brief characterization of these mechanisms and instruments is presented below.

2.3.1 Change and innovation behaviors and skills. In terms of behavior, it is possible to highlight the company's loyalty and the commitment to change. [Andreeva and Chaika \(2006\)](#) understand that people's loyalty to change is related to the normality by which changes are viewed by company employees considering factors such as open communication between managers and employees, allowing dialogue, feedback, and positive attitudes towards change.

Ability refers to the ability to have a regular sequence of coordinated behavior, which must be efficient in relation to its objectives, given the context in which this sequence occurs. The main characteristics of the abilities involve the combination of: (1) pragmatism, with skills involving sequence of steps in which each successively is triggered; (2) tacit knowledge,

Typology	Definition
Product	New discovery and significance of new products to serve the consumer, introduced to the market in a timely manner, and may consist of minor changes in the attributes of products already marketed by the company
Process	Introduction of new production methods, new management approaches and new technologies that could be used to improve production processes. It could be the introduction of new feedstock, or new equipment, or an improvement in procedures
Market	Refers to innovation consistent with market research, advertising, identification of new markets and entry into new markets. These are the approaches that companies adopt to enter and explore the market, identifying new niches to act
Behavioral	It can be observed at three levels: Individual, team and management level. It reflects sustained behavioral change facing innovation. It can be attributed to individuals who are able to change according to their personality. At the team level it is the team's adaptability to change, and at the management level it reflects management's willingness to change and the encouragement of new ways of doing things and willingness to create ideas
Strategic	Defined as the development of new competitive strategies that create value for the company by identifying new external opportunities in order to identify an existing gap between internal resources and the external environment. And the ability of the organization to rethink and strategically change its business

Table 1. Innovation typologies **Source(s):** [Wang and Ahmed \(2004\)](#)

where the actor performing a certain skill is not aware of the details of his/her performance, and knowledge of skills is largely tacit; and (3) choices, mostly automatically selected (Nelson & Winter, 2005).

Andreeva and Chaika (2006) state that the development of nonspecific skills enables employees to act on any kind of organizational change, not necessarily linked to day-to-day operational activities, but also professional skills in communication, negotiation, conflict resolution, leadership, economic analysis, project and people management, organizational knowledge and learning, which may involve: (1) identification and capitalization of market opportunities; (2) development of new strategies, and the ability of how to learn; (3) non-specific skills (Meireles & Camargo, 2014).

2.3.2 Routines and processes of search or innovation. Routines are learned, patterned, and repetitive behaviors, originated in part from tacit knowledge to achieve a goal. If the company does not use routines to adapt to changes in the environment, they do not have DC, but only *ad hoc* problem solutions (Winter, 2003).

According to Nelson and Winter (2005), there are three types of routines: (1) operational routines: necessary to perform basic activities, such as the production of goods and services, that guide the organization's behavior in the short term; (2) investment routines: related to the allocation of capital in the organization and directly impact profitability; and (3) search routines, which refer to evaluations performed in current routines, seeking to modify their aspects and characteristics over time in order to find solutions to problems.

Gerard (2011), in turn, argues that routines are defined as patterns of behavior that repeat themselves and that connect actors in a given context. The author further emphasizes that routines are learned behaviors that can be designed with the work process or can emerge independently as individuals find more effective ways to perform their activities.

Organizational and managerial processes refer to the ways in which things are done in the company, involving the routines or patterns of current practices and learning (Teece, Pisano, & Shuen, 1997).

Processes have all the capabilities needed to turn inputs into desired outcomes, including specifications, technology, tools, procedures, policies, practices and methods. Therefore, business processes play a central role in the permanent renewal of company resources aiming at their success and high performance (Gerard, 2009).

From the perspective of DC studies, both routines and processes support the generation of new ideas, new products and services, as well as the selection and implementation of change (Meireles & Camargo, 2014).

2.3.3 Learning mechanisms and knowledge governance. Learning mechanisms are arrangements and procedures used by organizations in order to collect, analyze, store, disseminate and use information and knowledge necessary for their performance and of their members. The mechanisms allow the continuous renewal of individual and organizational practices that affect results at different levels of the organization (Popper & Lipshitz, 2000).

López, Peón and Ordás (2005) define learning mechanisms and knowledge governance in organizations as a set of procedures for the acquisition, distribution and interpretation of knowledge and the registration of organizational memory.

The creation of organizational mechanisms is part of management tools that contribute to the capacity for organizational change. These mechanisms are: multidisciplinary working groups, committees, delegation of responsibilities and intensified inter-departmental information exchange, and alignment of the compensation system with the capacity-building tasks of change (Andreeva & Chaika, 2006).

From this set of mechanisms and instruments, companies develop innovative capabilities to ensure value creation and competitive advantages for their market positioning, in response to the constant changes that occur in the dynamic environment.

3. Methodology

This study was characterized as an empirical research, with qualitative approach and descriptive nature (Trivinos, 1987 & Flick, 2004). It was performed through multiple case studies (Yin, 2010). It investigated 21 IEBTs exiting organizations, identifying evidences of product, process and behavioral innovation typologies (Wang & Ahmed, 2004) and the organizational mechanisms and instruments (Meirelles & Camargo, 2014) that underpin the development of such typologies.

The selection of companies was based on the following criteria: (1) companies that are emerging from IEBTs, linked to the Community Universities of Rio Grande do Sul; (2) that presented some kind of innovation; (3) that were inserted in a dynamic environment; and (4) who agreed to participate in the research. The acronym INC is used to identify the incubators. The INC 1 is linked to the Northwest Regional University of Rio Grande do Sul–UNIJUI; the INC 2, to the University of Vale do Taquari–UNIVATES; the INC 3, to the University of Passo Fundo–UPF; and the INC 4, to the University of Santa Cruz do Sul–UNISC.

The companies that came from these four technology-based incubators were chosen because they all have to leverage entrepreneurship and innovation in the regions where they operate, playing a relevant role in the local/regional development process.

The study population was represented by a group of 81 companies housed by the incubators described above (incubated and graduated). However, the sample was represented by 47 companies already graduated. In other words, only graduates were chosen because they are already consolidated in the market, as they have already passed through the incubation phase, a period that guaranteed greater maturity and expertise.

Email addresses and telephone numbers of the 47 graduated companies were obtained from the incubators, and after contacting them, were excluded the ones that were in the process of closure and those who declined to participate for reasons not given to us. After the contacts ended, 21 companies remained.

In the first phase of the research, the documentary research technique was used to understand the companies' trajectory, carried out by consulting the websites of the organizations, searches on social networks, magazines and news websites. In the second phase, in-depth interviews were conducted based on a structured script, according to Table 2, configuring as the main data collection technique. It was built from the categories identified in the theoretical foundation called innovation typologies and mechanisms and instruments of development of the IC.

The interviews, previously scheduled, were applied to the 21 entrepreneurs and were conducted within the companies' facilities. They were recorded with the prior authorization of the interviewees in order to ensure the authenticity of the statements, facilitating the transcription and the correct analysis of the data.

For data analysis, we chose the content analysis technique, following the three phases proposed by Bardin (2011): (1) pre-analysis, (2) material exploration and (3) treatment of results, inference and interpretation.

The first phase consisted of transcribing the interviews with the 21 entrepreneurs, these transcripts were made freely, without the aid of any software, which ensured a wealth of details at the time of the analysis. Subsequently, the transcripts and documents were read and during the reading, what was considered important by the researchers for the analysis stage was highlighted. After reading and systematizing all interviews, the frequency and repetitions of words or phrases were verified, and a table was built systematizing all the interviews. Criteria were not established for the selections, they were made in order to identify in the interviewees' statements what types of innovations were developed by the companies, as well as which were the instruments and mechanisms that enabled the IC development.

In the exploration phase of the material, categories were established *a priori*. First, to identify the evidence of innovation typologies and, later, to identify the mechanisms and

Category	Subcategory	Questions
Innovation typologies	<i>Product</i>	<ol style="list-style-type: none"> (1) In the introducing of new products and services, is the company often first in the market? (2) How do customers perceive the products launched by the company? Do they see them as a major innovation compared to those on the market? (3) Compared to competitors, has the company introduced more innovative products and services in the last five years? (4) How do you consider the success rate of products and services launched by the company compared to competitors?
	<i>Process</i>	<ol style="list-style-type: none"> (1) Are we constantly improving our business processes? (2) Are the production methods adopted flexible enough to allow fast changes in layout and systems compared to competitors? (3) Has the company developed new management approaches and models during the last years? (4) When the company cannot solve a problem using conventional methods, does it improvise using new methods?
	<i>Behavioral</i>	<ol style="list-style-type: none"> (1) Do managers support when employees want to try new ways of doing things? (2) Is the company willing to try new ways of doing things, thus seeking new and unusual solutions? (3) Are employees and managers encouraged to think and behave in an original and innovative way? Explain how

(continued)

Table 2.
Questions to identify analysis categories

Table 2.

Category	Subcategory	Questions
Innovative capacity development mechanisms and instruments	<i>Behaviors and skills</i>	(1) Is there any commitment to staff changing standards set in the organization? What aspects deserve to be highlighted regarding this commitment?
		(2) What kind of behaviors and skills guarantee results-based management in this organization?
		(3) Are there any institutionalized procedures for problem solving practices? Which one(s)?
		(4) How does the company identify market opportunities in introducing innovations?
		(5) Is the organization proactive against competitors in introducing innovations? What behaviors and skills characterize this proactivity?
		(6) What types of skills can be highlighted in the company in introducing innovations?
		(7) What types of behaviors can be highlighted in the company when introducing innovations?
		(8) What behaviors should be highlighted in the company that favors the innovative environment in this company?
	<i>Routines and processes</i>	(9) Does the organizational structure favor or hinder the development of innovations in the organization? Help or hinder in what sense?
		(1) What are the critical processes that are crucial for maintaining an innovative environment in the organization?
<i>Learning mechanisms and knowledge governance</i>	(2) What are the main routines you would highlight that ensure the introduction of innovations in the organization?	
	(3) What are the institutionalized norms and techniques that you would highlight that ensure the innovative environment of this organization?	
	(4) What would you highlight as the quality control instruments that guarantee operational stability in the delivery of the final product/service?	
	(5) What are the main strategies that have ensured the introduction of innovations in the organization?	
	(1) How does the company absorb information that is crucial for the business management of the organization?	
	(2) What kind of actions are promoted to qualify the search for knowledge in the organization?	
	(3) Is there any kind of knowledge memory record in the organization? Which one(s)?	
	(4) Is any research done in the organization that enables the development of innovations? How are they developed?	
	(5) Are there mechanisms for the dissemination and exchange of internal information? Which one(s)?	
	(6) How does the company encourage the internal innovation process?	

Source(s): Developed by the authors (2017)

instruments of development of innovation typologies. In the last phase, the data were treated from interpretations and inferences according to the defined categories and pre-categories, in the light of the theoretical framework that guided the present study. The triangulation of data technique was used, aiming to analyze a theme based on different points of view in order to achieve more consistent theoretical and empirical contributions.

Next, we present the theoretical model of the analysis (see Figure 1).

4. Presentation and analysis of results

4.1 Product innovations

We present in Table 3 a systematization of the product innovation typology, based on the evidence found, as well as the mechanisms and instruments that support the development of this typology.

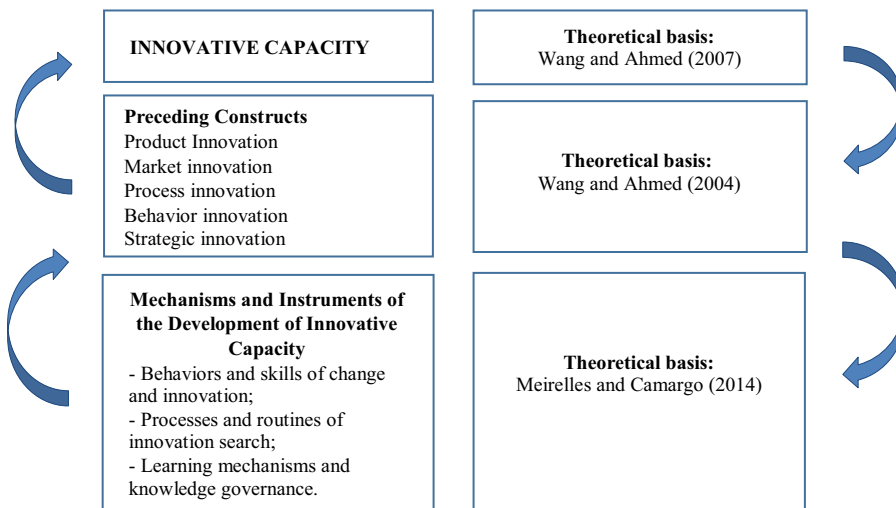
It can be inferred that most of the investigated companies present significant innovations that allow them to reach prominent positions, ranking the first places in the market considering the introduction of innovations. These product innovations took place at both the radical and incremental levels. Most companies have product innovations at the incremental level, as excerpted from the interview below:

The collagen, it had already appeared in candies, in a cereal bar, but with low grammage. Within a functional gluten-free line there wasn't one with two grams of collagen, *it was a new product* (EBTG9).

However, some companies have radical innovations, bringing totally innovative products to the market, most of them based on market demand:

In the case of home automation, we were the first, today there are other companies that work with it too, but we were pioneers (EBTG5).

Wang and Ahmed (2004) assert that product innovation is more frequent with regard to perceived novelties. In this sense, it was found that consumers notice the products launched



Source(s): Developed by the authors based on Wang and Ahmed (2004), Wang and Ahmed (2007), Meirelles and Camargo (2014)

Figure 1.
Theoretical model for the analysis of innovative capabilities in IEBT

Table 3.
Product innovations
and the mechanisms
and instruments that
underpin their
development

Mechanisms and instruments of the development of innovative product capacity			
Typology	Evidences		
Product	Evidences		
Behaviors and skills	Routines and processes		
Learning mechanisms and knowledge governance			
(1) Development triple transom cart	(1) Creative ability	(1) Routine of observing the market	(1) Participation at fairs
(2) Development of for unit, chairbarrel and wall bar-creation of system for filtration and registration of resumes	(2) Pro activity in innovating	(2) Routine of seeking new technologies	(2) Investment in courses and training
(3) Development of the app for fair expojuii/Fenadi	(3) Agility to innovate	(3) Routines of research	(3) Competitor monitoring
(4) Development of home automation system	(4) Market orientation	(4) Product differentiation process	(4) Monitoring of market trends
(5) Development of the project facilitated trade, creative barrel and pet home	(5) Ability to leverage <i>feedbacks</i> from customers/employees	(5) Information Search routine	(5) Technical visits to suppliers and competitors
(6) Development of egg disinfection system by ozone technology	(6) Ability to identify market opportunities		
(7) Development of concealed customer with <i>competitive benchmarking</i>	(7) Flexibility		
(8) Development of collagen bar and mug cake without gluten and lactose			
(9) Development of <i>webservice</i> climate; development of split lifter and amarok step protector; development of the Brazilian Industry 4.0 model			
(10) Development of <i>spores</i> and lactic acid bacteria for dairy products			
(11) Development of level indication device, seed sensors / grain counting, planting monitor and planter controller			
(12) Development of <i>data replication software</i> for form automation and the app my residue			
(13) Development of the tennis competition management system			

Source(s): Research data (2017)

by companies as something that adds value to them and solves their problems. Below, we show an excerpt from the interview that confirms customers' perceptions of products launched by companies:

Do they see us as a company that is always generating something different, or do they come to us to say what we think about it, because they know that we are always trying to create a differentiation in some product or solution (EBTG18).

Product innovation can also be characterized by the ability of companies to introduce products or services faster than their competitors, enabling the company to stay ahead in the market (Wang and Ahmed, 2004). When asked if in the last five years the company has introduced more innovative products or services than its competitors, some companies said yes, as evidenced by the following report:

Yes, our metallurgical company is focused on that. Even the most traditional service has processes that are differentiated, are improved. We always try to do differently (EBTG11).

Therefore, in accordance with the product innovation capacity of the investigated companies, it can be inferred that they present radical and incremental innovations regarding their products or services. Customers notice them as innovative companies that solve their demands and add value to their company through their innovative solutions, which results in greater assertiveness of the products launched, as they are based on their customers' needs and market demand.

From the perspective of the mechanisms and instruments of development of the product innovation capacity of the companies, the most impacting behaviors and skills were: *the creative ability*, which helps companies to develop innovations, and considers as the organization's ability to create new products and the *team expertise* to act creatively (Camargo, 2012).

Thus, it was identified that the companies studied have creative skills that help them in the development of product innovation.

The main ability is creativity. We reach the clients, get what they want and go back inside the agency to perform a brainstorm session to find out the clients' needs (EBTG6).

The *market orientation skill* assists companies in the process of introducing products developed according to customer needs, ensuring greater assertiveness of launched products. The market orientation ability was a very evident mechanism in the set of companies investigated, as reported below:

Through our customers' needs, most of our products are designed and developed on demand, according to their needs (EBTG21).

The *ability to take advantage of customer and employee feedbacks* was highlighted in all companies. They use this tool with the intention of improving their products or services, according to the opinion and ideas of their customers and employees. The companies investigated have this ability, as can be ratified in the following statement:

Many of our clients talk about the problem and don't know how to solve it, and from there we have an insight to generate something new. We hear a lot from people, customers, the team, because that's where we get a lot of ideas (EBTG4).

Also noteworthy is the flexibility, considered a key element in the companies studied, as it provides conditions for organizations to respond to the incessant changes that occur in the organizational environment (Piore & Sabel, 1984). Flexibility in the face of change is an important factor for companies' ability to change and adapt, according to the testimony obtained:

If the direction has changed, we change, we go on. Flexibility ends up being our differential, we change very fast, if it doesn't work out, we adapt quickly (EBTG4).

In the field of routines and processes, the highlights are the *research routines*, very present in the dynamics of these companies. The constant practice of research activities has allowed these organizations to discover new possibilities of materials and trends in the field.

I think it's referential research. Before starting any project, we do some research, not just based on what we have already done. The first thing is to research new things (EBTG12).

The *product differentiation process* enables companies to stay alive as they seek to market products or services with some differentiation from existing ones, ensuring a unique positioning.

Our customers realize that we are an innovative company in the market that can bring different solutions from our competitors'. This makes us win the preference of our customers. Being different and being recognized as a different company that will possibly bring an innovation to the process or product (EBTG13).

Also noteworthy is the *information search routine*. This search is operationalized through conversations with businessmen, customers and sales representatives, as well as connections with incubators, participation in fairs and industry events.

We are always meeting new people, expanding our network of contacts. These relationships are an important source of information for the development of new products, in addition to monitoring consumer trends. Participation in fairs and events and constant contact with partners (EBTG9).

Also, the routine of observing the market is of great relevance for maintaining the competitiveness of the investigated organizations. Companies can target their actions in a more assertive way, reducing uncertainties and qualifying the decision-making process.

We are always connected to the market, watching what is happening and based on customer needs. This need comes into the company and here in the engineering and P&D group, we talk a lot, exchange ideas and from that comes some solution for the customer (EBTG13).

With regard to learning mechanisms and knowledge governance, we highlight the participation in fairs as a strategy for absorbing market information, competitors, suppliers and new technologies that are useful for the development of new products or services.

Within our ability we participated in *fairs*, evidenced many things out there and brought into the company, what we observed, what we understand as an opportunity, together with the team (EBTG9).

The *investments in training*, that contribute to the qualification of technical teams, help companies to achieve better performance in the market. Winter (2003) is one of the advocates of the need for investment in learning to ensure that the organization owns DC.

We have invested good value in courses, lectures, postgraduate studies, visits to other companies that are suppliers, and others that are our competitors for learning (EBTG13).

The *competitive monitoring* also appears as another widely used mechanism by companies. According to Maróstica, Maróstica and Branco (2014), the use of a competitive monitoring system allows executives to analyze and evaluate information, being a critical success factor.

Yes, we always watch what they are doing, how and why they are doing it, and what we can do better or different (EBTG3).

The *technical visits to competitors and suppliers* assist companies in their search for new technologies being developed and news that suppliers have to offer. This mechanism favors

the process of acquiring external knowledge in the investigated companies and promotes the development of product innovations.

We visited other companies that are our suppliers, and others that are our competitors for learning (EBTG13).

4.2 Process innovations

The companies presented a series of process innovations described in Table 4, as well as the mechanisms and instruments that support the development of this typology.

With regard to constant process improvements, companies point out that they are constantly improving their processes, making use of consultancies and courses that help them in the management and standardization of processes. Below we present a comment that highlights this concern:

Yes, we constantly seek to verify what is working and what is not, especially what is showing results in terms of sales, how we are working, we are always adapting (EBTG14).

Typology	Evidences	Mechanisms and instruments of the development of innovative process capacity			
		Behaviors and skills	Routines and processes	Learning mechanisms and knowledge governance	
Process	<ol style="list-style-type: none"> (1) Use of technical support (2) Commercial sector outsourcing (3) Institutionalization of horizontal management (4) Entrepreneur training regarding management (5) Innovation as distribution and presentation of the product (6) Use of project management tools (7) Adoption of CAD 3D digital prototyping tools (8) Adoption of software for management and mapping processes (9) Partnerships with specialized companies (10) Hiring skilled people 	<ol style="list-style-type: none"> (1) Flexibility in production methods (2) Ability to create new approaches and management models (3) Ability to introduce new methods (4) Technological capacity 	<ol style="list-style-type: none"> (1) Continuous improvement process (2) Project presentation in AutoCAD 3D (3) Informal groups for problem-solving (4) Quality control routines (5) Horizontal organizational structure routine 	<ol style="list-style-type: none"> (1) Documentation and knowledge storage (2) Knowledge management practices (3) Information exchange between departments (4) Assistance of technical support 	

Source(s): Research data (2017)

Table 4. Product innovations and the mechanisms and instruments that underpin their development

With respect to the befitting aspect of using new technologies, companies use internet tools, CAD 3D digital prototyping tools and *software* for enterprise management and process mapping.

We work a lot with processes, we have many tools on the internet that help us to organize. *Trello* is one of the programs we use that allows us to organize processes, *Runrun.it* is one of the activities we use, *Google Docs* and *Calendar*, the tools of Google are very good, because you can update in real time, we create the processes and try to execute them (EBTG3).

As for production methods, companies claim to be flexible, enabling rapid change to reduce costs, increase productivity and meet customer demands:

Yes, we are flexible because it is a lean structure, not plastered or very standardized (EBTG1).

Regarding the new approaches and management models, companies have outsourced the sales and prospecting sector, have horizontal management, managers seek improvement and innovate in the distribution and presentation of the product:

Outsourcing to the commercial sector was a new approach taken by the company. We decided to outsource, let's try what it is like to have a call center and have the resellers there selling it for you. Today the call center that makes the contact, is the responsible to increase the number of customers (EBTG10).

Regarding the use of new problem-solving methods, managers responded that they use partnerships with other companies to produce something that the company cannot with its own production abilities, the use of new technology, research and even the search for qualified people to train staff or bring them into the company are identified problem solving methods, ratified in the comment below:

Usually we seek qualified people in the market that we do not have inside the company, we take this professional into our company to train and train our team or we use it as a partner (BTG13).

It can be inferred that the companies investigated have a process innovation capacity with regard to the use of new technologies and development of new management approaches. Its production methods are flexible which ensures a dynamic process can be changed whenever necessary, improvising new methods for problem solving when they appear.

With respect to change and innovation behaviors and skills, *flexibility appears in production methods*, which enables companies to adapt their processes in order to suit them to their customers' demands. Your products or services can be customized and changed according to the request of customers.

Yes, we are flexible, we just need to want to change and that will be a big advantage of ours. Even because we are small, this flexibility in the process, the way we work is our strong point (EBTG4).

The ability to introduce new methods is operationalized by hiring skilled people or partnering with other companies. Organizations introduce new methods to improve production and management processes. This ability is essential to the organization's global innovation capacity (Wang & Ahmed, 2004):

Yes, we have partner companies, some processes we cannot do internally, so we outsource, if there are any items that we cannot attend, we forward to these partners (Excerpt from the interview of EBTG1).

The *technological capability* is operationalized through the internal effort of these companies to master or adapt existing technologies in order to meet market demands. From the perspective of De Mori, Batalha and Alfranca (2014), technological capacity is an important

factor in determining the efficiency and effectiveness of production processes and the innovativeness of companies:

Our products, some are innovative, perhaps much more nationally. You can say that we create solutions that are certainly out there, but at a national level it is an innovation (Excerpt from the EBTG10 interview).

From the perspective of the search and innovation routines and processes, the *continuous improvement process* was highlighted, being a constant concern in all companies. Cost reduction strategies, customer satisfaction and production process optimization are actions present in the operational dynamics of these organizations.

It has to be part of the routine too, ask yourself what you are doing, what if I did it differently? Permanent question and constant search for improvement in anything we are doing (EBTG4).

For problem solving, companies make use of the practice of *informal groups*. Pre-defined meetings are used to anticipate potential issues, improve the work environment, and discuss ideas for improving company products or processes.

To ensure stability in delivering the final product to the customer, companies practice *quality control routines* ensuring that the product is delivered to the customer in perfect condition. Companies use testing and checklists procedures, creating templates for production processes and waiting for customer approval to begin the manufacturing process.

We make work memorials, every work has a memorial, which is like a *checklist* to be followed and which at the end of the work we check. The supervisor works together with someone responsible for the contracting company (EBTG5).

The *lean and horizontal organizational structure routine* favors the development of innovations, providing an innovative environment that encourages the emergence of new ideas while favoring the development of process innovations.

It has no structure, there are only four people. So, it makes it easier, so big companies are looking to be like small ones to be flexible. Everyone interacts together, and that is a strong point (EBTG2).

Regarding learning mechanisms and knowledge governance, the *knowledge management practices* are highlighted. The fundamental role of knowledge management is to transform individual knowledge into collective knowledge. Such practices are consistent with the dissemination of knowledge, which ensures the incorporation of internal knowledge (Correia & Sarmiento, 2003).

When a *designer* takes a course outside, after he comes back, he presents it to all colleagues, we do a presentation morning, then it is saved for future researchers (EBTG16).

To ensure the memory of organizational knowledge, the investigated companies use the mechanism of *knowledge documentation and storage*. All acquired knowledge is stored on the company's servers, in softwares available to record the knowledge, and the daily activities are recorded by the team.

Activities are logged in a module called Wiki. A simple HTML editor where we record our knowledge. Employees can store knowledge of all internal processes within the *Redmine software*, minimizing negative impacts with one employee leaving and facilitating the reception of new ones (EBTG19).

The *technical support aid mechanism* is used by companies to absorb information from the external environment that is critical to business management. By hiring consultants, companies seek to improve their processes or implement new ones.

I always have consultations with Sebrae, Peiex, when one ends, then I start another, most of the time they are free. Since joining I have always had consultancy (EBTG7).

4.3 Behavioral innovations

Behavioral innovation is related to the adaptability of the company to change, forming a synergy based fundamentally on a dynamic interaction relationship of the working groups (Wang & Ahmed, 2007). The evidences of this typology and the mechanisms and instruments that support its development are described in Table 5.

The analysis of behavioral innovation typology indicates that most of the companies investigated have an innovative culture, openness to new ideas and new ways of doing things, which fosters the development of innovations and provides greater efficiency and productivity, as well as reduced operating costs. The comment below ratifies such statement:

Yes, of course, we guide them when they have an idea, think about what benefit it will bring, either to the user or to the company. Think about how we will perform and what it will benefit. We try to urge them to go further, not just to bring up the idea. (EBTG18).

In this typology of innovation, the behaviors and skills of change and innovation that stood out were the commitment to change. This behavior reflects the teams and managers who are always engaged and imbued in the search for improvement in daily tasks and in the qualification processes of products and services. This can be confirmed in the report below:

I can't resist change, because if I do, I don't make the business work. There has to be this question that today is good, but tomorrow may not be (EBTG3).

Also noteworthy is the *organizational culture for innovation*, which consists of a very present skill in companies, operationalized through the incentive that managers provide to teams, in order to stimulate creativity and the emergence of new ideas, favoring the development of innovations. Wang & Ahmed (2004) have stated that the innovation-oriented organizational culture acts as a catalyst for innovations, a fact evidenced in the following statement:

Typology	Evidences	Mechanisms and instruments of the development of innovative behavioral capacity		
		Behaviors and skills	Routines and processes	Learning mechanisms and knowledge governance
Behavioral	(1) Innovation oriented culture (2) Openness to new ideas and ways of doing things (3) Encouraging staff to come up with ideas and propose solutions (4) Horizontal structure for integration and problem solving	(1) Attitude towards doing things differently (2) Commitment to change (3) Organizational culture for innovation (4) Freedom and openness provided to the employees (5) Ability to solve problems	(1) Open communication process between managers and employees (2) Pleasant work environment or innovative environment	(1) Rewards system to motivate new ideas (2) Exchange of experiences between entrepreneurs

Table 5. Behavioral innovation and mechanisms and instruments that underpin its development

Source(s): Research data (2017)

The company has a collaborator, and is *encouraged by us to come up with ideas and create* new things. And if he innovates, is rewarded, has complete freedom to do things. Innovation is part of our culture (EBTG2).

The *freedom and openness afforded to the employee* is a behavior that encourages the process of internal innovation, favoring an innovative environment in these companies. Managers give staff freedom to decide how to perform their tasks, flexible hours if necessary, internet access for research, and openness to contribute ideas. This behavior is evidenced in the following comment:

We give them the freedom to decide how to do it as long as the result is achieved. I show how I can do it, but if you want to do it differently, that's up to you, you have all the freedom, but the end result has to be this (EBTG11).

In the field of search and innovation routines and processes, we highlight the *open communication process between managers and employees*, which generates greater commitment to the team and stimulates the exchange of information; and the *pleasant work environment or innovative climate*, which guarantees a welcoming environment and stimulates the innovation development process. It is possible to verify that there is interaction between managers and their team, seeking opinions and feedbacks.

I think it's friendship, this cozy atmosphere we have inside makes us able to innovate and make anything work, and if you don't have that well-being among people, you can't do anything (EBTG16).

Finally, the most prominent learning mechanisms and knowledge governance concern the reward system for motivating new ideas, which awards employees with financial bonuses and tourism travel.

We have an internal award that every month we give a prize for the best work, the best innovation. This is the system we use so that we always have new things (EBTG16).

Another important mechanism in this process is the exchange of information among entrepreneurs, which appears as a practice used by companies to improve existing knowledge as well as acquire new ones. This engine is a powerful source of knowledge acquisition that assists companies in developing innovations.

We have a group, the entrepreneur, a group of various architects, we meet every 20 days, we have meetings to see what we need, like a chat (EBTG12).

5. Concluding remarks

Innovation development is a determining factor for companies that want to remain competitive in dynamic and turbulent environments. In this sense, investigating how companies develop and sustain their innovative capabilities is a relevant task in the academic and professional world.

Given the results presented herein, it was possible to understand the process of developing the innovative capacity of the companies studied, and this development occurred through behaviors and skills, routines and processes and mechanisms of learning and knowledge governance that underpin the development of the product, process and behavioral dimensions.

This research has shown that companies that are emerging from technology incubators need innovation capacity to survive in the market. These innovations are fundamentally related to product, process and behavioral innovations, typical of these types of companies. Certainly, by size, small businesses, and the type of products they develop, the typologies of market and strategic innovation have not been identified.

If, on the one hand, the absence of evidence of these two other typologies presents itself as a limitation of the study, on the other hand, it leaves a gap for the continuity of the studies, i.e. to investigate why in this type of segment these other innovation typologies are not present.

This study brings an important academic contribution, cooperating with the theoretical field by bringing the DC under the focus of one of its component elements, the innovative capacity. It also contributes to expose how companies that are emerging from IEBTs develop their IC. With respect to managerial contributions, this research shows that studying the development of IC is important for the organizational success of EBT, as well as any organization that wants to remain competitive in the market. By knowing the mechanisms and instruments for the development of IC, managers and other organizational actors can apply them to their organizations in order to make them more competitive.

Considering the limitations of the study, we point out the fact that it cannot be generalized to other segments, since it was restricted to a set of companies that are emerging from IEBTs, with specific realities and based on the perception of the managers of these companies. Therefore, the conclusions are restricted to the perceptions of these managers only.

As a suggestion for future studies, it is recommended to consider the other components of DC, such as: absorptive and adaptive capacity. Other studies could include other audiences, such as customers, employees, suppliers, incubator coordinators, which could contribute to enrich and expand the study results.

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