08, 09, 10 e 11 de novembro de 2022
ISSN 2177-3866

INNOVATION POLICIES' IMPACT ON DYNAMIC CAPABILITIES OF KNOWLEDGE-INTENSIVE FIRMS: the case of a regional entrepreneurship and innovative development program

BRENNO BUARQUE DE LIMA
UNIVERSIDADE ESTADUAL DO CEARÁ (UECE)

SAMUEL FAÇANHA CÂMARA
UNIVERSIDADE ESTADUAL DO CEARÁ (UECE)

TIAGO ANDRÉ PORTELA MARTINS
PROGRAMA DE POS GRADUAÇÃO EM ADMINISTRAÇÃO - PPGA UECE

ROBERTA FEITOSA DE LUCENA CAVALCANTE
UNIVERSIDADE DE FORTALEZA (UNIFOR)

INNOVATION POLICIES' IMPACT ON DYNAMIC CAPABILITIES OF KNOWLEDGE-INTENSIVE FIRMS: the case of a regional entrepreneurship and innovative development program

1. INTRODUCTION

Innovation policies have been an area in which several studies have been made over the last few decades. In this category, they can be considered as macro-level efforts to develop institutions, human resources, technologies and other means related to the development of Science, Technology and Innovation (S,T&I). Thus, such policies aim to promote innovation and leverage the performance of public and private institutions (Audretsch & Link, 2012; Bajmócy & Gébert, 2014; Patanakul & Pinto, 2014).

Knowledge-intensive companies have gained prominence in the current literature on Innovation Management due to the significant investment that large corporations and public policies have directed towards these companies. Startup companies, especially, have received a lot of investment in the business environment, with large companies making significant investments of financial resources to acquire these companies, mainly due to their great potential to scale technological solutions for a large customer base (Ries, 2012).

Knowledge-Intensive Entrepreneurship (KIE) has been a widely studied field of research, dealing with which factors enhance the creation and development of KIE (Groen, 2005; Malerba et al., 2015; Protogerou & Caloghirou, 2015). These studies address both the regional level, which investigates the inter-institutional dynamics that enhance KIE and at the firm level, seeking to understand the internal factors of the firm that enable the development of these companies. Another field of research studied in the area is the public policies to promote the KIE, which seeks to understand the government mechanisms that encourage and promote the creation and development of KIE firms.

In this sense, there is a vast literature of Knowledge-Intensive Entrepreneurship that focus on the understanding those mechanisms that promotes and encourages entrepreneurship, technology and innovation (Audretsch, 2014; Stam, 2015; Caloghirou, Prorogerou & Vonortas, 2018; Walsh, 2019). Entrepreneurship policies, specially, usually focus on: i) supporting the development of new businesses through tax incentives or loans; ii) mentoring the development of new businesses, through monitoring programs for the development and scaling of the business; iii) investing in institutions that are conducive to the development of innovative entrepreneurship, such as universities and Science and Technology Institutions (STIs).

KIE is a phenomenon that drives economic competitiveness and dynamic and innovation capabilities (Acs, Autio, & Szerb, 2014). The definition of dynamic capabilities undertaken by Helfat and Peteraf. (2009) emphasizes the intentionality of the process, as this can be understood as the organization's ability to extend, create or modify its resource base. Entrepreneurs will perceive opportunities long before others, as well as share their vision with others to help them execute.

This paper studies how the dynamic capabilities and innovation capability are affected by innovation policies in knowledge-intensive entrepreneurship firms (KIE firms), in a context of a regional development program. The development of dynamic and innovation capabilities at the firm level is an essential factor for the firm's growth and development, leveraging competitiveness and organizational performance factors. Dynamic and Innovation Capabilities are a widely studied and discussed area in Management, being considered important factors for the business model (Teece, 2018) and the organization's competitiveness (Boccardelli & Magnusson, 2006; Li & Liu, 2014).

However, there are still few studies in the literature that explore the trajectory of knowledge-intensive companies during an innovation policy program. Usually, these studies

focus on innovation policy measuring economic variables at the macro-level (Lanahan & Feldman, 2015; Kantis, Federido & Giandola, 2021; Russo & Pavone, 2021). In this sense, there are still great effort to be made, to understand the impacts of these policies at the micro-level, such as the capabilities, practices and routines of companies that participated in innovation programs.

The research question that guides this study is how does a regional innovation development program in a developing country, providing the necessary foundations for innovation, influence dynamic capabilities and innovation capabilities in knowledge-intensive firms? This study seeks to understand the impact of a regional innovation development program on the dynamic and innovation capabilities of knowledge-intensive companies.

2. THEORICAL BACKGROUND

2.1. Knowledge-Intensive Entrepreneurship

Knowledge-Intensive Entrepreneurship (KIE) has gained increasing prominence in the studies of entrepreneurship. The KIE is a multidimensional, systemic phenomenon that depends on the context in which it operates. Knowledge-intensive companies can exhibit different degrees of innovation and knowledge intensity and be cultivated and promoted in high and low technology sectors (Caloghirou & Llerena, 2015).

The knowledge-intensive activities consist of the activities of R&D that enable the exploitation of technological opportunities, seizing technological improvement, new product development, and a new business model. Those activities related to the firm's technological development explore commercial opportunities (Sousa-Ginel, Franco-Leal & Camelo-Ordaz, 2017), providing innovation for the firm sector and the consumers.

Malerba and McKelvey (2020) indicate four critical dimensions of knowledge-intensive entrepreneurship. The first one is that KIE is a new independent firm, considering that the empirical focus on KIE may concentrate on the early stage of the venture. The second is that the KIE firm must be innovative, introducing innovation into the market with profit. The third dimension is that knowledge-intensive companies use the knowledge in their operation, dedicating to the use of existing knowledge, the integration and coordination of different knowledge assets, and the creation of new knowledge. The fourth and last dimension is that the KIE firms are opportunity-driven, as they exploit an innovative opportunity, explore the market needs, and use a scientific and technological knowledge base.

Secundo, Schiuma and Passiante (2017) proposed a framework to study learning dynamics in knowledge-intensive companies. The framework considers i) the individual entrepreneur, the character that learners in all stages of the process, especially in the creation and first stages of development of the firm; ii) the ontological level of entrepreneur learning, where the process can happen (at individual, organizational or network level; iii) entrepreneurial learning processes, that is the characteristics of the learning processes; iv) knowledge-intensive learning context, where the entrepreneurial learning process happens (in a startup, venture or ecosystem).

2.2 Innovation Policies

An innovation policy can be conceptualized as a series of government activities in plans, programs, projects, or actions to foster innovation (Audretsch & Link, 2012; Bajmócy & Gébert, 2014; Patanakul & Pinto, 2014). Edler and Fagerberg (2017) corroborate with Edquist (2011) definition that innovation policies can be considered public policies that impact innovation. And complement that these policies must be applied at different times and under different motivations, including different approaches (e. g. scientific policy, industrial policy, technological policy).

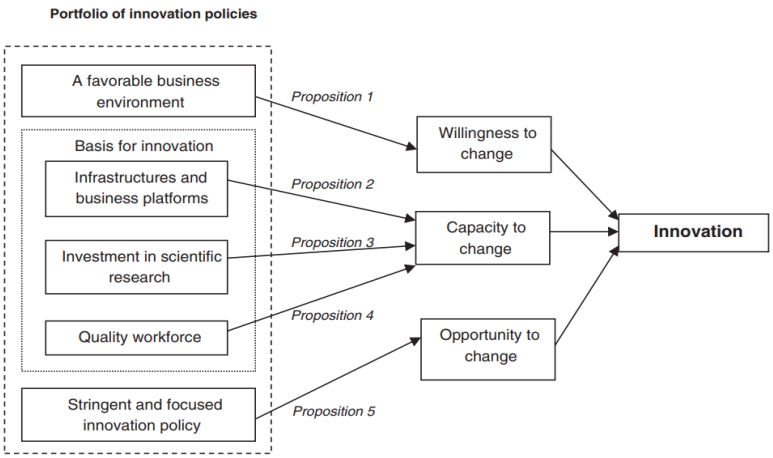
Thus, the authors demonstrate three types of innovation policies: i) mission-oriented policies, which, according to Ergas (1987), aim to provide new solutions that work for specific challenges on the political agenda; ii) invention policies, which have a more restricted focus, as they focus on (R&D) activities, and transfer the exploitation and diffusion of the invention to the market; iii) system-oriented policies, which concern resources at the system level, such as the degree of interaction between different parts of the system.

Literature shows different views on public policies for innovation. Patanakul and Pinto (2014) developed a framework to guide researchers and policymakers in understanding the roles of government public policies in promoting innovation. They indicate three ways for a firm to move towards technological change: (i) willingness to change, determined by the firm's attitude and its knowledge of potential changes; (ii) ability to change, related to its technical knowledge and skills; and (iii) opportunity for change, which involves difficulties between the technology used by the firm and that currently available for adoption/adaptation (technological diffusion and incremental innovation), or technology that could be developed internally (a radical innovation).

These authors suggest that government should have a portfolio of innovation policies and define important environmental conditions and factors for its formulation: (i) a favorable business environment; (ii) infrastructure and business platforms; (iii) investment in scientific research; (iv) a high-quality workforce; and (v) a stringent and focused innovation policy. Figure 1 shows the framework developed by the authors, relating innovation policies to the impact on companies and their capacity to innovate.

This research will focus on the Capacity to Change and its variables, considering that these construct, among the ones proposed by Patanakul and Pinto (2014), is the most crucial for the development of dynamic capabilities on knowledge-intensive firms (Groen, 2005), mainly the ones in the early stages of development (Islam, Fremeth & Marcus, 2018). In this sense, we propose that the Capacity to Change is related, in KIE firms, to Technical Change (Coombs & Bierly, 2006), Dynamic Capabilities, and Innovation Capabilities (Patanakul & Pinto, 2014; Teece, 2018; Malerba & McKelvey, 2020).

Figure 1 - Understanding the role of innovation policies



Source: Patanakul & Pinto (2014).

2.3 Dynamic Capabilities in KIE Firms

Penrose (1959) made a significant contribution to the field of strategic management. In the introduction to the Resource-Based View (RBV), she proposes that what differentiates companies is their differentiation capabilities from others, their resources. The resource-based

view provided an insight into how competitive advantages are achieved and how companies can maintain these competitive advantages over time (Penrose, 1959; Barney, 1991; Teece, Pisano & Shuen, 1997; Kraaijenbrink, Spender & Groen, 2010).

Alvarez and Busenitz (2001) studied how the Resource-Based View is related to entrepreneurship. In their statement, entrepreneurship and RBV use the same unit of analysis, which are resources. The authors claim that entrepreneurial opportunities exist mainly because different actors have different views on the relative value of resources and how they convert into inputs and outputs.

Protogerou and Caloghirou (2015) studied how dynamic capabilities are related to knowledge-intensive entrepreneurship. The research results show that dynamic capabilities positively link new companies' growth, innovative performance, and international sales. An important finding is that the ability to adapt to the market is more critical for the development of young companies than the adaptation of technology, showing that, in the initial stages, it is more necessary for new ventures to analyze and adapt their resources to the market (Boccardelli & Magnusson, 2006).

It is also worth noting the Absorptive and Network Capabilities, considering that those are capabilities that are crucial for the development of knowledge-intensive companies in early stages of development (Boccardelli & Magnusson, 2006). The association of networks in KIE firms is necessary because it is how the members acquire experience in commercializing a product in a new sector. In some cases, the participants do not have market experience (Soetanto & Geenhuizen, 2015; Huynh et al., 2017), so the association in networks is essential, especially in the first years, a phase in which the KIE firm needs know-how for product development and technology transfer (Boccardelli & Magnusson, 2006).

In this sense, the Network Capability is a construct that measures the ability of the members of these companies to build, maintain and develop good relationships with different actors, such as partners, competitors, suppliers, among other important actors in the field of technology transfer, which are important to enable the development of technological maturity in these companies (Sousa-Ginel, Franco-Leal & Camelo-Ordaz, 2017), as well as their ability to convert this particular product/technology into a marketable product/service.

The knowledge-intensive firms usually seek to participate in networks to access technological knowledge and commercial opportunities (Walter, Auer & Ritter, 2006; Huynh et al., 2017; Oukes et al., 2019). Their managers generally decide to participate in cooperative networks to collaborate and share knowledge that can generate innovation, consequently increasing the participating members of a collaborative network (Breschi & Malerba, 2005; Funk, 2014).

Absorptive capabilities, in turn, can be defined as a firm's capabilities to perceive, assimilate, and apply new and external information for commercial purposes (Cohen & Levinthal, 1990). In their seminal article on absorptive capabilities, Cohen and Levinthal (1990) argue that exploiting external knowledge is crucial for innovative capabilities. The authors sustain that prior knowledge, manifested in skills and expertise, enables the recognition, assimilation, and application of valuable information for commercial purposes. These processes occur at the individual level, with employees, and at the organizational level, in different sectors and between these sectors (Cohen & Levinthal, 1990).

The innovation capabilities are essential for developing new firms' products, processes, and projects (Breznik & Hisrich, 2014; Camisón & Villar-López, 2014). They reflect the capabilities of a company to allocate resources to generate value for their clients, and they can be reflected in the products, in the processes, or in the organization itself (mainly when it is related to organizational innovation).

Different factors influence innovation capabilities at the organizational level. Culture, for example, is an essential factor for the development of innovation capabilities. Promoting an

innovation culture, giving autonomy, stimulating new ideas, and developing new projects are relevant for establishing an innovation culture, creating a basis for developing innovation capabilities. For example, Coombs and Bierly (2006) highlight that technological capability is one of the most important sources of competitive advantage. In this sense, innovation capabilities are essential for Knowledge Intensive Entrepreneurship (Malerba & McKelvey, 2020). Coombs and Bierly (2006) how the technological capabilities of the dynamic capabilities impact the firm's performance.

2.4. Research Framework Conceptual model

The framework of the research is visible in the Figure 2, showing the relations between the constructs. The constructs of innovation policy are inspired by the work of Patanakul and Pinto (2014), which they call “basis for innovation”. In this paper, is proposed the relationship of innovation policy and dynamic capabilities through these areas of policies, that give the basis for innovation, through the promotion of Science, technology and business. In addition to the framework of Patanakul and Pinto (2014), this research proposes that Technology Change and Acquisition of Knowledge are also actions of policies that are important to analyze.

Looking at the framework, is possible to visualize the relationship between the constructs of innovation policy and dynamic capabilities. The research aims to explore and understand how these models of innovation policy can influence the dynamic capabilities of knowledge-intensive firms.

The first assumption is that the infrastructures and business platforms influence the network capability. Considering that the support of infrastructure and business of innovation programs (e.g.: TTOs, government programs and incubators) usually are related to the connection with other business and technology partners (Edler & Fagerberg, 2017; Huynh et al., 2017), it is proposed that the infrastructure and business platform influences the network capability.

The dynamic capabilities perspective is a construct that helps to build a strategic approach from the multiple possibilities of innovations developed within the scope of projects and programs. Validating Teece's (2007) arguments, the relationship between dynamic capabilities and the ability to achieve new forms of competitive advantage consists of the ability to integrate, build and reconfigure internal and external competencies to deal with rapidly changing environments, in a skillful and efficient way. effective.

The second and third assumptions relate the investment in scientific research and technology change and the quality of workforce and acquisition of knowledge with the absorptive capabilities. Considering that the more the firm receives R&D investments and the hiring of qualified labor, the greater its ability to learn and assimilate and transform knowledge into innovation (Camisón & Forés, 2010; Camisón & Villar-López, 2014).

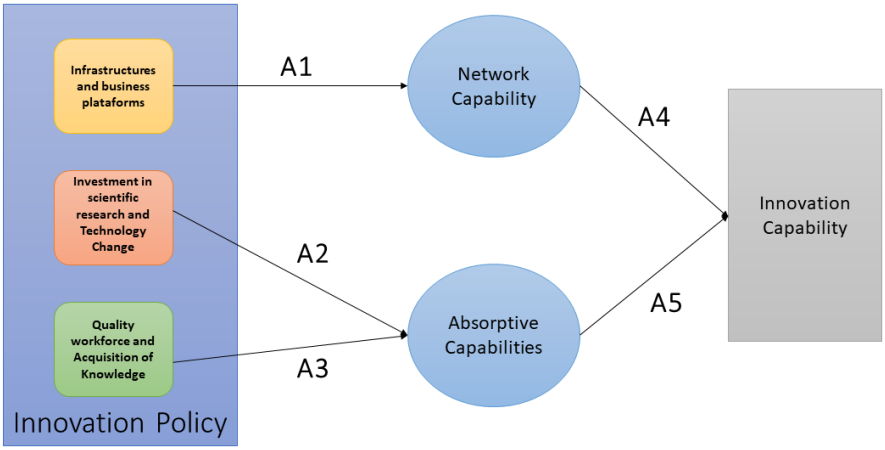
In this sense, the role of absorptive capability can be recognized, resulting from the interaction between government, companies and universities, due to the interaction, sharing and construction of knowledge, the ability that both actors have to learn from each other and with the environment, becoming a fundamental capability for projects and programs. In this scenario, the rapid changes observed make the innovation process an essential skill in generating competitive advantage and the absorptive capacity has a strong relationship with the ability to innovate (Zahra & George, 2002; Sapienza et al., 2006).

Finally, the fourth and fifth assumptions point out that the network capability and the absorptive capability influence the firm's innovation capability, as they enhance technological learning and the ability to enter the market (Sousa-Ginel, Franco-Leal & Camelo-Ordaz, 2017; Diánez-González & Camelo-Ordaz, 2019). Those dynamic capabilities (network and absorptive) are present in the relationship between the innovation policies and the innovation capabilities, since the results of policies to encourage innovation generally impact

at the organizational level (technological, commercial, management), in order to leverage the potential to generate innovation in companies.

Considering this perspective, Moré, Vargas and Gonçalo (2014) relate the absorptive capability to organizational innovation, in which the processes of acquisition, assimilation, transformation and application of knowledge are elements that induce innovation and organizational performance. Absorptive capability influences the organizational performance of organizations, since companies with high levels of absorptive capabilities can bring innovation to their interior, enabling a competitive advantage that positively impacts the organizational performance.

Figure 2 - Research Framework



Source: proposed by the authors (2022).

3. RESEARCH DESIGN

3.1. Research methods and strategies

The data collection procedures took place through the use of research instruments, which, in this paper, were represented by primary and secondary data, publications, national and international research, semi-structured interviews (Mann, 1992) and direct observation (Patton, 2002). Data were analyzed using content and narrative analysis techniques (Freitas & Janissek, 2000) to extract the interviewees' perceptions of the topics addressed.

The interview participants were companies that participated in the Economic Clusters of Innovation Program (ECIP) innovation and entrepreneurship program, a public innovation policy linked to the government of the state of Ceará, based on a joint action of the Secretariats of Economic Development and Labor (Sedet), of the Science and Technology and Higher Education (Secitece), and its affiliates Cearense Foundation for Support to Scientific and Technological Development (Funcap) and Ceará State Development Agency (Adece).

The data collection was made between january until march of 2022, with semi-structured, in-depth interviews being used as the main method, through the video platform called Google Meet, with an average duration of 40 minutes. The universe of knowledge-intensive companies participating in the program was 46 startups. In total, 22 interviews were made with entrepreneurs from different regions of the State and inserted in different sectors of activity (Table 1). The interviews were recorded for later transcription and analysis, according to the participants' authorization.

After developing the theoretical framework for analysis with the framework proposal, the next step was to promote its applicability. Therefore, the application was carried out in Ceará, a state in the Brazilian Northeast region. This State has an estimated population of approximately 9,240,580, distributed in 148,894,442 km², in 184 municipalities, with an HDI

of 0.682 and a monthly household income per capita of R$ 1,028.00 (IBGE, 2010, 2020, 2021a, 2021b; IPECE, 2020). The State of Ceará in the Innovation Index of Brazilian States (FIEC, 2021) shows that in 2021, that State currently occupies the 11th place in the general index, ranking 9th in capabilities and taking the 14th position in results. It is the 2nd among the northeastern states, behind only Pernambuco (10th), with São Paulo in first place.

3.2. Economic Clusters of Innovation Program (ECIP)

The objectives of the ECIP are to strengthen regional economic and social development, generate greater competitiveness in the regions by increasing the productivity of activities with greater potential, create a new economy based on innovative ventures in the region, foster the region's wealth with better income distribution, increase the wealth of the State with better distribution among the regions and retain and attract talents trained in the region by offering high quality opportunities, encouraging entrepreneurs who have innovative ideas to solve the main problems of competitiveness in the existing economic conglomerates in Ceará.

A total of 46 innovative entrepreneurship projects were supported, which adopted various technological trends with significant potential to contribute to the economic growth of the state of Ceará in the short and medium terms (SCT, 2021). As a result, projects from nine regions of Ceará were contemplated with a focus on local problems, namely: Greater Fortaleza, East Coast, Vale do Jaguaribe, Sertão Central, Sertão do Cariri, Serra da Ibiapaba, Sertão de Crateús, Sertão de Sobral and Litoral Norte.

The innovative projects were directed to the problems identified in the sectors and regions (Clusters) established as priorities throughout Ceará, in all there were 23 Clusters in the areas of Agribusiness, Tourism, Commerce, Civil Construction, Education, Renewable Energy, Mining and Metal Mechanics, Health, ICT, Infrastructure and Logistics and Wood Industry.

The ECIP is coordinated, monitored and supervised by a central team from the Government of the State of Ceará, with the participation of 41 Regional Researchers (RRs) from the respective Clusters, selected by the PCEI. These researchers promoted the transfer of knowledge between science and technology institutions (ICTs) in their region and the productive sectors; the entrepreneurial construction of innovative technological solutions; and carrying out projects that can contribute to the development of these programs and generate an impact on science, technology and innovation in the Clusters where their actions will be implemented. In this way, the choice was made due to its characteristics of a network approach and the action of a policy to stimulate innovation through the creation of Innovation Clusters.

It is important to highlight that the focus of the research will be on the innovation policy related to the necessary bases for innovation, as pointed out in the theoretical framework. Therefore, the study in question seeks to understand the impact of a regional innovation development program on the dynamic capabilities of knowledge-intensive companies. By doing this from the perception of the participating entrepreneurs, it is expected that both relevant variables will be raised by them, as well as relevant relationships between such variables can be evidenced.

4. RESULTS ANALYSIS

4.1. Policy Innovation Benefits

In the next parts of this article, the constructs identified by the analytical framework as relevant to understand the presence of the benefits associated with the studied program will be presented, as well as their influences (assumptions) on the innovative capabilities of the beneficiary startups.

4.1.1. Scientific research and technological change

Some entrepreneurs were attracted to the program because they saw the opportunity to combine their academic studies with entrepreneurship, and some ideas were provided by course conclusion works, as evidenced by the following excerpts, extracted from the speech of interviewees 19 and 2:

> (...) So, this issue of startups, entrepreneurship is also a trend in the academic world, including the Regional Researcher-1, professor starting to offer, including, it is from the trade line here in Cariri, a discipline linked to these issues which I said is also a cater to the academic world because of its fraction, pro doctorate and everything else. So it was also a little with this academic bias, with the initial intention to be in the program and also for having a skill with entrepreneurship, since childhood because of being involved with the entrepreneurial family. Then I also have some feet in entrepreneurship. (Interviewee 19).

> No, not mine. From the master's student in the laboratory. We went there. We took it and adapted it, my my TCC (completion of course work) is also part of it, but the most is his. (Interviewee 2).

On the other hand, it was also noticed that the interviewees saw in the program the possibility of taking a step forward in activities that were usually already carried out both in their training process and in their professional performance. The following excerpt from the speech of interviewee 22 illustrates this perception:

> Okay, we come from an area of the environment, the entrepreneur and I made the environmental technician, we have already worked a lot with project development in relation to article, writing, this client business, the teacher always taught us. Once we wrote the business plan in the entrepreneurship discipline, we had to go after potential customers so we could get an idea of what the customers would be like. (Interviewee 22).

At the same time, entrepreneurs' perception of possible assistance from the program for activities involving scientific research is diffused. A considerable portion of the interviewed entrepreneurs point out that they do not perceive a clear and direct help from the program agents in this regard, except for the figure of the regional researcher (RR), as can be illustrated by the following excerpt, extracted from the speech of interviewee 5:

> Yes, all of this was through the RR, the same was even the evaluator of my TCC (completion of course work). We had support from the UFC (Federal University of Ceará), at NUTEC (Nucleus of Technology and Industrial Quality of Ceará). (Interviewee 5).

As for technological change, it is noted that some interviewees, in their speech, relate it to the possibility of combining it with scientific research, increasing the process of developing this technology. At this point, the help given by the program to the teams is also recognized, as can be seen in the following excerpts, extracted from the speech of interviewees 7 and 4:

> I think so, it is always said that this support exists. We want to write an article about it because we know we have potential, but it was an idea that was generated in the show and for the show, but the writing potential will come later. (Interviewee 7).

> (...) and we feel very encouraged to be looking for new technologies such as our teacher, our advisor, right? In fact, our researcher is Professor RR-1, he is very connected to the area of data science, so whenever he can, he asks us to include some part of technology, often involving artificial, right, data analysis, these things that they do, depending on of the project enrich it to make a difference and we even feel that it adds more to the product, the solution, and the startup as a whole. (Interviewee 4).

In view of the above, it is noted that concepts and themes of scientific research, both worked by regional researchers and by entrepreneurs who happen to participate in the academy, are present in the scope of the startup's solution, including aligning with the technological change worked by the teams with program assistance.

4.1.2. Quality Workforce

In terms of hiring workforce for the startup, the interviewees indicated that they were not able to do this during the program, relating this difficulty to investment restrictions, the scholarship offered and the mishaps with programming and development of the technology worked on by the startup. The following excerpts from the speech of interviewees 14, 3 and 6 illustrate this synthesis:

> (...) I was seeing other startup products that needed an investment of 400 thousand to get off the ground. We are receiving grants, sometimes a good part of the investment in equipment came out of the startup grant. And we from engineering, students, some already worked with the area, even from IT itself, the investment has already come from people who sometimes do not supply, even the issue of investment in manpower. (Interviewee 14).

> Yes and no, yes and no, but why? Because we had a person who, on account of the scholarship, only benefits two members, she is not with us. She is another very important person, she is still a partner in the project, she is not so active at this stage because we are having the scholarship and then we are focusing more but counting on her mainly for the future of the enterprise, anyway, she would be closer if I had a bag for her too. (Interviewee 3).

> (...) No, the staff only found out at this last meeting that we were having this development difficulty because we have a reduced team, I think there were no questionnaires to find out if the team was the same at the beginning. I was never asked if the team was the same from the beginning. (Interviewee 6).

The entrepreneurs' speech also indicates a feeling on their part that the program has not helped them in cases where it is necessary to change team members, however they recognize the grant that is received by two members of each startup as of great value, to make investments.

As for the training of their team, the interviewees recognized the relevance of the training received in the most diverse areas, such as marketing, finance, legislation, design and monetization. These capabilities were evidenced in the structure of online workshops for all members of the program's startups: fellows, non-scholars and regional researchers. The need to apply the acquired knowledge was shown to be quite clear in the interviewees' speech, as evidenced in the following excerpts extracted from the speech of interviewees 2 and 13:

> As much as the product itself, we take not only the look, but go beyond the look, some information from a workshop here and there that we add to our product, because to deliver a better product to the customer, that's what we do. want, right? Deliver the best product to the customer. So here, the "Corredores Digitais" Program (sic) yes, it contributes a lot to that. (Interviewee 2).

> (...) training is very general, I cannot complain about training options, there are many on the journey, this could be reformulated through a more structured offer, I also thought that there was a lack of a charge for a return, a feedback, to know if the team had really taken advantage, understood and applied it correctly within their project. (Interviewee 13).

The speech of the interviewees also indicated the help of the program, in its most diverse actors, in providing training aligned to the needs of startups, something that is important because it allows for practical action on the part of startups participants, as attested by the excerpts to extracts from the speech of interviewees 11 and 16:

> (...) this can be felt both with RR, with the "Corredores Digitais" Program, and with the partner company, apart from the bootcamps, we had several mini-courses, with enormous incentives. These 3 actors were super important. (Interviewee 11).

> (...) we participated in workshops, being aware of other integration tools and we were creating our scope and articulating our programming, from field and exploratory research to seek to segment a customer niche, to the tools we could use to be able to validate the product. (Interviewee 16).

4.2. Capabilities

At this point in the text, the interviews carried out demonstrate the presence of the firms' capabilities constructs that were previously identified by the analytical framework (Figure 2)

4.2.1. Absorptive Capabilities

In terms of acquiring new technological knowledge, the entrepreneurs' discourse indicates that the monitoring of startups, especially in the figure of the regional researcher (RR), and the training offered are the most prominent ways of helping the program in the perception of the interviewees. This can be considered the engine for the development of the team in terms

of its technological level, regardless of its initial state (before the program), as evidenced by the following excerpts extracted from the speeches of interviewees 22 and 13:

> As we already come from the technology area of the course, we have a very large knowledge, when entering the program, our knowledge increased a lot, because we discovered other development platforms, we received many tips in the workshops. It was something that benefited a lot, so I think the program helped a lot in this regard, we grew as a technology professional, we were able to focus on developing an application; I've never seen myself developing an application, you understand? With this incentive from us winning the scholarship and everything, trying to profit from this project, I believe it was a very beneficial thing. (Interviewee 22).

> (...) When the team received support from the program in acquiring new technological knowledge, we had very interesting guidance from the RR, according to the difficulties we were experiencing. (Interviewee 13).

In terms of the development of the startup's technology or product, the discourse of entrepreneurs, in general, suggests that this capacity has been developed slowly but steadily throughout the startup's journey through the program. As catalysts for this action, regional researchers can be identified, with their advice, and the difficulties faced by the teams, based on the needs of their startup throughout the journey. The following excerpts from the speech of interviewees 17 and 19 illustrate this synthesis:

> In our meeting, we focus a lot on that, mainly on how we are going to develop this technology, I already told him [RR] that I was (sic) developing a platform for this today, because people who already master it and also most of websites today, 90% of the internet is on this platform. And he [RR] already came here, said how to improve this issue of interface, we were (sic) even discussing with him the issue of the interface to see its usability, to see if it is adaptable to various segments and people. The teacher even gave some tips for us to add to the question of leaving everything in the description, descriptive audio because we have a very large audience with people with disabilities, so making some videos with audio description, having that sensitivity too. (Interviewee 17).

> The mentorships, the training and all the troubles, it is certainly getting better, learning more every day. Every day is a new research and a new trouble, so all this helps us to polish ourselves, better and be more qualified in what we are proposing. Because none of us are properly trained in tourism. But, every day there is new information about the region or technology, so every day we are getting better at what we are proposing, despite not having entered the commercial phase, I hope that soon we will be able to enter the commercial phase. And every day it is improving, perfecting and polishing, going from scratch to the product. (Interviewee 19).

4.2.2. Network Capabilities

Regarding the exchange of startup knowledge with other participants or members outside of the program, respondents point out that there is a lack of greater articulation of the program so that startups actually talk more among themselves. What has proved to be quite common in the responses has been an interaction only between startups located in the same Cluster, under the guidance of the same regional researchers, as indicated in the following excerpt extracted from the speech of interviewee 1:

> Yes, we have here in the region and we are close to the other startup. They are from the same city as us. And we chat. They also participate in this meeting, for example, the researchers, our researcher, and their researcher is a RR-1 teacher too, so we exchange some ideas, shall we say, right? (Interviewee 1).

The program's role in supporting teams to develop their ability to exchange information was the most controversial element according to the entrepreneurs' discourse. A portion even goes so far as to point out that they do not perceive any action on the part of the program to encourage the exercise of such capacity, as the following extract from the speech of interviewee 15 shows:

> (...) I know the members of another startup in the region, but no contact to exchange experiences, never had. I didn't see any incentive from the Program in this regard. As for external members, yes, but it has nothing to do with the program. (Interviewee 15).

As for the R&D process of the startups participating in the program, there is a certain difficulty on the part of the entrepreneurs to pay attention to this capacity, considering that it is one of the activities most distant from the immediate reality of the members of the startups, something that gradually tends to dissipate, since the follow-up by the regional researcher, as a rule, has reinforced the need for the startup to carry out this process. The following excerpts from the speech of interviewees 18 and 21 illustrate this synthesis:

> (...) We provide a situation of this resource of time for this issue of R&D but at the same time it is not enough, let's say, even one of the words that the regional researcher commented and said that we has not yet managed to close an R&D cycle 100%, but on the other hand we try to insert and understand and adapt these processes within our startup process. So it's something we go after, but given the limited time and team we end up not being able to reach, let's say, who is expected in the academy or in the theoretical definition, right? Of that question. (Interviewee 18).

> We didn’t think so much about going to the field, as the program progressed, we saw this need and had no feedback on it, until we got to polish it from scratch to new. (Interviewee 21).

4.3. Innovation Capabilities

Regarding the startup's innovation capabilities, the majority of entrepreneurs perceive that the program encourages them to think differently, in search of solving the problems faced from a new perspective. The understanding that such capacity has been strengthened throughout

the journey can be noticed in the speech of several of the interviewees. The following excerpts from the speech of interviewees 15 and 5 illustrate this synthesis:

> (...) I think so, the program lets us create, it was not something imposed, we had our idea, we were selected, they saw our potential and we were free (sic) to make the resolution itself. (Interviewee 15).

> In terms of capacity, our team used to be a lot, let's put it this way. Too much thinking about research, shall we say so? And now our team is a little more entrepreneurial, a little more of thinking more like a startup. I think that was what was missing when we joined, now we think more like a startup and not like researchers, so let's put it this way. (Interviewee 5).

5. CONCLUSIONS

The present article was able to demonstrate, as predicted by the analytical framework, that there are influences in the studied program between the benefits obtained by the Economic Clusters of Innovation Program and the capabilities of startups to innovate, especially with regard to their ability to relate in a network and the from these networks acquire and use knowledge in the solutions developed during the journey proposed by the program to teams/startups. In this conclusion, the participation of the Regional Researcher stands out, a figure used in the program to carry out the articulation with the regional ecosystem and the startups, mainly with the Universities. Apparently, the program has an intelligent specialization in selecting researchers who know the local reality and technological trends that can help startups both in their technological evolution and in the development of their business.

For future studies, it is recommended to continue research in the program, since more cycles of the project will be executed. Thus, it is possible to gather insights on how the program evolves over time, and whether this has in any way influenced the development of the dynamic capabilities of the participating companies. It is also recommended studies on other similar programs, which aim to develop knowledge-intensive entrepreneurship through the connection of startup companies with specialist researchers and industries of the sector. Through these comparative studies with other programs, it is possible to capture lessons learned, which can improve the Economic Clusters of Innovation Program (ECIP).

REFERENCES

Acs, Z., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship: measurement issues and policy implications. *Research Policy.* 43. 473-494. 10.2139/ssrn.2008160.

Alvarez, S. & Busenitz, L. (2001). The Entrepreneurship of Resource-Based Theory. *Journal of Management.* 27. 10.1177/014920630102700609.

Audretsch, D. B. (2014). Da universidade empreendedora à universidade para a sociedade empreendedora. *The Journal of Technology Transfer, 39* (3), 313-321.

Audretsch, D. B., & Link, A. N. (2012). Empreendedorismo e inovação: marcos de políticas públicas. *The Journal of Technology Transfer, 37* (1), 1-17.

Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of management,* 17(1), 99–120.

Bajmócy, Z., & Gébert, J. (2014). Os contornos da política de inovação na abordagem da capacidade. *Tecnologia na Sociedade, 38*, 93-102.

Boccardelli, P., & Magnusson, M. G. (2006). Capacidades dinâmicas no empreendedorismo em fase inicial. *Gestão do Conhecimento e Processos, 13* (3), 162-174.
Breschi, S., & Malerba, F. (2005). *Clusters, redes e inovação*. Imprensa da Universidade de Oxford.
Breznik, L., & Hisrich, R. D. (2014). Capacidades dinâmicas versus capacidade de inovação: estão relacionadas?. *Jornal de Pequenas Empresas e Desenvolvimento Empresarial.*
Caloghirou, Y., & Llerena, P. (2015). Políticas públicas para o empreendedorismo intensivo em conhecimento: Implicações na perspectiva dos sistemas de inovação. Em *Dinâmica do Conhecimento Empreendedorismo Intensivo* (pp. 451-463). Routledge.
Caloghirou, Y., Prorogerou, A., Vonortas, N. S. (2018). Effects of University Research Exposure on Young Company Behavior and Performance. In E. Erdil, D. Meissner and J. Chataway (eds.). *Innovation and the Entrepreneurial University*. Switzerland: Springer.
Camisón, C., & Forés, B. (2010). Capacidade de absorção de conhecimento: novos insights para sua conceituação e mensuração. *Journal of Business Research*, 63(7), 707-715.
Camisón, C., & Villar-López, A. (2014). A inovação organizacional como facilitadora das capacidades de inovação tecnológica e do desempenho da empresa. *Journal of Business Research*, 67(1), 2891-2902.
Coombs, J. E., & Bierly III, P. E. (2006). Medindo a capacidade tecnológica e o desempenho. *R&D Management*, 36(4), 421-438.
Cohen, W. M., & Levinthal, D. A. (1990). Capacidade de absorção: Uma nova perspectiva sobre aprendizagem e inovação. *Ciência administrativa trimestral*, 128-152.
Diánez-González, JP, & Camelo-Ordaz, C. (2019). A influência da estrutura das redes sociais na orientação empreendedora de spin-offs acadêmicas. *Gestão de Marketing Industrial*, 80, 84-98.
Edler, J., & Fagerberg, J. (2017). Innovation policy: what, why, and how. *Oxford Review of Economic Policy*. 33. 2-23. 10.1093/oxrep/grx001
Edquist, C. (2011). Design of innovation policy through diagnostic analysis: Identification of systemic problems (or failures). *Industrial and Corporate Change*, 20(6), 1–29. doi: 10.1093/icc/dtr060. Alternative Preview.
Ergas, H. (1987). Does Technology Policy Matter? *In* B. Guile and H. Brooks (eds.), Technology and Global Industry: Companies and Nations in the World Economy, National Academy Press, 191–97.
Freitas, H. & Janissek, R. (2000). *Análise léxica e análise de conteúdo: técnicas complementares, sequenciais e recorrentes para exploração de dados qualitativos.* Porto Alegre, RS: Sphinx Sagra.
FIEC - Federação das Indústrias do Estado do Ceará (2021). Índice FIEC de Inovação dos Estados 2021. Accessed on May 30, 2022 from https://arquivos.sfiec.org.br/nucleoeconomia/files/files/Indice%20fiec%20de%20Inovacao/Indice-FIEC-Inovacao_2021.pdf
Funk, RJ (2014). Aproveitando ao máximo onde você está: Geografia, redes e inovação nas organizações. *Academy of Management Journal*, *57* (1), 193-222.
Groen, A. J. (2005). Empreendedorismo intensivo em conhecimento em redes: rumo a uma abordagem multinível/ multidimensional. *Journal of Enterprising Culture*, *13* (01), 69-88.
Helfat, C., & Peteraf, M. (2009). Understanding dynamic capabilities: progress along a developmental path. *Strategic Organization - Strateg Organ.* 7. 91-102. 10.1177/1476127008100133.
Huynh, T., Patton, D., Arias-Aranda, D., & Molina-Fernández, LM (2017). Atuação de spin-offs universitários: Capacidades e redes de equipes fundadoras em fase de criação. *Journal of Business Research, 78*, 10-22.

IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (2010). Densidade demográfica: IBGE, Censo Demográfico 2010, Área territorial brasileira. Rio de Janeiro. Accessed on June 02, 2022 from https://www.ibge.gov.br/cidades-e-estados/ce.html.

IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (2020). População estimada: IBGE, Diretoria de Pesquisas, Coordenação de População e Indicadores Sociais, Estimativas da população residente com data de referência de 1º de julho de 2020. Accessed on July 01, 2022 from https://www.ibge.gov.br/cidades-e-estados/ce.html.

IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (2021a). Cidades e Estados. Accessed on July 02, 2022 from de https://www.ibge.gov.br/cidades-e-estados/ce.html.

IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (2021b). Área Territorial: Área territorial brasileira 2020. Rio de Janeiro. Accessed on June 02, 2022 from https://www.ibge.gov.br/cidades-e-estados/ce.html.

IPECE - Instituto de Pesquisa e Estratégia Econômica do Ceará. (2020). Desenvolvimento humano e social. Accessed on June 02, 2022 from http://www2.ipece.ce.gov.br/publicacoes/ceara_em_numeros/2020/social/eleicoes.htm

Islam, M., Fremeth, A., & Marcus, A. (2018). Sinalização de startups em estágio inicial: bolsas de pesquisa do governo dos EUA e financiamento de capital de risco. *Journal of Business Venturing*, 33(1), 35-51.

Kantis, H., Federico, J., & Girandola, M. S. (2021). Tensiones y desafíos na avaliação do impacto das políticas de empreendimento. *Tec Empresarial*, 15(1), 36-55.

Kraaijenbrink, J., Spender, J.-C & Groen, A. J. (2010). The resource-based view: a review and assessment of its critiques. *Journal of Management.* 36. 349-372. 10.1177/0149206309350775.

Lanahan, L., & Feldman, M. P. (2015). *Mix de políticas de inovação em vários níveis: um olhar mais atento às políticas estaduais que aumentam o programa federal* SBIR. Política de Pesquisa, 44(7), 1387-1402.

Li, D. Y., & Liu, J. (2014). Capacidades dinâmicas, dinamismo ambiental e vantagem competitiva: evidências da China. Journal of business research, 67 (1), 2793-2799.

Liao, S. H., Wu, C. C., Hu, D. C., & Tsui, K. A. (2010). Relationships between knowledge acquisition, absorptive capacity and innovation capability: an empirical study on Taiwan's financial and manufacturing industries. *Journal of information science*, *36*(1), 19-35.

Malerba, F., & Mckelvey, M. (2020). Empreendedorismo intensivo em conhecimento: indo além do empreendedor schumpeteriano. *Small Business Economics*, *54* (2), 503-522.

Najafi-Tavani, S., Najafi-Tavani, Z., Naudé, P., Oghazi, P., & Zeynaloo, E. (2018). How collaborative innovation networks affect new product performance: Product innovation capability, process innovation capability, and absorptive capacity. *Industrial marketing management*, *73*, 193-205.

Mann, P. H. (1992). *Métodos de Investigação Sociológica.* Rio de Janeiro: Zahar.

More, R. P. O., Vargas S.M. L. & Gonçalo, C. R. (2014) Interfaces da Capacidade Absortiva numa Perspectiva Organizacional/Interfaces Of Absorptive Capacity In An Organizational Perspective. Revista Inova Ação, p. 30-52.

Oukes, T., von Raesfeld., A., Groen, A., & Consórcio PCDIAB. (2019). Poder nas relações de uma startup com seus parceiros estabelecidos: interações entre poder estrutural e comportamental. *Gestão de marketing industrial*, *80*, 68-83.

Patanakul, P., & Pinto, J. K. (2014). Examinando os papéis da política governamental sobre inovação. *The Journal of High Technology Management Research*, *25* (2), 97-107.

Patton, M. (2002). *Qualitative Research and Evaluation Methods,* 3rd edn. Thousand Oaks, CA: Sage.
Penrose, E. (1959). *The theory of growth of the firm.* London: Basil Blackwell. 1959.
Protogerou, A., & Caloghirou, Y. (2015). Capacidades dinâmicas em empresas jovens intensivas em conhecimento: uma abordagem empírica. Em *Dinâmica do Conhecimento Intensivo Empreendedorismo* (pp. 263-288). Routledge.
Ries, E. (2002). *Uma startupxuta: como os atuais utilizam a inovação contínua para criar empresas extremamente bem-sucedidas.* São Paulo: Lua de Papel, 2012. ROTHMAN, Howard.
Russo, M., & Pavone, P. (2021). Portfólios baseados em evidências de combinações de políticas de inovação: uma análise entre países. *Previsão Tecnológica e Mudança Social*, 168, 120708.
Sapienza, H., Autio, E., George, G. & Zahra, S. (2005). A capabilities perspective on the effects of early internationalization on firm survival and growth. *Academy of Management Review.* 31. 10.5465/AMR.2006.22527465.
SCT - Secretaria da Ciência, Tecnologia e Educação Superior. (2021*). Edital Nº 01/2021 - Programas Corredores Digitais e Clusters Econômicos.* Accessed on July 07, 2021 from http://www.sct.ce.gov.br/corredoresdigitais/
Secundo, G., Schiuma, G. & Passiante, G. (2017). Entrepreneurial learning dynamics in knowledge-intensive enterprises, *International Journal of Entrepreneurial Behavior & Research*, Vol. 23 No. 3, pp. 366-380. https://doi.org/10.1108/IJEBR-01-2017-0020
Soetanto, D. & Geenhuizen, M. (2015). Getting the right balance: University networks' influence on spin-offs' attraction of funding for innovation. *Technovation*. 36-37. 26-38. 10.1016/j.technovation.2014.10.008.
Sousa-Ginel, E., Franco-Leal, N., & Camelo-Ordaz, C. (2017). A influência das redes na capacidade de conversão de conhecimento de spin-offs acadêmicos. *Industrial and Corporate Change*, *26* (6), 1125-1144.
Stam, E. (2015). Ecossistemas empresariais e política regional: uma crítica solidária. *Estudos Europeus de Planejamento*, *23* (9), 1759-1769.
Teece, D. J., Pisano, G., & Shuen, A. (1997). Capacidades dinâmicas e gestão estratégica. *Revista de Gestão Estratégica*, 18(7), 509-533.
Teece, D. J. (2007) Explicating Dynamic Capabilities: The Nature and Micro Foundations of (Sustainable) Enterprise Performance. *Strategic Management Journal*, 28, 1319-1350. http://dx.doi.org/10.1002/smj.640
Teece, D. J. (2018). Modelos de negócios e capacidades dinâmicas. *Planejamento de Longo Alcance*, *51* (1), 40-49.
Walsh, K. (2019). Emergência de capacidade regional em um ecossistema empreendedor. *Revista de Empreendedorismo e Políticas Públicas*.
Walter, A., Auer, M., & Ritter, T. (2006). O impacto das capacidades de rede e da orientação empreendedora no desempenho das spin-offs universitárias. *Journal of Business Venturing*, *21* (4), 541-567.
Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, v. 27, n. 2, p. 185-203.