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DOES THE INCUBATION PROCESS ASSIST ADAPTIVE, ABSORPTIVE AND INNOVATIVE CAPACITY DEVELOPMENT? MULTIPLE CASES STUDIES IN THE TRIÂNGULO MINEIRO AND ALTO PARANAÍBA REGION

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Abstract

Purpose: This article aimed to analyze the role of business incubators in the region of Triângulo Mineiro and Alto Paranaíba-MG, with incubated small business in support them to access resources and capabilities to develop adaptive, absorptive and innovative capabilities, based on dynamic capabilities hierarchy (Wang & Ahmed, 2007).

Design/Methodology: To achieve this goal, we did a qualitative and descriptive research with multiple case studies in 3 incubators and 23 incubated small companies.

Originality/Relevance: Information, strategies, technologies and resources do not necessarily contribute to the generation of competitive advantage of small business. In this sense, the support of technology-based business incubators should assist incubated small companies to create competitive advantages and stimulate their growth. As the government, according to ANPROTEC (2017), funds most incubators, accelerators and technological parks directly or indirectly the validation of the results and effectiveness of such investments is important, in promoting the innovation culture, job creation and the income that new businesses offer to society

Findings: The results indicate the development of adaptive, absorptive and innovate capacities based in the promotion of an environment of innovation, knowledge and of experience of incubators managers and consultants (monitoring/mentoring), promoting networking to achieve information, knowledge and opportunities, and positive image of incubators.

Theoretical/methodological Contributions: These findings contribute to the advancement of studies on the importance of inter-organizational relations as propelling the development of dynamic capabilities, as well as in the discussion of the results of the actions of the incubators. It is suggested, therefore, that ANPROTEC could consider incorporating this theoretical approach in its **CERNE** method to create performance indicators of adaptive, absorptive and innovative capabilities developed from processes and practices adopted by incubators.

Keywords: Dynamic Capabilities. Business Incubator. Entrepreneurship.

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1 INTRODUCTION

Once companies operate in competitive environments, they are expected to be adaptable, flexible and constantly improving the ways in which they operate, and also their products, services and structure (Teece; Peteraf & Leih, 2016). According to data from the Global Entrepreneurship Monitor (GEM) survey on business mortality, conducted by SEBRAE[3] (2017), 41.6% of small and micro-enterprises closed in Brazil before completing 2 years of activity. In this context, and according to data from the National Business Incubation Association, in Brazil we note the offer of structures that aim to provide support and assistance to business activity – the same way it happens in other countries in greater or lesser degree. Among these entrepreneurial endorsing structures, we have business incubators, technological parks, and seed accelerators, which offer several services and assistance to the companies served (Maciel et al, 2014).

As reported by a study conducted by Anprotec[4] (2012) in association with the Ministry of Science and Technology, Brazil possessed 384 incubators operating, hosting more than 2640 companies, and with the with a forecast of revenue of over R$500 million collected in taxes, and generation of 16,394 direct jobs. Through incubators, 2,509 projects have been graduated, generating R$ 4.1 billion and employing 29,205 people in different segments: technology (40%), mixed (18%), traditional (18%), cultural (2%), social (7%), agro industrial (7%), and services (8%).

Customarily, companies that seek incubators are characterized by acting upon and/or owning innovative products or products which use technology. Enterprises supported by incubators usually receive support since the planning stage up to the consolidation of their activities (Sebrae, 2017). The incubated companies tend to have better results and to be better prepared for their insertion in the market (Raupp & Beuren, 2007).

Taking into account the precepts of the dynamic capabilities approach, we may argue that success in obtaining competitive differentials is linked to the capacity and ability of the company to adapt, configure and reconfigure its various resources to the needs, dynamics and influence of the market in which it is inserted (Teece; Pisano & Shuen, 1997; Ambrosini & Bowman, 2009; Teece et al, 2016; Teece, 2017). These

[3] Serviço Brasileiro de Apoio à Micro e Pequena Empresa - *Brazilian Micro and Small Business Support Service*
[4] Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores - *National Association of Entities that Promote Innovating Enterprises*

capabilities can be developed in three dimensions of approach and configuration – adaptive, absorptive, and innovative. Adaptive capacity allows the company to respond to external opportunities; absorptive capacity is focused on organizational learning and internalization of knowledge; innovative capacity holds innovative behaviors and processes that enable the exploration of new markets (Wang & Ahmed, 2007).

In light of what has been mentioned heretofore, the objective of this research was to analyze the performance of business incubators in the Triângulo Mineiro and Alto Paranaíba (MG) region, regarding the support offered for the development of the adaptive, absorptive and innovative capacities of incubated companies, thus contributing to the development of their competitive advantages.

The approach of Dynamic Capabilities has contributed to different themes and research orientations as an option that privileges the analysis of organizational dynamics in the face of rapidly changing environments (Peteraf, Di Stefano & Verona, 2008; Camargo & Meireles, 2014; Takahashi, Bulgacov, Semprebon & Giacomini, 2016; Alves, Barbieux, Reichert, Tello-Gamarra & Zawislak, 2017). Among the different themes studied using this approach, Takahashi, Rosa, and Bulgacov (2019) point out interorganizational relations as one of the emerging matters, though it still encompasses few studies and requires more research.

Specifically on absorptive capacity, Schmidt (2010) calls attention to the need to understand the different sources of intra and interorganizational knowledge (of other organizations and of scientific knowledge) for the formation of different types of capacities. And according to Cassol, Cintra, Ruas, and Oldoni (2016), even with the increase of research on dynamic capabilities few are about small and medium enterprises. Andino (2005) and Tondolo, Tondolo, Puffal and Bitencourt (2015) remarked that there is a gap regarding the use of this approach to analyze, more particularly, the interorganizational relationship between incubators and incubated companies – few papers on this matter exist.

Therefore, this research endeavored to contribute to the theoretical advancement of the dynamic capabilities approach, discussing the importance of interorganizational relationships in the development of adaptive, absorptive, and innovative capacities. More specifically, it aimed at investigating how this occurs in the relationship between incubators and incubated companies, reflecting much more on the role of the incubator as a transforming agent than as a space with certain resources. In terms of practical contributions, the results help in the evaluation and

implementation of strategic and managerial practices of the incubators and in the reflection on their actions, results and impacts.

At first glance, the support offered by business incubators, notably the technology-based ones, is provided through structural, managerial and technological support, and in the direction of strengthening and stimulating the generation of competitive advantages in the incubated companies (Andino, 2005; Raupp, 2012; Maciel et al, 2014). However, the results of this research indicate aspects that transcend such operational support. As the government, according to Anprotec (2017), funds most incubators, accelerators and technological parks directly or indirectly another contribution is the validation of the results and effectiveness of such investments, in promoting the innovation culture, job creation and the income that new businesses offer to society.

This article has been divided into five sections. The first one is the present introduction, then the theoretical background composed of five topics is presented. After that the methodological procedures are exposed, after which come the analysis and subsequent discussion of the results. Finally, the last section brings the closing remarks.

2 THE THEORY OF DYNAMIC CAPABILITIES: ORIGINS AND ASSUMPTIONS

The dynamic capabilities approach backs the construction of a competitive advantage over resource stock possession, as well as it advocates the Resource Based View (RBV), along with the ability to accumulate, configure and reconfigure these resources before the uncertain and constantly changing external environment (Teece et al 1997; Ambrosini & Bowman, 2009; Teece et al, 2016). Thus, successful companies in the market are those capable of presenting rapid responses and innovative products for the needs of such market, and the ones which, beyond that, are capable of coordinating and reconfiguring internal and external competencies (Teece; Pisano & Shuen, 1997; Teece et al, 2016; Teece, 2017). These competencies are understood elements consisting of external and internal antecedents that, together with specific processes that affect the resources and organizational capacities, promote the competitive advantage of organizations (Zollo & Winter, 2002; Tondolo & Bitencourt, 2014).

From the studies of Teece (2007; 2009), it is possible to identify the micro fundamentals of the dynamic capabilities through the practices and routines related to

the identification of opportunities (sensing), capacity to take advantage of these opportunities (seizing) and ability to reconfigure resources from previous capabilities (reconfiguring). According to Wang and Ahmed (2007), dynamic capabilities are characterized by the behavioral orientation of a company to act in the integration, renewal, reconfiguration and re-creation of its resources and capacities, besides updating and reconfiguring its essential capacities in opposition to changes in the environment, seeking the conquest or even maintenance of competitive advantage. The current construction of the theoretical field of dynamic capabilities provides a variety of approaches and postulates about the constituent elements of accumulation, configuration and reconfiguration of tangible and intangible resources to achieve competitive advantage (Teece & Pisano, 1994; Teece et al, 1997; Helfat & Peteraf, 2009; Ambrosini & Bowman, 2009; Takahashi et al, 2019).

In order to better understand how the relations between the role of the incubator and the development of dynamic capabilities in incubated enterprises is constituted, the discussion in the following topic tackles how capacities can be classified hierarchically.

2.1 Dynamic Capabilities Levels and Hierarchy

Some authors suggest the structuring, or hierarchical division of capacities, using different criteria and dimensions. Teece (2012), for instance, advocates that dynamic capabilities are superior competencies that determine the ability to integrate, build and reconfigure resources, internal and external competencies to meet the demands of rapidly changing business environments. Moreover, there are the operational (or ordinary) capacities, which assist in the creation and maintenance of the structure and processes for the current products and services (Teece et al, 2016; Teece, 2017; Alves; Barbieux; Reichert; Tello-Gamarra & Zawislak, 2017).

Wang and Ahmed (2007), on a different perspective, adopt the four-level classification related to Dynamic Capabilities, composed of zero level, first order, second order and the level of dynamic capabilities. Zero level capabilities relate to the various resources available, both tangible and intangible, such as technologies, brands, location, among others, and may have attributes of heterogeneity, immobility, rarity, imperfect imitability and irreplaceability (Barney, 1991), which can eventually produce a competitive advantage. First order capacities are characterized by the company's ability to take advantage of all zero level resources and their applicability in

order to achieve their objectives, and can be set as competitive advantage. The second order – also called essential capacities – is the set of capacities that are configured as bundles of resources and capabilities that are strategically important to the company and are capable of producing competitive advantage thich is often temporary. Lastly, third-level capacities would be the Dynamic Capabilities: a group of capabilities that dynamically influence the other three levels, with strategic orientation, acting in response to internal and external factors.

Dynamic Capabilities are defined as adaptive, absorptive and innovative in their nature. They act on the renewal, reconfiguration, acquisition and integration of the organization's set of resources, usage capabilities and second-order capability sets. Moreover, they influence their own configuration as dynamic capabilities (Wang & Ahmed, 2007). Figure 1 presents the synthesis of the hierarchy of capacities:

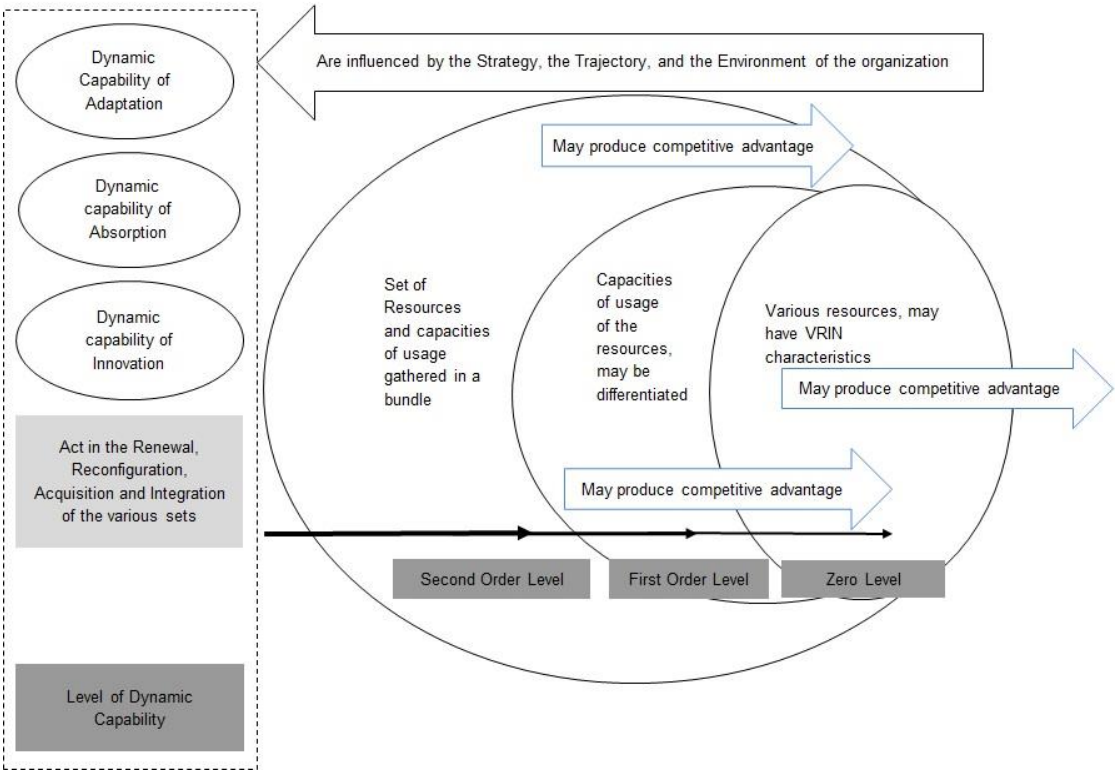

Figure 1: The operation levels of Dynamic Capabilities
Source: Made by the authors based on Wang and Ahmed (2007, p. 39).

At the level of dynamic capacities, Wang and Ahmed (2007) typify adaptive capacity as the ability of adapting in order to respond to external opportunities, associated to market monitoring competence and speed of response to change. According to Muniz, Freitas and Lesca (2007), organizations must be prepared and organized in advance so as to enable the generation of results in changing

environments. For this to happen, knowing the environment and dealing with its level of uncertainty is paramount; organizations must also be attentive to ongoing changes and be able to respond proactively.

Absorptive capacity rests on the ability to recognize the value of new information and use it in the organization that is based on organizational learning skills and knowledge internalization (Wang & Ahmed, 2007). As stated by Cohen and Levinthal (1990), precursors in the study of absorptive capacity, the basis for innovation processes is the absorptive capacity that is influenced by i) the degree of knowledge of the organization; ii) the effort made in the search for contents and sources of information; iii) the set of investments made and the performance of the individuals that compose it. Furthermore, for Moré, Vargas and Gonçalo (2014), in an interface approach of internal and external environments, the absorptive capacity is considered as constituted by the knowledge derived from the processes that involve exploration, retention and exploitation, and by the different capacities (absorptive, transformative, connective, innovative and disruptive).

In addition, innovative capacity is based on innovative behaviors and processes and the premise that a strategic orientation helps to develop new products and services or allows the exploration of new markets (Wang & Ahmed, 2007). Burlamaqui and Proença (2003) declare that if on the one hand the innovation process contributes to the constant changes in market fundamentals – such as reconfiguration, renewal or extinction of segments –, on the other, the implantation of innovative processes is not a trivial operation, once it requires processes and the existence of funding resources. Generation of competitive advantage based on innovation and technology will be sustainable in proportion to its difficulty to be replicated by the organization and/or competitors. As the difficulty to identify the elements of sustaining the competitive advantage increases, the more difficult it gets to replicate it, and the greater becomes its aptitude to sustain a competitive advantage on a permanent basis.

With the sake of analyzing how this hierarchy of capacities is structured and whether it is possible to develop the capacities of incubated companies at the level of dynamic capabilities, it is imperative to understand how the incubators work. More specifically, one must understand how technology-based incubators function. These are the subjects of the two topics that come hereafter.

2.2 Business incubators

Concerning the provision of favorable conditions for the implementation of new businesses and enterprises, business incubators, accelerators and technological parks offer various services and support to the companies served. This is done either by providing physical infrastructure, logistics and communication, access to laboratories and technologies, or by providing managerial qualification, stimulating the creation of connections and networks of contacts (Raupp & Beuren, 2011; Godeiro; Dantas; Silva & Celestino, 2018). Incubators, the focal point of this study, are entities that promote entrepreneurship and innovation with the provision of physical and technological structures, and services that aim to contribute to the improvement of processes and products, production and productivity (Reis; Palma & Crespo, 2012; Maciel et al, 2014). One of its basic premises is the provision of a low-cost structure for incubated entrepreneurs. The intention is to provide access to academic research, resources and development agencies, administrative and legal training, networking, partnerships, physical structure and resources (Ribeiro and Plonski & Ortega, 2015, Silva et al, 2016). Therefore, they function as catalysts of technological assets, mediating the knowledge produced in the partner institutions (Reis, Palma & Crespo, 2012).

As found by Sebrae (2017), these companies can be classified as technology-based incubators, traditional or mixed sector incubators, agribusiness enterprise incubators, cooperative incubators, cultural incubators, design incubators and social incubators. This varies according to their specialty, focus of action, available resources and partnership networks. In terms of location, most of them are located in universities and research institutes (Anprotec; 2012; Godeiro; Dantas; Silva & Celestino, 2018), whereas most of the entities that support, manage or structure incubators, accelerators and technological parks are linked to the public sector or public and private educational institutions (Anprotec, 2017). To achieve their goals, incubators can offer companies an initial incubation time of six months, and a two-year residency, with the possibility of expansion for up to three years, depending on the incubator. There is likelihood that incubators charge monthly fees, participation in results or the promotion of activities (Ribeiro, Plonski & Ortega, 2015). The stage of development of the incubated companies starts with the process of selecting the business plan, then followed by the

phases of implantation, development, growth and, lastly, the graduation of the incubated company, according to Raupp and Beuren (2011).

When it comes to incubators in the state of Minas Gerais, more specific data has also been gathered. According to data from NTG[5] of the Federal University of Viçosa (UFV), the state of Minas Gerais has an innovation habitat, which in 2015 consisted of 21 business incubators, 4 technological parks, 112 incubated companies, 193 graduated companies, and 23 resident companies. The incubated companies have a turnover of R$32.17 million, the value for graduated companies is R$218.08 million and for residents, R$86.22 million. They have also generated 3,787 job posts and and a tax collection of R$47.39 million (NTG, 2017). Regarding the nature of the management entities responsible for the incubators in Minas Gerais, there is a similarity with the national context: the majority of the incubators (62%) is under the management of some type of higher education institution. Only two federal universities do not have business incubators, the Federal University of the Triângulo Mineiro (UFTM) and the Federal University of Vale do Jequitinhonha and Mucuri.

Likewise, the division of the segments in the state is similar to the countrywide context. The main segment is technology (40%), which is divided into software (74%), applications (63%), and digital games (43%). As for the main indicators used to measure the performance of incubated companies, we have revenue (72%), market share (50%), and number of jobs generated (44.4%) (NTG, 2017).

2.2.1 Technology-based Business Incubators

In addition to being inserted in dynamic global markets, the technology-based companies (TBCs) have high employment of human resources, essential for the conversion of innovation into products and services (Andino, 2005). According to the author, the need for investment in research and development, access to technologies, research centers, raw materials and first-class resources become obstacles to the survival of the nascent EBTs, bringing them closer to research centers and institutes, technology-based incubators and educational and research institutions. According to Martinez apud Andino (2005), the mortality of EBTs is influenced in large part by three factors: 1) difficulties in converting technology into business, since such a process is complex and involves several factors, even though the technology has great potential;

[5] Núcleo de Tecnologia de Gestão - *Management Technology Center*

2) the profile of researchers who are mostly focused on the creation and use of technologies, lacking the training, experience, behaviors and resources necessary to the nascent business; 3) the need for high investment, either through the use of scarce resources, equipment that is difficult to access or nonexistent in the market, and the risks inherent to the potential market rejection of the innovation presented.

With a view to support incubated companies and offer a series of mechanisms to promote competitive advantages, Anprotec and Sebrae developed, in 2012, a certification process that, through the adoption of a set of practices by the incubators, seeks the continuous improvement of the qualitative and quantitative processes of incubators. Incubators that adopt the platform and method of the Cerne[6] are expected to act more proactively in the aid and incentive of sustainable development, based on innovation (Anprotec, 2012; Almeida; Barche & Segatto, 2014).

Implemented in 2012, Cerne is a certification model, similar to ISO9000 (adopted by companies), and the change process it advocates affects all dimensions of the incubator (Reis; Palma & Crespo, 2012). The three levels of coverage of the Cerne model are characterized as: 1) Entrepreneurship**,** based on the areas related to support incubated enterprises, 2) Process oriented towards the systems that enable business ideas, and 3) Incubator, level focused on sustainability and scope of incubator objectives, conforming the level of complexity of key processes implemented. These were structured in maturity levels or "Core Axes", maturity levels were defined as enterprise, incubator, partner network and continuous improvement (Almeida; Barche & Segatto, 2014; Korontai et al., 2016; Cerne, 2015).

In the subset of key processes that underpin the incubation process, each level of maturity exceeds the previous one in terms of coverage and level of demand regarding the effective adoption of the preceding key processes. The Cerne 1 axis relates to the activities of support and encouragement for the incubated enterprises, whereas Cerne 2, Cerne 3 and Cerne 4 – not yet implemented in Brazil – aim to strengthen the innovation environment with the practices adopted, and also promote the inclusion and participation of the incubator as a promoter of such environment (Almeida, Barche & Segatto, 2014, Cerne, 2017).

Bringing the theoretical background to a conclusion, it is essential to present how the dynamic capabilities approach is related and can serve as a theoretical frame

[6] Centro de Referência para Apoio a Novos Empreendimentos - *Reference Center to Support New Ventures*

of reference to analyze the relationship between incubator and incubated companies with respect to the development of competitive advantages.

2.3 Analysis of the Incubators' Performance in the Development of Dynamic Capabilities in Incubated Technology-Based Enterprises

Specifically involving the approach of the dynamic capacities with the context of incubators and incubated companies, two papers have been found. Tondolo et al (2015) has a qualitative approach, where they make the relation between dynamic capabilities and the organizational social capital in incubator and technological park. The authors conclude that, in the case studied, the incubated companies are able to explore opportunities through the support offered by the technological park and incubator for the development of management training and internal processes. Moreover, they were promoters of the interactions not only within the companies but also between them and external agents, such as other companies, universities and government, also developing their social capital. The second paper found was by Andino (2005), and it had a quantitative approach. This study analyzed the impact of the business incubation process using the dimensions: innovation capacity, financial capacity and managerial capacity. This was done in order to measure the impact of the incubation process compared to non-incubated companies. The results showed that there was no statistically significant difference between incubated and non-incubated companies. However, there were important differences in innovation and managerial skills, resulting in incubated companies having outcomes that are more positive.

It has been shown that technology-based companies are exposed to dynamic and uncertain environments where their base of action is the innovation of products and services (Andino, 2005; Iacono; Almeida & Nagano, 2011; Godeiro; Dantas; Silva & Celestino, 2018). Referring to Teece et al (1997) and Teece et al (2016), the best organizational performance is obtained by those companies with greater aptitude and ability to respond quickly to the environment. What happens is that in competitive environments, microenterprises face greater difficulties to consolidate and thrive (Teece et al., 2016). This difficulty is even more pronounced when it comes to companies with high technology employment (Sebrae, 2017). In addition to that, internal aspects of companies such as capital and managerial experience shortage compose these challenges (Andino, 2005).

For the sake of mitigating these effects and promoting the development of companies – mainly technology-based companies – we sought to analyze, with this

research, how and if incubators create a stimulating environment, and how they contribute to the development of adaptive, absorptive and innovative dynamic capabilities within the incubated companies. Since incubators receive resources (oftentimes public resources), there is a need to monitor and evaluate their performance and results. This evaluation concerns the infrastructure offered, resource management and incubation processes (Dornelas, 2012; Silva, 2016; Godeiro; Dantas; Silva & Celestino, 2018).

Thus, the theoretical-methodological approach taken here was the approach of dynamic capacities, specifically regarding the capacities of adaptation, absorption, and innovation. This approach was developed from the micro-foundations of the dynamic capacities of sense, seize and reconfigure (Teece, 2007) and the hierarchy of capabilities (Wang & Ahmed, 2007), as summarized in Figure 2.

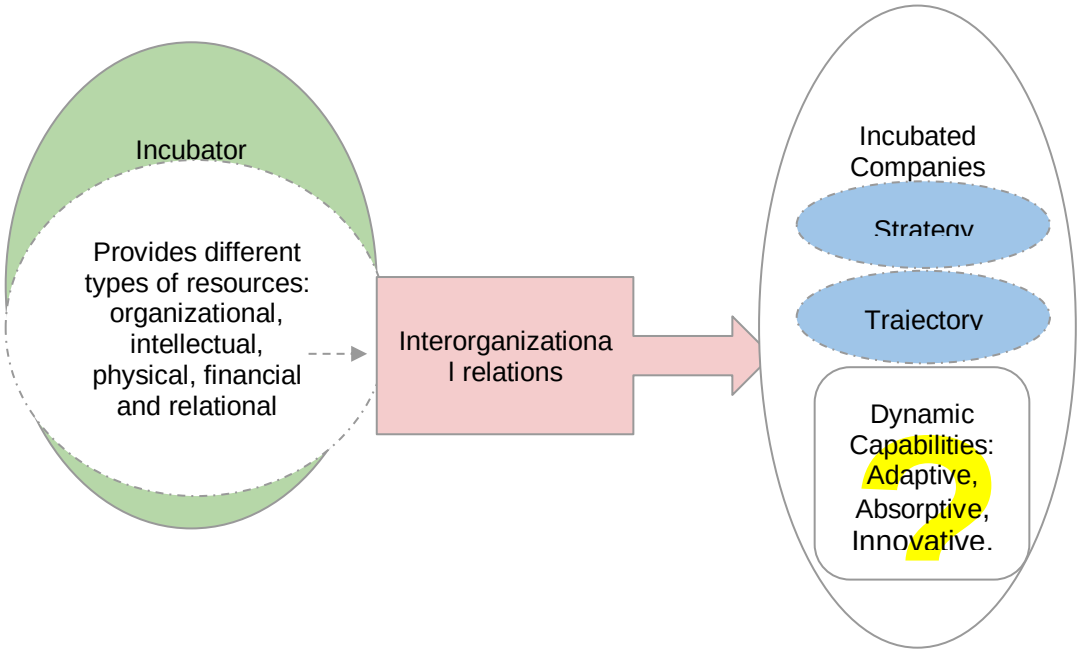

Figure 2 – Analysis of the Incubators' Performance Using the Dynamic Capabilities Approach
Source: Made by the authors based on the theoretical background

In the integration model presented in Figure 2, it is understood that the incubator offers an environment where the incubated companies have access to some types of resources and capacities. These, along with the trajectory of each organization, its competitive environment, the adopted strategy and the managers' decisions, influence the use and configuration of first and second order capabilities as well as the development of Dynamic Capabilities.

As they aid in organizational dynamics, they influence and are influenced, acting in the renewal, reconfiguration, acquisition and integration of diverse resources and resource sets, in a context of permanent change. It is understood, therefore, and

in the view of Chesbrough (2008) and Costa and Porto (2014), that not always a single company can have all the resources and capacities needed to develop innovations and also dynamic capabilities; it depends on interactions and complementation, that is, in interorganizational interactions. This may be even more evident in an incubating micro-enterprise environment.

3 METHODOLOGICAL PROCEDURES

The present study aims to analyze the performance of the incubators in the Triângulo Mineiro and Alto Paranaíba region regarding the support offered and actions in the form of access to resources and capacities that assist in the development of the adaptive, absorptive and innovative capacities of the incubated companies. Using a qualitative approach, the procedure method chosen for the treatment of the research corpus was the case study of the descriptive type, which according to Santos (2002), enables the researcher to deepen the characteristics and factors relevant to the research questions, respecting the scope of the object researched. The multiple case study was composed of 3 incubators and 23 incubated companies based in the Triângulo Mineiro and Alto Paranaíba.

With the adoption of the descriptive and multiple case study it is possible to describe and establish relationships between different perspectives for the phenomenon. In order to choose the incubators researched, two criteria were listed: i) enterprises linked to the educational institution; ii) enterprises that already had graduated companies in their incubation process. These criteria are justified because these incubators are the ones that have a higher infrastructure and are not in the service of a single company, for instance, that creates an incubator as a business unit; and already having graduated companies attests a glimpse of maturity and validation of the incubator's processes.

Therefore, 3 incubators were selected: two linked to private higher education institutions and one linked to a public higher education institution. The educational institutions to which the incubators are linked to have in common: i) the quantity of higher courses offered and the areas served (all have more than 30 higher courses acting in all areas), ii) they have multiple campuses, iii) they act regionally. The three incubators are concentrated within a distance of 250 kilometers from each other. Figure 3 presents the incubators researched and the types of business incubated by them.

Incubator	Areas of the company researched
A	Advertising Agency, Engineering Services, Engineering Services, Security Technology, Management Software, Food Safety Standards, Advertising Agency/Market Place, Environmental Services, Agricultural Technology and Inputs, and Management Software
B	Educational Materials Publisher, Water Recycling Equipment, Management Software, Environmental Services, Biotechnology, Transactions Application, Service Intermediation Application and Purchasing Application
C	Cattle Productivity monitoring system, Sports practice equipment, Management software applied to agriculture, Development of industrial monitoring system/equipment, Production of insect-based food, Development of industrial maintenance system/equipment

Figure 3 – Incubators and Incubated Business Types
Source: research data (2019)

The entrepreneurs who participated in the research and are part of the programs of the three incubators have, mostly, higher education degrees, mainly from courses related to Exact Sciences and Agribusiness. Incubator C stands out for having entrepreneurs with a more advanced training and for having professors participating in the incubation process. The businesses are related to the agribusiness, systems, services and applications sectors, with emphasis on equipment development projects in incubator C.

For data collection, documentary research and semi-structured interviews were used. In the documentary research, different databases available were considered, including websites, spreadsheets, reports, graphs, statistics, images, various documents and newspapers, among others; public sources of information such as Sebrae and Anprotec were consulted to gather the information regarding the methodology and characteristics of the incubators, the incubation process and the incubated companies surveyed. Furthermore, restricted sources made available by the interviewees were also researched.

The semi-structured interviews were carried out with the managers of the 3 incubators and with 23 entrepreneurs participating in incubation projects of the incubators surveyed.

Data collection was carried out from August to December 2017. The guidelines for the semi-structured interviews were developed based on the interview scripts of Andino (2005), Machado (2015), Gomes and Marcondes (2016), Souza (2016) and Cassol, Zapalai and Cintra (2017); in addition to the theoretical contributions, and the categories of key processes and practices, or macro processes, of Cerne 1, which also served to define, *a priori,* the analysis categories, as shown in Figure 4.

CATEGORY	DESCRIPTION
Analysis Category 1	Trajectory, strategy and environment of incubators
Analysis Category 2	Zero level resources offered by incubators (which relate to the various resources available, both tangible and intangible, such as technologies, brands, location, etc. These features may have VRIO attributes of heterogeneity, immobility, rarity, perfect imitability, and substitutability (BARNEY, 1991), these resources may eventually produce competitive advantage)
Analysis Category 3	First order resources offered by incubators (knowledge resources, skills and experiences, system and procedure resources, cultural and value resources, networking resources)
Analysis Category 4	Adaptive capacity of incubators [ability to diagnose the environment (sensing), ability to communicate, ability to qualify people, ability to reconfigure resources, processes and products (reconfiguring), reconfiguration/re-creation].
Analysis Category 5	Absorption capacity of incubated companies (acquisition, assimilation, transformation, and exploration capacities).
Analysis Category 6	Innovative capacity (capacity for strategic development, capacity of technological management, capacity of project management, capacity of knowledge of the client and markets, capacity of reconfiguration of resources, processes and products to seize opportunities and to add value

Figure 4 - Analysis Categories
Source: authors based on the works of Andino (2005), Machado (2015), Gomes and Marcondes (2016), Souza (2016), and Cassol, Zapalai and Cintra (2017).

When it comes to analysis of the data collected, the approach used was content analysis, as proposed by Bardin (1977). In this sense, after the data was collected, the analysis process was divided into five steps: i) preparation of information; ii) transformation of content into units; iii) categorization or classification of units into categories (already previously established); iv) description of the data; and (v) interpretation (MORAES,1999).

4 CROSS-CASE ANALYSIS AND DISCUSSION OF THE RESULTS

In this section the results of the analysis of each of the analysis categories identified will be presented and discussed.

4.1 Trajectory, strategy and environment of incubators

The way in which the incubators in the Triangulo Mineiro and Alto Paranaíba Region combine their resources, implement their methods and support the companies that participate in their incubation programs, the tangible and intangible resources they have, and the results they get, are directly influenced by their trajectory, the strategy they adopt, the image they have in the community and the environment to which they operate, with the end result being influenced by the characteristics of each company served, obtaining different results in each case. The structural, managerial and technological support offered by business incubators works towards strengthening and stimulating the generation of competitive advantages in incubated companies, corroborating other studies such as Andino (2005), Raupp and Beuren (2011), Raupp (2012), Maciel et al (2014) and Godeiro; Dantas; Silva & Celestino (2018).

Born of articulations between public authorities, business and educational entities, the incubators have a very close constitution time; incubator A has been present for 15 years, incubator B for 20 years, and incubator C for 16 years.

Incubators A and B are maintained by non-profit institution; incubator C is maintained by federal autarchy. Figure 5 shows some characteristics of the 3 incubators studied.

Characterization of Incubators			
Characteristics	A	B	C
Maintaining institution	Educational institutions to which they are linked		
Origin of resources	Educational institution to which they are linked, fomentation notices and fees		
Origin of incubator	Initiative of society and public power		
Constitution year	2002	1997	2001 - Went through restructuring in 2013
Incubator profile	Mixed incubator		Technology-based incubator
Amount of companies	13 graduated, 3 in process of graduation, 4 incubated, and 3 pre-incubated	28 graduated, 11 in between incubation and pre-incubation	10 graduated, 8 in between incubation and pre-incubation
Professionals available	Faculty, technical staff, volunteer entrepreneurs and contracted consultants	Volunteer entrepreneurs, technical staff and contracted consultants	Teachers provided by the sponsor and fellows
Main partnerships	SEBRAE, FAPEMIG[7], CNPq[8],FINEP[9], FIEMG[10], RMI[11], ANPROTEC, among other institutions, in addition to acting in sync with each other and with other incubators		
Incubation modalities	All incubators work with pre-incubation and incubation systems, in addition to the modalities of resident and non-resident company		
Average period of incubation practiced	36 months	24 months	36 months
Major origin of incubated companies	Faculty, members of the community, and entrepreneurs		Faculty, student body, members of the community and entrepreneurs
Branches of activities contemplated	Agribusiness, systems development, application development	Agribusiness, systems development, Biotechnology, application development, equipment development	Agribusiness, systems development, application development, equipment development, food supplement
Implantation of **Cerne**	Certification stage of **Cerne** 1	Awaiting resources for public notice for the implementation of **Cerne** 1	Participating in a call for implementation of **Cerne** 1, already adopts some practices related to Monitoring

Figure 5 – Incubators' Trajectory and Characteristics
Source: research data (2019)

[7] Fundação de Amparo à Pesquisa do Estado de Minas Gerais - *Foundation for Research Support of the State of Minas Gerais*
[8] Conselho Nacional de Desenvolvimento Científico e Tecnológico - *National Council for Scientific and Technological Development*
[9] Financiadora de Estudos e Projetos - *Financier of Studies and Projects*
[10] Federação das Indústrias do Estado de Minas Gerais - *Federation of Industries of the State of Minas Gerais*
[11] Rede Mineira de Incubadoras - *Network of Incubators from Minas Gerais*

According to the data collected, the main source of funds for incubators is their supporting institutions, although they raise funds through promotion notices and charge fees from companies participating in their programs, among other sources. The 3 incubators are located on campus and have privileged locations, whether urban or regional. They also have good support structures and aid to the enterprises served by their incubation programs, either by the profusion of academic structures and structures of extension and academic improvement, laboratories, Legal Practice Centers, Junior Enterprises, Technological Innovation Centers, among others. They also have a dedicated governing body and a range of service professionals, whether teachers, outsourced consultants or professionals from collaborate institutions.

Adopted in each of the incubators researched, the Cerne method has contributed to the expansion and promotion of the results achieved in the incubation process. The managers of the incubators researched demonstrate interest in continuing with the process of implantation of this method, which is focused on the monitoring and follow-up the activities of both internal processes and the strengthening of the innovation environment. It is also visible that incubator A is already in a much more advanced phase of its implementation, ending the Cerne 1 stage, focused on the enterprise. However, it was observed that the Cerne method focuses more on the certification of the adoption of key processes with its key practices, but there is no indication of how to evaluate them. In this sense, evaluating the results of the combined efforts between incubator and incubated companies in the development of adaptive, absorptive and innovative capacity will be a way of complementing Cerne1, which focuses on the success of the enterprises.

4.2 Zero Level and First Order Resources offered by Incubators

Along with providing infrastructure for resident companies and space for non-resident companies, all incubators have a broad physical resources structure, and structures of partner institutions are also offered through agreements. According to Wang and Ahmed (2007), such resources are classified as zero level resources. The structure available, with respect to the perception of the entrepreneurs researched, meets their needs, but the extension of resources is not widely used – incubated companies make limited use of laboratories and research centers.

The set of services offered in the basic support to the activities, such as reception and maintenance services, as well as the more complex services such as

consulting, tutoring and training – besides the monitoring activities – contribute to the development of management activities and the development of productive processes of the companies served by the incubation programs promoted by the incubators researched.

This corroborates Costa and Porto (2014) when they discuss the frequent need for interaction and cooperation between organizations for the development of their dynamic capacities.

Training, event promotion and interaction activities, along with consulting, mentoring and monitoring, developed by the three incubators, promote the access, reorganization of resources and the development of new resources by the companies served. Resources such as knowledge, skills, experiences, values, procedures, methodologies, relationship networks are understood as first order capacities, which act on zero level resources, aiming to maximize their use and results as pointed out by Wang and Ahmed (2007).

Incubation programs provide advice, guidance and mentoring for pre-incubated and incubated companies. In the issue of mentoring, we highlight the incubator B, while incubators A and C work more with monitoring. All of them approach management topics such as finance, human resources, marketing, processes, quality, business modeling, among others, and, in addition, entrepreneurial behavior. The activities developed by mentoring and monitoring promote a systematic review of business models and business plans, with emphasis on the activities of the incubator B that provide the entrepreneur's contact with professionals and other entrepreneurs of various segments, generating exchange of experiences, guidance and expansion of their network.

The incubators work in a similar way with regard to the training offered; they provide training programs through partner institutions and other activities developed by the educational institution. In this matter, incubator A also uses training in the distance education modality. It is important to note that the incubators and their maintainers have an image and reputation with the academic community, the business community and society in general, which represents a great differential for the companies served, since they are associated with its image and promote access to the market, suppliers and partners.

4.3 Absorptive, Adaptive and Innovative Capacities of Incubated Companies

As maintained Wang and Ahmed (2007), the dynamic capabilities are not configured in processes, but are incorporated in them, which means that dynamic capabilities are configured as a bundle of second order resources that form the essential capabilities of companies and which are strategically focused on their goals. In this sense, each incubated company develops its essential capabilities from zero level resources and first order capacities, that can be owned or provided by the incubators. From there, it becomes possible to develop the ability to identify opportunities (sensing), to seize these opportunities (seizing) and to reconfigure their resources and capacities (reconfiguring), which is consonant with Teece (2007); Teece et al (2016) and Teece (2017), in the discussion of acting adaptively, absorptivity and innovatively.

Based on the data collected, it is possible to analyze that the activities and support offered by the incubators for the resident and non-resident companies promote a dynamic process of revision, adaptation and improvement of the projects. Hence, it is possible to observe the reconfiguring capacities, which promote adaptations of incubated companies to their market and allows them to seize opportunities, as well as enabling a significant process of innovation of products and services offered when sensing market opportunities.

At the Dynamic Capabilities Level, Wang and Ahmed (2007) typify Adaptive capacity as the ability to respond to external opportunities, linked to market monitoring competence and to the speed of response to change. In this regard, it is important to highlight the influence of the characteristics of each incubated company, as well as the instruments and resources used by the incubators so that the interaction of these different resources influences and is influenced by the results generated. As reported by the entrepreneurs of incubated companies, this results in change of strategies, focus and even products and/or services offered.

The adaptive capacity is present not only in the process of improving activities, but also in the redefinition of strategies to act in front of the market. Thus, Figure 6 presents a summary of the activities developed by incubated companies to develop this capacity.

Characteristics	A	B	C
Search of opportunities	The activities of accompanying the companies stimulate the validation of opportunities and adaptation of the projects to the perceived opportunities		
Conducting of Market Research			
Execution of business training programs	The training activities contribute to the adequacy of the structure and the way companies operate		
Access and usage of laboratories	Although access is facilitated, the projects and actions undertaken do not have much interaction with the laboratory capacity		
Flexibility in projects and performance	Adaptation is encouraged, even if it significantly changes the scope of the project		Adaptation is regulated and limited by the approved project's profile
Adaptations based on competition			

Samples of data collected[12]:

"A targeting has occurred, right? That's it for sure, the original design if you get it, it has nothing to do with what the company is today, nothing anymore, the essence remains the same, but all goals, market, it has been changed, has been adapted, directed to this" (Interviewee A3).

"So with the incubator comes this view, more related to management, planning, management really, of monitoring the customer, direct costs, fixed costs, variables, profitability. Which service is most profitable, which is the flagship. This same entrepreneurial view helped a lot, organizing customer feedback which is something we never had" (Interviewee A7).

"We are still in the same direction, it has been improving over time, trying to get more focus, not so specific, but also not so broad. We get all excited wanting to do a lot of things and get lost. The incubator said, 'wait a sec, let's get back here, the focus is on this, the goal is this, let's plan and it's going to be like this'" (Interviewee B6).

"We knew what we wanted to do when we got there, but we did not know how. And then, over time we have been studying a lot, we have found the best methodology of production that is the program that we have today, prototyped " (Interviewee C1).

"In terms of concept, we had a vague idea. I think it was the maturation, provided by Incubator C, mainly this issue of the business plan, I think it is more the question of maturation, understanding what we wanted to do, developing the idea, studying the market better, talking to a lot of people as we did. It was kinda about getting validation on or own, before we start the development " (Interviewee C1).

Figure 6 – Development of the Adaptive Capacity
Source: research data.

Absorptive capacity is structured in the ability to recognize value in new information and knowledge and to use it in the company, whether in the reconfiguration of activities, products or services. Such competence is based on organizational learning and internalization of knowledge, according to Wang and Ahmed (2007); this is done through the follow-up processes adopted by the incubators (through mentoring, consulting and/or monitoring) allied to the knowledge and information that are made available and absorbed by the companies. It enables revisions and updates of the strategies and projects, but also the visualization of opportunities presented by the market context, the increase of technologies with the products and services obtaining greater potential of implantation. This joint work translates into the improvements and use of the various resources in the environment – human, technological and/or

[12] Samples were collected in Portuguese and translated to English for this publication.

financial–, and into an ability to reconfigure companies and create and take advantage of new market opportunities not previously perceived.

Incubated companies demonstrate the progressive adoption of tools and management tools, as well as methodologies of business modeling and ideation, offered through the training and guidance made by the incubators. The incubated entrepreneurs reported to act in a more structured, coherent and directed way towards their objectives and goals and alongside the market, as summarized below in Figure 7.

<table>
<tr><th>Characteristics</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Locate, identify, value and acquire external knowledge</td><td colspan="3" rowspan="4">The activities of monitoring, tutoring and consulting promote, along with the training activities, the perception of the opportunities, knowledge and resources available. Enabling the adoption of knowledge, development of partnerships and access to diverse resources of knowledge, structural resources and access to the market.</td></tr>
<tr><td>Routines and processes which create new operations, knowledge, competences, goods and products</td></tr>
<tr><td>Routines and processes that allow new information to be analyzed, processed, interpreted, understood, internalized and classified</td></tr>
<tr><td>Refinement of externally acquired knowledge to adapt it to internal routines, in order to facilitate the transfer and combination of prior knowledge with the new knowledge acquired or assimilated</td></tr>
<tr><td colspan="4">Samples of data collected:
“It is absorption, one takes a look, researches that and brings it inside the company, suddenly a month goes by and we’re already using that inside the company” (Interviewee A3).

“Mentoring inserts you, it connects you with the reality of the market, so without mentoring, there's no way. Mentoring is a great differential, if you take mentoring away, the incubator is over” (Interviewee B4).

“The part of market consulting was the one that we profited a lot from, we did the SWOT, we already use several tools, various personas to analyze the business”. (Interviewee B3).

“I learned, discovered, understood, saw the dangers we have, the risks we are in. So everything has changed, practically, the elaboration process, the methodology creation, we leave with another vision, I feel now I have enough baggage, information to get to work in another way” (Interviewee A4).

“The issue of access to other entrepreneurs, other suppliers, network expansion contacts was very powerful, this was made possible by the incubator. It was stimulated and it is a way to enter into the innovation system that Incubator B is part of, all events, networking, relationship cafes” (Interviewee B3).</td></tr>
</table>

Figure 7 – Development of the Absorptive Capacity
Source: research data.

The aspects of the innovative capacity are contemplated by the environment, but it is necessary to adopt mechanisms of maintenance outside the incubation; therefore it is crucial to measure the effects of the distance from the innovation environment and its maintenance and permanence in the graduates. In this regard, incubators A and B are characterized by being incubators with mixed profile, because despite adopting innovation and technology as a reference, they receive enterprises of the most varied profiles. Incubator C, in its turn, seeks a positioning as a technology-

based incubator. Nevertheless, all of them have been receiving projects originating from a movement of startups aimed mainly at the development of applications. In this sense, the innovation process can be characterized by approaches angled towards improving processes, products, services and/or productivity, and quality gains among other factors; or may be linked to the perception of the environment, interaction with new demands and opportunities.

According to the entrepreneurs of the incubated companies surveyed, the permanent discussion of the scope of activities, goals, forms of action, review of minimally viable products, profiles of *personas*, value propositions, competitive advantages, among other methods and approaches, enable a broader view of potential needs to be met by companies, as well as mechanisms to transform them into sources of revenue. Figure 8 shows the characteristics of this capacity.

<table>
<tr><td>Characteristics</td><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Innovation in products and services</td><td colspan="3" rowspan="6">Because most of the companies are in the implementation phase, the support actions are focused on supporting this implementation, with procedures, processes and flows that while promoting a permanent discussion about the products and services developed, discuss their suitability to the market.</td></tr>
<tr><td>Innovation in production processes</td></tr>
<tr><td>Innovation in organizational structures</td></tr>
<tr><td>Innovation in profile and training of people</td></tr>
<tr><td>Innovation in adapting to the market, taking advantage of opportunities</td></tr>
<tr><td>Innovation in integration with local and regional systems</td></tr>
<tr><td colspan="4">Samples of data collected:
“Another cool part is that it's practically a drive for innovation, so practically everything that goes from innovation in the city or region goes through the incubator. It turns out that whoever is inside it or at least part of the network of contacts of the incubator is already affected in some way, there is that event, that fair that impacted you at some point” (Interviewee A9).

“The network that the incubator provides us, all the traveling, participating in cases, the mentoring, the support, it prepares us, gives us strength, it is very, very good” (Interviewee A6).

“We got support from CNPQ through CNPQ RAI, and set up a very high-level team through the concession of grants to three PhD researchers.” (Interviewee, B8).

“Developing, developing, today we are totally disruptive, even within the area of Company B3 we have development teams that do all the customization of the product” (Interviewee B3).

“Our gadget, at first, was created to be a cheaper gadget on the market, but as it had the capacity for a more refined fit, the staff at Incubator C gave me a tip, 'hey why you don’t you improve it and bring it to rehabilitation, since it is universal? '. So it will be multidirectional” (Interviewee C2).

“We did not understand anything about business, we just had an idea. Personally, I think the incubator helped more in the sense of changing the focus and also in the formalization of the business, creating the mental model, although it is something that always changes if we had not been prepared to change, many things would be loose” (Interviewee C5).

“It is the set of actions of the incubator that is feeding and contributing to the innovation, the symbiosis of one with another. I would say that it is the ecosystem, because it is a set of both physical and psychological variables that help” (Interviewee C4).</td></tr>
</table>

Figure 8 – Development of the Innovative Capacity
Source: research data (2019).

Monitoring and follow-up activities – whether promoted by the Cerne 1 method, originated from monitoring, mentoring and/or consulting activities or from a schedule monitoring process – emerge from the interviews as a preponderant factor in the development of projects and action plans, as well as practices that at the same time stimulate and capture entrepreneurs' performance. In a unanimous way for the incubated companies, there is the perception that the permanent charging of activities becomes a fundamental vector in the scope of the improvements obtained and the results achieved.

The development and expansion of the network of contacts are cited as factors that promote opportunities, access to diverse resources, and the construction of partnerships ranging from collaboration to investment of financial resources. There were mentions to cases that reached the exchange of experiences and experiences and beyond: they achieved significant financial investments, access to technologies that were difficult to obtain, possibility of acting in new markets, among other results; all through the contacts promoted by the incubation.

Aiming to compile the results found and to assist in the analysis of the data in regards to the theoretical frame of reference, we bring Figure 9.

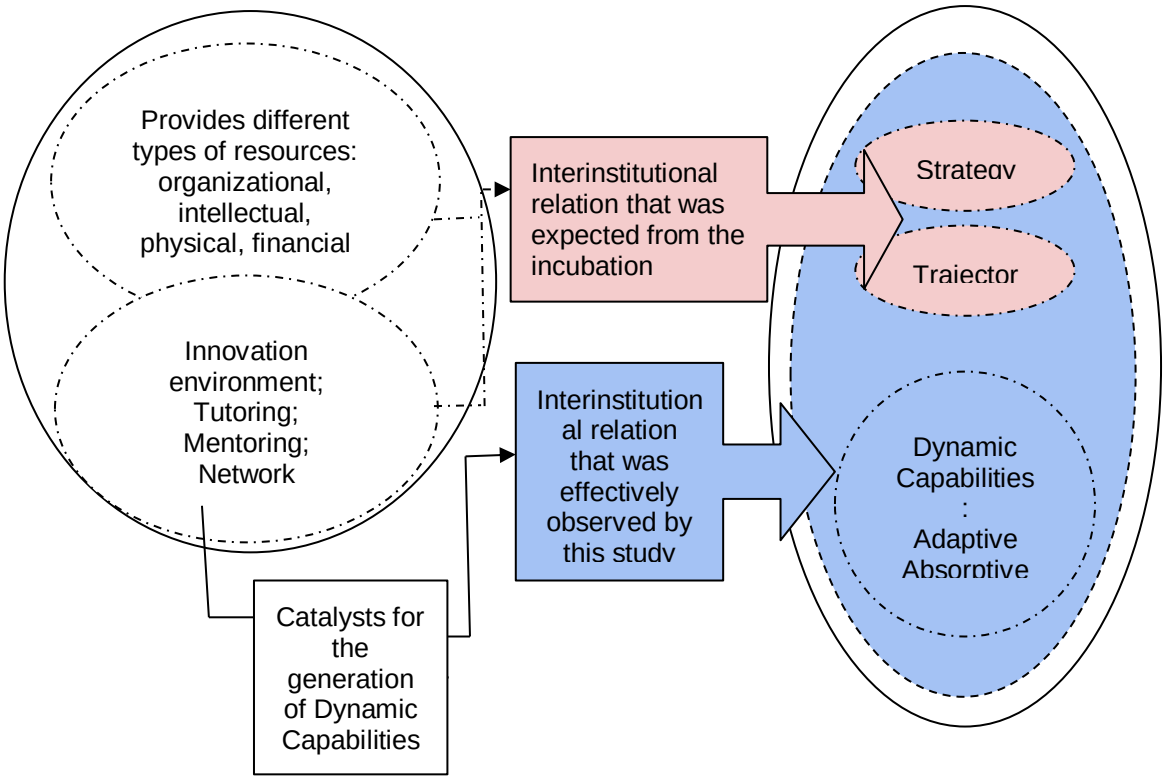

Figure 9 - Research Results
Source: Made by authors based on research data.

The constitution of the resources, innovation environment, monitoring/mentoring and the network of contacts, allied to the association, configuration and reconfiguration of other resources have contributed to the stimulus to the emergence of these capacities presents itself in a different way in each company served by the incubation programs and is influenced by factors such as the trajectory and resources available in each enterprise, besides the interaction of these with their target markets and how the incubated companies use resources available to the incubators. The dynamic capabilities approach focuses more on developing these capacities as an intrinsic process to a company (Teece, 2007) or, at most, between partner companies (Costa & Porto, 2014). Considering the findings found in the field research, it was evident that the development of absorptive, adaptive and innovative dynamic capabilities can also occur in the interorganizational relationship between incubator and incubated companies. This is because incubated companies have few resources, requiring a joint process that crosses organizational limits, where the actions, knowledge, experience and relations network of incubators are shared with incubated companies, helping in their process of acquiring information and knowledge in their choices and positions.

In competitive environments, microenterprises face greater difficulties to emerge and prosper, a difficulty accentuated by the characteristic of some degree of technology demanded and employed. Here knowledge becomes a preponderant asset in business activity and mere availability and access to information, strategies, technologies, modes of production and methodologies does not necessarily contribute to the generation of competitive advantage, as already pointed out in the study by Andino (2005). Thus, this research found that the sum of the resources and capacities of the incubator have the catalytic effect, in this case as an accelerator, for the development of adaptive, absorptive and innovative capacities in the incubated companies.

5 CONCLUSION

Through the analysis of the three incubators, it was identified that the set of resources and support activities offered is similar and follows a predefined structure, largely influenced by the Cerne method, with small variations. It was also possible to identify that the promotion of an innovation environment (with capacities and access to scientific knowledge), knowledge and experience of managers and consultants with

their monitoring and training activities, and network of relationships that provides access to different types of information, knowledge and business opportunities. These, added to the positive image of the incubators surveyed, are preponderant factors that influence the results achieved by incubated companies.

These elements contribute as a catalyst effect in accelerating the absorption, construction and consolidation of zero level, first order and second order capacities and capabilities which, in turn, form the basis for the adaptive, absorptive and innovative capacity development of incubated enterprises and leads to possible competitive advantages that will sustain the growth of these companies. In this sense, it is considered that other Brazilian incubators will achieve similar results. However, it is necessary to point out that the trajectory and the recognition achieved by these incubators in their cities and in the region has helped in the consolidation of their resources and the search by the companies for the incubation process of these institutions.

The theoretical contribution of this study to the approach of dynamic capabilities is in the advancement of the analysis of the role that interorganizational relations have in the development of dynamic capabilities and their application in the reality of small and micro enterprises. Although the subject is already of interest to some researchers, as pointed out by Takahashi et al (2019), this research shows the specific relationship that is established between incubators and incubated companies and stresses that incubators are not only spaces for innovation promotion but also are agents of development of dynamic capabilities of the incubated companies, compensating for the shortcomings and the lack of resources, the experience of the entrepreneurs and of the small trajectory of these young micro-enterprises.

The practical contribution lays in pointing out that the guidelines and actions proposed by the Cerne method, specifically in the Cerne stage 1 (that focuses on the strengthening and success of the projects), which are being adopted by most Brazilian incubators, if properly implemented and connected with the demands of the market and of the region where the incubators are, can directly contribute to the generation of dynamic capacities. However, it was noted that Anprotec encourages incubators to adopt the Cerne method with their key processes and key practices in each of the stages for subsequent certification, but does not establish performance indicators and ways of measuring the results of incubator efforts for incubated enterprises' success. Therefore, it is suggested that Anprotec could adopt the dynamic capabilities

approach, similar to what was done with the Resource Based View (present in **Cerne**'s conception), for the elaboration of indicators and ways of measuring results. This could be done by evaluating how and how much the incubator assists in the identification and analysis of opportunities, as well as in the acquisition and transformation of different resources and knowledge in the adaptive capacity of the incubated companies, and also in their capacity to absorb information and knowledge and to innovate products and processes.

The information collected, to a large extent, are perceptions of individuals involved in the process, such as incubator managers and the entrepreneurs themselves about the role and action developed in the incubation process, and that is a limitation of this study. Although Cerne is a national guideline of Anprotec, this study reflects a reality limited to a specific region of Minas Gerais and the Southeast region.

We suggest, for further studies, that this research is extended to other cities and regions in Brazil, and also to have comparative studies between states and regions, as a way to report the similarities and disparities. It would also be interesting to compare the performance of incubators with technological parks and accelerators, as means to observe the possible differences and potential complementarities.

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