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Critical elements to the development of an entrepreneurship ecosystem: The case of Sergipe

Elementos críticos para o desenvolvimento de um ecossistema de empreendedorismo: O caso de Sergipe

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Abstract
Purpose: To analyze the existence of critical elements and challenges to the success of the entrepreneurial ecosystem in the state of Sergipe. Specifically, based on a theoretical framework developed by the authors, we sought to identify and examine the presence of cultural, social and material elements. **Methodology/approach**: Qualitative research was developed using an incorporated case study and data collection through non-participant observation, document analysis and 15 interviews with the main actors of the ecosystem. **Main results**: The results demonstrate the applicability of the developed framework and the presence of cultural, social and material elements as critical components to entrepreneurial ecosystems. On the other hand, in the context studied, these elements are underused and little explored by business and government forces in Sergipe. **Academic contributions**: This research is relevant for developing a theoretical framework for the analysis of entrepreneurial ecosystems and for identifying critical elements and challenges to these environments, contributing to the specific literature on the subject. **Practical contributions**: The results discuss the material, social and cultural elements, with their respective components, that foster the functioning and development of entrepreneurship ecosystems, debating solutions and offering insights and analysis for public managers and business leaders working in these ecosystems.
Keywords: Entrepreneurship ecosystem; cultural elements; social elements; material elements; theoretical framework.

Resumo
Objetivo: Analisar a existência de elementos críticos e desafios ao sucesso do ecossistema empreendedor no estado de Sergipe. Especificamente, buscou-se, a partir de um framework teórico desenvolvido pelos autores, identificar e examinar a presença de elementos culturais, sociais e materiais. **Metodologia/abordagem**: Pesquisa qualitativa com uso de estudo de caso incorporado e coleta de dados por meio observação não-participante, análise documental e realização de 15 entrevistas com os principais atores do ecossistema. **Principais resultados**: Os resultados demonstram a aplicabilidade do framework desenvolvido e a presença de elementos culturais, sociais e materiais como componentes críticos aos ecossistemas empreendedores. Por outro lado, no contexto estudado, esses elementos são subutilizados e pouco explorados pelas forças empresariais e governamentais de Sergipe. **Contribuições acadêmicas**: Essa pesquisa se mostra relevante por desenvolver um framework teórico para análise de ecossistemas empreendedores e pela identificação de elementos críticos e desafios a esses ambientes, contribuindo para a literatura específica sobre o tema. **Contribuições práticas**: Os resultados discutem os elementos materiais, sociais e culturais, com seus respectivos componentes, que fomentam o funcionamento e desenvolvimento de ecossistemas de

empreendedorismo, debatendo soluções e oferecendo insights e análises para gestores públicos e líderes empresariais atuantes nesses ecossistemas.
Palavras-chave: Ecossistema de empreendedorismo; elementos culturais; elementos sociais; elementos materiais; framework teórico.

1. Introduction

For decades, entrepreneurship has been regarded as one of the most important drivers of economic development and stimulus for innovation (Chung et al., 2022). Moreover, this phenomenon is key to accelerating structural change in the economy, competition, productivity, job creation, and national competitiveness (Ziakis et al., 2022).

However, to achieve these results, entrepreneurship requires a local and institutional context that activates its potential (Sendra-Pons et al., 2022), as is the case in entrepreneurship ecosystems. These ecosystems are areas with high growth of entrepreneurship based on a combination of environmental factors that influence people's willingness and ability to create new businesses (Ziakis et al., 2022). Thus, it is places with coordinated activities to create a territorial and business environment that minimizes transaction costs and allows businesses to succeed (Kuratko et al., 2017).

Nevertheless, to generate high business activity, these ecosystems need to integrate cultural perspectives, social networks, investment capital, universities, and economic policies (Theodoraki et al., 2017). They also require political stability, effective government, regulatory quality, sound rule of law, bureaucracy ease, and access to credit (Stam & Van de Vem, 2021; Sendra-Pons et al., 2022). These elements, which can be divided into material, social, and cultural attributes (Spingel, 2017), are fundamental and critical to creating an enabling environment for growth and innovation -based ventures (Theodoraki et al., 2017).

Because of its potential to generate impact and share economic, technological, and social value (Thomas; Asheim, 2021), this topic has attracted the attention of industry, policymakers, and academics seeking to understand its evolution (Pita et al.., 2021) and create guidance for the advancement of entrepreneurship ecosystems (Yuan et al., 2022).

In this sense, this study intends to expand the discussions on this topic by considering the entrepreneurship ecosystem of Sergipe, which has excelled in offering government support, support organizations and emergence of startups to promote entrepreneurial activities (Martins, 2020). In addition, Sergipe is among the fastest growing economies in Brazil in 2021 (IBGE, 2021) and its capital, Aracaju, is among the three most entrepreneurial cities in the Brazilian Northeast (ICE, 2020).

Thus, the objective of this article is to analyze the existence of critical elements and challenges for the success of the Sergipe entrepreneurship ecosystem. Based on a theoretical framework developed by the authors, this study specifically sought to identify and investigate the existence of cultural, social and material elements. For this purpose, the single case study strategy (Yin, 2015) was applied, based on interviews with different actors of the entrepreneurial ecosystem of Sergipe, a total of five startups and ten other different actors operating directly in the local ecosystem, in addition to documents and direct observation of entrepreneurship events, which allowed the triangulation of the data.

On this subject, despite the growing interest in the literature on this topic (Isenberg, 2011; Spingle, 2017; Stam and Van de Vem, 2021), discussions on entrepreneurship ecosystems remain practice-oriented (Colombo et al., 2019) and lack thematic depth to build and consolidate a theoretical status and research agenda (Brown & Mason, 2017; Wurth et al., 2021). However, despite the growing interest in the literature on this topic (Isenberg, 2011; Spingle, 2017; Stam & Van de Vem, 2021), discussions on entrepreneurship ecosystems remain practise-oriented (Colombo et al., 2019) and lack thematic depth to build and consolidate a theoretical status and research agenda (Brown & Mason, 2017; Theodoraki et al., 2017; Wurth et al., 2021).

Thus, this research is relevant to developing a theoretical framework for analyzing these ecosystems and identifying critical elements and challenges for these environments. It contributes to the literature on this topic and provides insight and analysis for public managers and business leaders operating in entrepreneurship ecosystems. Moreover, it should consider that the research findings can add to the literature the scenario of an entrepreneurial ecosystem in its early stages and new configurations among its elements, as observed in the results of the present study. This promotes scientific progress in entrepreneurship ecosystem research.

2. Entrepreneurship ecosystems: Components, pillars and attributes

Entrepreneurship ecosystems emphasize the role of social, economic, institutional, and relational context (Alvedalen & Boschma, 2017) in stimulating economic activity. In this context, Isenberg (2010)

considers these ecosystems as a set of individual elements, such as leadership, culture, markets, and customers, that are interconnected in complex ways and that alone do not drive sustained business creation and growth.

It follows that entrepreneurship ecosystems represent the harmony between cultural perspectives, social networks, investment capital, universities, and economic policies that create an enabling environment for innovation-based ventures (Theodoraki et al., 2017), among which startup companies and other technology organizations excel (Stam & Spigel, 2016; Ziakis et al., 2022).

Although the literature points to important factors for the success of entrepreneurship ecosystems (Isenberg, 2011; Brown & Mawson, 2019; Feld, 2012; Stam, 2015; Stam & Van de Vem, 2021; Spigel, 2017; Loots et al., 2020; Brasil, 2018), there is no adequate model for all of these ecosystems, but fundamental conditions for their development.

In order to optimize and simplify the discussion on these requirements, a synthesis of what has been proposed by relevant scholars on the subject, such as Isenberg (2011), Feld, (2012), Wef (2013), Stam (2015), Spigel, (2017) and Brazil (2018) was prepared. Considering the similarities and complementarities between these studies, the main characteristics of each of them are presented in Table 1.

Table 1 – Components, pillars and attributes of entrepreneurship ecosystems

Model/Authors	Model elements
Mastery of entrepreneurship ecosystems: Isenberg (2011), Brown e Mawson (2019); Loots et al., (2019), Flores e Kovács (2018); Martins (2020); Østergaard & Marinova (2018).	• Public policies: leadership, government, regulatory frameworks, tax incentives. • Financial capital: structure for investments of traditional investors, angel investors and other forms of financing. • Culture: success stories and norm of society stitchers with incentive to entrepreneurship. • Support: Infrastructure, support professions, non-governmental institutions, professional services such as legal and accounting advice. • Human capital: skilled labor and educational institutions • Markets: customers, networks and other agents for regionalization and diversification of the economy.
Attributes that emphasize the interaction between ecosystem actors: Feld (2012); Purbasari et al., (2019); Yuan et al., (2022); Malecki (2017).	• Leadership: committed entrepreneurs • Intermediaries: mentors, consultants, accelerators and incubators. • Network: integration between startups, entrepreneurs, investors, consultants, mentors and supporters. • Government: support for economic growth. • Talent: diversity and specialization in the talent team, mainly from human capital from universities. • Support: legal services, accounting, real estate, insurance and etc., integrated, effective and affordable. • Engagement: integration between entrepreneurs and community in events such as *pitch days*, startup meeting, *hackathons,* competitions, etc. • Companies: incentive and implementation of cooperation between large companies and high-growth startups. • Capital: investor community - angel, seed and risk - and other forms of financing.
Pillars of the Entrepreneurship Ecosystem: WEF (2013), Al-Abri et al., (2018).	• Affordable markets: easy access to the market by large, medium and small enterprises. • Workforce: diversity of human capital specialized and with experience in enterprises. • Sources of funding: friends and family, angel investors, risk and access to other sources of credit. • Support system: mentors, advisors, professional services (legal, accounting, real estate and insurance), incubators, accelerators and networks of entrepreneurs. • Regulatory structure and infrastructure: tax incentives, public policies favorable to the creation and development of business, basic infrastructure, telecommunications, internet and transportation. • Education: training and pre-university and university education oriented to entrepreneurship. • Catalyzing universities: promotion of an entrepreneurial culture, formation of ideas and graduates for new companies. • Entrepreneurial culture: tolerance to risk and error, promotion of entrepreneurship (success stories, research culture, positive image of entrepreneurship).

Model of the entrepreneurship ecosystem: Stam (2015); Stam e Van de Ven (2021); Pita et al., (2021)	• Structural conditions (fundamental for building value in the ecosystem): formal institutions, culture, physical infrastructure and demand for new products. • Systemic conditions (determinants of success): Information networks, labor and capital; leadership, finance and risk acceptance, diverse and skilled groups of workers (talents), knowledge, support services and intermediaries. • Departures: entrepreneurial activity • Results: value creation for the ecosystem.
Attributes of an entrepreneurship ecosystem: Spigel (2017); Loots et al., (2020); Cloutier e Messeghem (2021).	• Cultural attributes: beliefs and perspectives, cultures of support and success stories. • Social attributes: social networks (entrepreneurs, investors), mentors, talents (professional qualification) and investment capital (angel investments, risk, family). • Material attributes: public policies (legal norms on entrepreneurship), markets, universities (technologies, academics and entrepreneurs), infrastructure and support services (lawyers, accountants, consultants).
National Entrepreneurship and Startup Development Plan: Brasil (2018); Martins (2020)	• Regulation: legalization, management and promotion of entrepreneurship • Market: business competitiveness in the national and international market • Infrastructure and entrepreneurial capacity: educational environment, *coworking*, accelerators, incubators, technology parks, etc. • Culture: social vision and incentives. • Creation and dissemination of knowledge: creation and sharing of technical-economic-scientific knowledge. • Finance: fundraising, investment funds, angel investor, grants, microcredit.

Source: The authors (2022).

The comparison and careful analysis of the components, pillars and attributes of entrepreneurship ecosystems shows that scholars on this topic identified similar key elements for their development. In this sense, in order to create a framework with greater visual interaction and integration between these elements and simultaneously while taking into account that the different groups have attributes of social, cultural and material character (Spigel, 2017), an integrated model with the necessary elements for the creation and development of an entrepreneurship ecosystem is proposed.

2.1. Key elements and components of the entrepreneurship ecosystem

According to Spigel (2017), there are three main regional resources that favor entrepreneurship: a) cultural elements, b) social elements, and c) material elements. Cultural elements are the foundation of the entrepreneurship ecosystem; social elements are associated with acquired resources and social networks; and material elements are tangible resources presences of the ecosystem.

First, the components associated with the cultural, social, and material elements are discussed, and then the proposed framework is presented.

2.1.1. Cultural elements

Cultural elements, understood as the root of the entrepreneurship ecosystem, aim to stimulate the creation of new businesses in a population (Stam & Van de Ven, 2021) based on their beliefs and expectations (Spigel, 2017), and can therefore be understood as the characteristics of the local society in relation to entrepreneurship (Martins, 2020). Based on literature consulted (Table 1), success stories (Isenberg, 2011; Feld, 2012; Wef, 2013; Spigel, 2017) and cultural attitudes (Isenberg, 2011; Wef, 2013; Stam, 2015; Spigel, 2017; Brazil, 2018) are representative components of these elements.

The stories of local entrepreneurs who founded startups or other successful businesses and became major market leaders inspire younger entrepreneurs (Feld, 2012), stimulate university students (Wiele, 2017), make the region's culture more tolerant of risk (Isenberg, 2011; Spigel, 2017), and catalyzes interest from new entrepreneurs (Hisrich et al., 2014).

Cultural attitudes are related to society's tolerance of risk, mistakes, and failures; innovation, creativity, and experimentation; and the social status of the entrepreneur (Isenberg, 2011). Integrating these components fosters an environment that is supportive of entrepreneurship and conducive to the creation of risky ventures (Spigel, 2017).

2.1.2. Social elements

Social elements are the resources composed of or acquired through existing social networks in a region that facilitate access to and recognition of opportunities and technologies, financial capital, human capital, and leaders (mentors or successful entrepreneurs). Thus, for new ventures to benefit, connections and trust must exist between entrepreneurs, investors, and other stakeholders to share

resources (Spigel, 2017; Wiele, 2017). From the analysis of Table 1, networks, leadership, financial capital, and human capital can be grouped as social elements.

As for networks, it is essential that there is a network of interpersonal relationships to connect entrepreneurs, mentors, investors and skilled labor (Spigel, 2017) and facilitate access to financial, human, technological and material capital (Stam, 2015). In these networks, relationships must also be built with support organizations such as universities (Zarate-Hoyos & Larios-Meoño, 2015), accelerators, incubators, advisors, consultancies (Wiele, 2017) and government agencies (Obaji, 2014).

In addition to the relationships already highlighted, holding events is a way to increase engagement in the network (Feld, 2012), promote businesses and ideas, attract investment (Roman et al., 2020), and promote the business activities of the actors represented in the ecosystem (Wiel, 2017).

Regarding leadership, there needs to be a group of visible, accessible, and engaged leaders who are committed to the development of the region (Feld, 2012), provide guidance, and act as role models for the entrepreneurship ecosystem (Stam, 2015) by creating entrepreneurial interactions and providing mentorship through practical, knowledge and experience technological (Wiele, 2017). In this way, leadership helps other entrepreneurs identify and explore entrepreneurial opportunities and improve their business performance (Hoang et al., 2022).

Financial capital, in turn, includes the sources of resources available and accessible to entrepreneurs. These resources include angel investors, friends and family, seed investors, venture capital investors, and private equity (Isenberg, 2011; Feld, 2012; Wef, 2013; Spigel, 2017; Brazil, 2018). These sources must be available across all sectors and ecosystem locations for entrepreneurs to access them (Feld, 2012).

Human capital represents the skilled, educated, and trained workforce for the pursuit of entrepreneurship. This element highlights the need for qualified people to start and develop businesses. It is closely related to universities, which are sources of talent and when connected to the ecosystem, provide market-ready graduates and stimulate entrepreneurial activity (Field, 2012; Wiele, 2017).

2.1.3. Material elements

Material elements are those that have a tangible presence, albeit in the form of rules, in a given area. This group includes government, accelerators, incubators, legal and accounting advice, technology parks, coworking, and universities. Analysis of Table 1 shows that the regulatory environment (Isenberg, 2011; Feld, 2012; WEF, 2013; Spigel, 2017), markets (Isenberg, 2011; WEF, 2013; Stam, 2015; Spigel, 2017), supporting infrastructure and facilitators (Isenberg, 2011; Feld, 2012; WEF, 2013; Stam, 2015; Spigel, 2017), and universities (WEF, 2013; Stam, 2015; Spigel, 2017) are among the most important aspects of the material elements.

The regulatory environment includes legislative aspects to legalize, manage, and promote entrepreneurship (Brasil, 2018), including actions to company opening (online system, simpler processes, creation of a single place of registration), taxes, and regulation of bankruptcies (creation of specialized courts). In addition, the regulatory environment should include measures that affect social values and attitudes toward entrepreneurship in order to reduce the stigma of failure and increase society's appreciation of entrepreneurial activity (Fuerlinger et al., 2015).

The element of markets refers to the regionalization and diversification of the economy (Isenberg, 2011), considering the characteristics of new businesses and accessibility to the internal market (people, governments and local and/or national businesses) and to the external market (internationalization) (Brazil, 2018; Ács et al., 2018). Thus, markets are closely related to the regulatory environment, which it should promote the development of new business areas, including in the international environment.

The element supporting infrastructure and facilitators is formed by several actors, such as supporting professions (legal and accounting advice) (Field, 2012) and physical infrastructure that facilitates urban connections, labor mobility, and knowledge flows (Alves et al.., 2019). This infrastructure includes telecommunications, especially Internet services, transportation and logistics, access to the region, and the availability of energy to entrepreneurial activity (Isenberg, 2011).

Facilitators are organizations such as incubators (Al-Shamaileh et al., 2020), accelerators (Beyhan et al., 2021), and technology parks (Konarev & Konstantinova, 2019) that accelerate the development of the entrepreneurship ecosystem by providing technical and specialized support to sustain and grow business activities (Isenberg, 2011). In this way, the supporting infrastructure and facilitators create opportunities for business growth and ecosystem strengthening (Silva et al., 2021).

Finally, universities play the role of stimulating ideas and talent, providing a specialized workforce, and developing and disseminating new technologies that create entrepreneurial opportunities (Spigel, 2017). In addition, it is necessary for universities to foster interactions and

create conditions for the transformation and dissemination of academic knowledge into economic and social outcomes through technology transfer, intellectual property management, and integration of innovation and entrepreneurship (Matos, 2018).

Due to the expressiveness and importance of the elements presented, they are considered crucial for the development of entrepreneurship ecosystems and form the basis for the elaboration of a theoretical framework on the subject. Table 2 summarizes these elements and their respective components, grouping them into cultural, social, and material elements (Spigel, 2017).

Table 2 – Elements and components of entrepreneurship ecosystems

Element Type	Element	Components
Cultural Elements	Success stories	• Visible successes
	Cultural attitudes	• Tolerance of risks and failures • Innovation, creativity and experimentation • Image of entrepreneurship (Social status)
Social Elements	Networks	• Networks among social elements, entrepreneurs and support institutions, among all actors • Events (*hackathons*, *startup meetings*)
	Leadership	• Visible entrepreneurial leaders • Networks between entrepreneurs - mentoring
	Financial Capital	• Angel Investors • Seed Capital Investors • Venture Capital • Private Equity • Other sources
	Human Capital	• Entrepreneurship training • Talents from various areas • Taking advantage of university students
Material Elements	Regulatory environment	• Policies related to business creation • Taxes • Tax incentives • Bankruptcy regulation • Intellectual property legislation
	Markets	• Accessibility to local, national and international markets • Presence of large, medium and small enterprises
	Support infrastructure and facilitators	• Supporting professions (legal, accounting, real estate and insurance advice) • Physical infrastructure (telecommunications, transportation and logistics and energy) • Facilitators (incubators, accelerators, technology parks) • Other entrepreneurship support organizations
	Universities	• Interaction between universities and companies to generate academic startups • Dissemination of knowledge • Technological diffusion • Talent bank from student training

Source: The authors (2022).

Thus, there are many components grouped according to the element to which they belong. These elements and their components were fundamental for the operationalization of this research.

2.1.4. Proposal of theoretical framework with elements critical to the development of entrepreneurship ecosystems

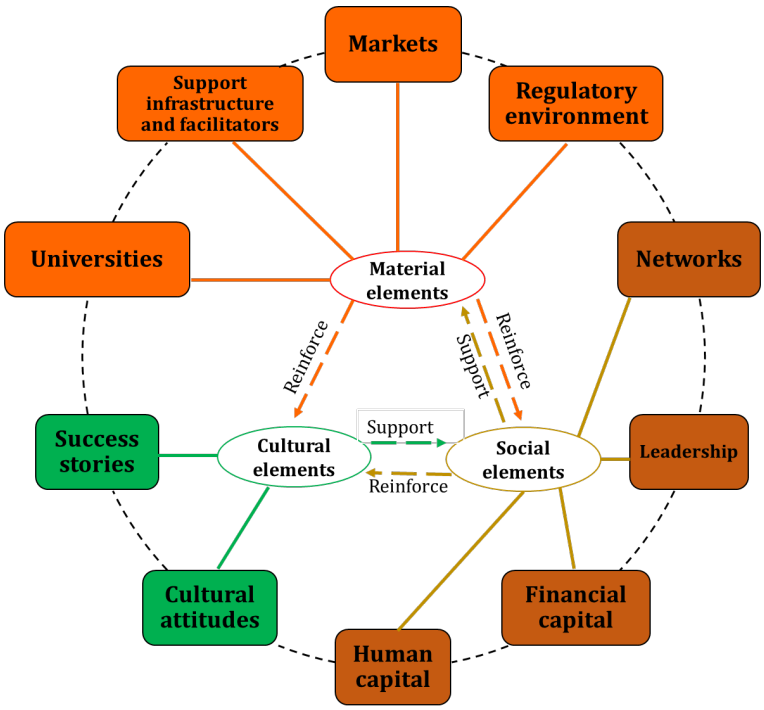
Based on the elements addressed in the previously discussed literature (Isenberg, 2011; Feld, 2012; WEF, 2013; Stam, 2015; Spigel, 2017; Brazil, 2018), an attempt was made to compare the elements and group them according to the relationships that exist between them. Thus, it was found that Spigel (2017) proposed some relationships between these elements, which were maintained in the

elaboration of the proposed framework. In that (Figure 1), the cultural, social and material elements are grouped and connected, demonstrating the relationship of interdependence between them.

Understanding the proposed structure starts from the pillar of entrepreneurial culture, because for an entrepreneurship ecosystem to develop, there must be a local culture and social beliefs that support and encourage entrepreneurship. This positive cultural context encourages people to become skilled (human capital); it attracts investors who finance new ventures (financial capital); it enables successful entrepreneurs to act as mentors (leadership) and encourages potential entrepreneurs; and the interaction between all these actors fosters an environment conducive to entrepreneurship (networks).

These interconnected elements enable the emergence of material elements, i.e., the need for infrastructure in the region (technology parks, energy services, transportation, and others); laws that favor the creation of new businesses; universities that not only create a positive culture for entrepreneurship but also provide adequate labor; support services such as legal counsel, accounting; entrepreneurship support organizations; intermediaries (accelerators, incubators, coworking); and markets.

Figure 1 – Elements of the entrepreneurial ecosystem



Source: The authors (2022).

The presence of material elements in an area can strengthen social elements-as universities that provide human capital and knowledge, which can fortify entrepreneurial culture. Material elements can also enhance culture, strengthened by universities (material element). So, it is worth noting that social and material elements support and/or reinforce each other, and that all elements work together in the entrepreneurship ecosystem.

The interactions between these elements occur in such a way that the cultural elements that form the basis of an entrepreneurship ecosystem enable the emergence of new elements: the social elements. The social elements, in turn, provide for the emergence of material attributes that can reinforce the social and cultural elements, while the social elements reinforce the cultural elements.

Thus, entrepreneurial activity arises from the interaction of these elements, i.e. entrepreneurship is the result of the exposed framework. In this way, in order for new businesses to be created and existing businesses to grow, it is necessary for these elements to be present in the environment and to interact with each other. Based on the understanding of the elements that form entrepreneurial ecosystems, the goal was to identify these elements in Sergipe's entrepreneurship ecosystem.

3. Methodological procedures

This is qualitative research, which considered appropriate for gaining a deeper understanding of a particular phenomenon (Corbin & Strauss, 2008), and also suitable for a better understanding of entrepreneurship ecosystems (Santos, 2022). In addition, the researchers in this study sought to understand the entrepreneurship ecosystem in its natural setting by attempting to understand or interpret the phenomenon through the meanings its participants give it (Denzin & Lincoln, 2005).

It is worth noting that the topic of entrepreneurship ecosystems has been little researched in the Brazilian context, as the studies listed in databases such as SPELL and Scielo offer limited discussion of the formative elements and challenges of these ecosystems (February 2022 consultation). Based on this finding, this research is considered exploratory as it seeks "new insights, questions, and assessment of phenomena" that are poorly explored in the literature (Saunders et al., 2009, p. 139). On the other hand, this study is also descriptive, a fundamental characteristic of qualitative research (Godoy, 1995), as it provides a detailed account of a situation and/or social scenario (Newman, 2010).

The method chosen was the integrated single case study, which is characterized by having more than one unit of analysis in a single case (Yin, 2015). In this method, attention is focused in more of one subunit, which allows for a better understanding of the phenomenon under study and makes the results obtained more robust and convincing (Löbler et al., 2014).

Siggelkow (2007) emphasizes uniqueness, representativeness, distinctiveness, potential for illustration, and inspiration for new theoretical discoveries as selection criteria in choosing the unique case. In this research, the entrepreneurship ecosystem of Sergipe was selected, which has attracted the attention of the business community, the government and society, but for which there are still no studies on its general panorama. Other reasons for the selection of the case are given at the end of this section.

Because it is important to collect and triangulate different sources of data in case studies (Yin, 2015), three sources of evidence were used in this research: Documentation, non-participant observation, and interviews. The documents analyzed were: 1) Sebrae report with a survey on startups in the state of Sergipe; 2) Inova + Sergipe report on mapping actors; 3) reports from the startups database of ABStartups (StartupBase) and Startse on mapping local startups; 4) reports from the Centelha program[1] on mapping actors.

The direct observation carried out while attending events with topics related to the entrepreneurship ecosystem of Sergipe aimed to identify the actors and the actions carried out in the state. Thus, it was possible to establish a first contact with the field and identify its actors. Interviews were conducted using semi-structured scripts according to the role each actor plays in the ecosystem: startups or other actors (mentors, investors, institutions and supporting professions, universities - specifically for managers associated with the field of entrepreneurship). Each interview script was structured according to the elements listed in Table 2, which represent the categories and analysis elements of this study.

The actors present in the Inova + Sergipe movement were defined as the basis for the selection of interviews. In order to identify other important actors, the technique of snowball sampling was used, also known as informant chain (Biernacki & Waldorf, 1981; Vinuto, 2014), in which interviewees named other important informants. This technique was used because there was no mapping of actors in the Sergipe entrepreneurship ecosystem, which made it difficult to access them.

Since there is no ideal number of participants in qualitative research, the number of respondents was determined by the criterion of theoretical saturation, when responses began to be repeated and no longer generated new data (Bardin, 2010). In this way, 15 (fifteen) interviews were conducted and almost 13 hours of data collection. It was 10 interviews with the different actors and 5 with the owners or managers of the startups. To ensure the confidentiality of the actors interviewed, their names were kept confidential and presented as actors A–J and startup managers A–E.

Given the snowballing technique and the fact that it is a limited network of people, a cluster analysis was performed using NVivo 12 Pro® software to check for response bias, which proved that the interviews provided different views among participants.

The characterization of the interviewees is shown in Table 3.

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[1] Initiative formed by the Brazilian Ministry of Science, Technology and Innovations (MCTI), Financier of Studies and Projects (Finep), National Council for Scientific and Technological Development (CNPq), National Council of State Research Support Foundations (Confap) and CERTI Foundation to stimulate the creation of innovative enterprises and entrepreneurial culture in Brazil.

Table 3 – Actors consulted

	Function		Type of actor
Actors	Actor A	Unit leader	Facilitator
	Actor B	Technology and Innovation Program Coordinator	Source of funding
	Actor C	Coordinator	University
	Actor D	Coordinator of the Chamber of Technology and Information	Support organization
	Actor E	Owner	Facilitator
	Actor F	Coordinator	University
	Actor G	Owner	Facilitator
	Actor H	Superintendent	Support Organization
	Actor I	Superintendent	Support Organization
	Actor J	Technical Director	Facilitator
Startups	Operating time		Area
	Startup A	6 Years	Finance
	Startup B	Less than 1 year	Education, Games and Mobile
	Startup C	Less than 1 year	Education
	Startup D	15 years	Games
	Startup E	10 Years	Software

Source: The authors (2022).

In order to analyze the results of the interviews, content analysis was used with the steps of preliminary analysis, material exploration and processing of the results, inference and interpretation (Bardin, 2010). The categories of analysis used were previously defined based on the literature analyzed and correspond to the elements and components of entrepreneurial ecosystems presented in Table 2 and conceptualized in the theoretical foundation.

In applying Bardin's (2010) content analysis, the three chronological steps of data processing were followed: 1) pre-analysis, which consists of the selection and organization of the material to be analyzed in order to systematize the initial ideas - carried out through the selection of documentation, transcripts of interviews and reports of direct observations; 2) material exploration, which refers to the phase of analytical description through the application of material coding techniques - carried out based on the categorization of the data from the three sources already mentioned according to the analytical categories (ecosystem elements and their respective components); and 3) the treatment of the results, conclusions and interpretations intended for the conclusions and interpretations of the collected data. To facilitate this process, NVivo 12 Pro® software was used, in which the transcribed texts of the interviews, notes from non-participant observation, and documents were archived.

In addition to this tool, cluster analysis was used to group respondents by similarity. In the results analysis section, in order to optimize space and avoid repetition, we presented the interviewees' statements that summarized the group's perception on each of the constructs identified in Table 2.

3.1. Sergipe entrepreneurship ecosystem

In Sergipe state, there are 34,381 companies (CEMPRE IBGE, 2021) and at least 40 startups in full operation, according to a joint survey by Sebrae, Startse and Startupbase. In addition, the Entrepreneurial Cities Index - ICE (2020), highlights Aracaju - capital of Sergipe State - in the pillars of regulatory environment and entrepreneurial culture, showing that the time of processes, tax costs and fiscal facility are attractive for the activity of entrepreneurs in this city.

Moreover, in Sergipe there has been a movement to create startups for at least a decade, operating since 2012 with the aim of developing the state's entrepreneurship ecosystem (Felizola, 2020).

Another action worth mentioning is the Inova + Sergipe project, launched in 2018, with the participation of important actors of the Sergipe entrepreneurship ecosystem, such as Federation of Commerce of the State of Sergipe (FECOMERCIO), universities, the City Hall of Aracaju, the Sergipe state government, the Electricity Company of Sergipe (CELSE), the Bank of the State of Sergipe (Banese) and the Bank of the Northeast of Brazil - BNB. This project was developed with the objective of promoting the socio-economic development of the state with actions in innovation, creativity, job generation, and startup acceleration and pre-acceleration.

In Sergipe, the efforts of a group of actors are known, such as Brazilian Micro and Small Business Support Service (SEBRAE), Caju Valley, the Tiradentes University (UNIT), Federal University of Sergipe (UFS), Federation of Commerce of the State of Sergipe (FECOMERCIO), Foundation for the Support of Research and Technological Innovation of the State of Sergipe (FAPITEC/SE), Technological Park of Sergipe (SERGIPETEC), the Institute Euvaldo Lodi (IEL) and Federation of Industries of the State of Sergipe (FIES), Acelerase (Startup Accelerator in Sergipe), National Service for Commercial Learning (SENAC) for the development of entrepreneurship in the state, especially with regard to the strengthening and creation of innovative companies, through the construction of strategies that bring together these actors and promote the process of accelerating startups (Martins, 2020).

Even with these actions, the state of Sergipe does not appear in any research in which successful ecosystems are highlighted, and for these reasons, it is believed that it has particularities that allow analyzing the existence of critical elements and challenges to the success of an entrepreneurship ecosystem.

4. Presentation and analysis of results

The presentation and analysis of the results in this study is in accordance with the categories of analysis arranged in Table 2 and established in the proposed framework (Figure 1). Thus, the cultural, social and material elements of the Sergipe ecosystem of entrepreneurship are presented and discussed.

4.2. Cultural elements

In the case of cultural elements, success stories and cultural attitudes were analyzed. Regarding success stories that promote the performance of ecosystem agents, respondents mentioned the story of six startups, namely: 1) Pagcerto (Actors A; D; E; F; G; J; Startups A; B; D; AND); 2) Lumengames (Actor G; Startup B); 3) Filazero (Actor E); 4) Explicaê (Actor D); 5) Avonale (Actor J); and 6) Quero Delivery (Startup E).

The biggest highlight was the startup Pagcerto, mentioned by ten of the fifteen respondents. They said: "I think that Pagcerto [...] is a company that started a few years ago, made the product and received millions in investments" (Actor G). On the other hand, most startups stated that success stories did not influence their decision to undertake. This finding demonstrates that, in addition to the existence of success stories, these stories must act as catalysts and models for potential entrepreneurs (Hisrich et al., 2014; Spigel, 2017).

On this subject, it was said:

> *In the area of startups, oddly enough [these stories] are still kind of hidden [...] they don't divulge that much. The disclosure is in the market niche of each one. [...] And there must be many other stories out there happening. [...] I believe that the lack of disclosure is a problem for the promotion of the ecosystem here (Actor J).*

In this sense, Sipola (2021) clarifies that the dissemination and appreciation of success stories is related to the corporate culture of the region and is more likely to be accepted if there are social-entrepreneurial incentives in the environment. Moreover, the non-publication of these stories contrasts with the findings of Cervantes-Zacarés et al. (2021), who report that it is common in these ecosystems for the media to publicize positive information to stimulate the entrepreneurial behavior of individuals, which can be an alternative to activate the potential of this element in the context of Sergipe.

To understand the element of cultural attitudes, respondents were first asked about entrepreneurial culture and innovation. About entrepreneurial culture, some of the interviewees said the following: "I see in Sergipe, I do not know if because of its size, I do not know if because of the mentality of the people, but I see that [...] the entrepreneurial spirit here is still a little slow in terms of developing their own businesses (Actor A).

Entrepreneurial culture is also composed of elements such as risk and fault tolerance, innovation, creativity and experimentation, and the image of entrepreneurship. About risk and fault tolerance, it has been said:

> *Error tolerance is a big problem that we have here, and no longer just in Sergipe, but in all of Brazil. [...] The tolerance for error is very low [...] You want zero risk and zero risk does not exist [...] Do you want to do something different? There is a risk of doing something wrong (Actor I).*

This statement confirms that tolerance for mistakes and failure was nonsignificantly positive, showing that in Brazil the tolerance for failure in the entrepreneurial process is very low (Silva et al., 2021).

To reverse this perception of mistakes and failures, and to become a consolidated ecosystem, the Sergipe ecosystem needs to create social level understanding that failure can be positive and can help create economic and social value through new experiences of entrepreneurs (Marineau & Nordstrom, 2020). When the local community is quick to embrace entrepreneurs and their experiences, they are not embarrassed, they are encouraged to continue in new businesses (Feld, 2012), and they recycle and share their experiences, creating an ecosystem strengthening environment where failure is understood, tolerated, and not punished (Spingel & Harrison, 2018).

On the other hand, the state government, in collaboration with other spheres of power (municipal and federal), must propose public policies and develop campaigns that affect societal values and attitudes toward entrepreneurship to reduce the stigma of failure and increase society's appreciation about business practice (Fuerlinger et al., 2015) in Sergipe.

Innovation, creativity and experimentation were also not expressive in the respondents' statements. They said that: "We still have a cultural problem, which is to make sure there is no barrier to innovation" (Actor I); "Nobody believes in innovation here. This is a fact" (Startup E).

In this sense, it was also said that there is an institutional movement to change this scenario:

> *There is a connection between a culture of innovation and experimentation. The universities play an important role in this regard, UFS, UNIT, ITP, Embrapa, ITPS, ITPI, these actors are responsible for this culture of innovation, creativity and knowledge, because this is the mission of the university and the research Centre. They strongly promote this theme (Actor E).*

Given the reliance on universities to stimulate innovation, it is assumed that the ecosystem under study is at an emergent and/or nascent stage, as the importance of universities is greater in fragile ecosystems (Pita et al., 2021). It is not intended here to reduce the importance of universities, but to reiterate that the development of innovation and entrepreneurship ecosystems requires support in multiple dimensions, including integrated action of technology and capital components (Yuan et al., 2022) arranged in entrepreneurs, private investors, large companies (sharing and diffusion of innovations), public policy, and government agencies (Aaltonen, 2016).

Regarding the good image of entrepreneurship, respondents reported almost unanimously that the population of Sergipe prefers other professional activities. About it was said:

> *In Brazil as a whole, especially in the Northeast, it seems that the student leaves graduation and sees the job market to work for others or apply for a public job. There is a third way out, which is to take the acquired knowledge and set up your own business and the government wants to invest in that, that is, it wants to create this third alternative (Actor B).*

> *Speaking specifically of here [Sergipe], there is an additional challenge because you have a region that has no history, a region where the mentality is very much to have a public job or to work within the benefits of the CLT [Consolidation of Brazilian Labor Laws], which creates a hostile environment for the entrepreneur (Startup A).*

In this context, it is believed that the preference for public jobs is due to the low disclosure of the benefits of companies/entrepreneurs working in innovative and commercially profitable areas.

4.3. Social elements

For this category of analysis, aspects of networks, leadership, financial capital, and human capital were addressed. Regarding the networks, we tried to analyze the interaction between the actors of the ecosystem, the events and the entities responsible for their organization. When asked about the existence of the network, opinions differed. Some respondents considered that the ecosystem actors have already formed a network (Actors A; B; E; H; I; Startups B; C; E), others indicated that the network is in the process of formation (Actors D; F; G; J; Startup D), and some reported the existence of isolated groups, not networks (Actor C; Startup A).

Two movements were mentioned as promoters of the network: the first was Caju Valley (Startups B; C) and the second was the Inova + Sergipe movement (Actors B; D; E; G; H; I; J; Startup C). About these movements it was said that: "So the nodes are there, just need to create more connections. Inova + Sergipe comes with the intention of infiltrating this potential network that has been built, but needs to improve the interactions, the relationships" (Actor H).

> *There is no network, there are isolated actions, people doing isolated things, institutions doing isolated things. [...] But the network does not exist at all, and they do not look for each other. Everybody does their work in isolation, and they arrange to do some things, but the thing does not flow, it does not take shape because they have a lot of personal interests. People want to ride the wave rather than necessarily build an ecosystem (Actor C).*

Thus, the isolated action of ecosystem actors limits its development and diffusion by preventing the sharing of knowledge, strategies, and perspectives, as well as the provision, access, and mobilization of resources human, material and infrastructure, which are fundamental to the consolidation of entrepreneurship ecosystems (Komlósi et al., 2022).

To analyze the engagement of the actors, documents (websites and invitations from ecosystem actors) were also reviewed to list the events that take place in the state and promote the ecosystem. In this sense, an extensive list of events promoting entrepreneurship and innovation in Sergipe was discovered, such as the Hackathon Marathon (UFS and Sergipetec), entrepreneurship Ecosystem Meeting (SEBRAE), SEBRAE Entrepreneurship and Innovation Marathon (UFS and SEBRAE), Startup Day (IFS), Startup Weekend Edu Aracaju (UNIT), Launch Inova + Sergipe - success stories (FECOMÉRCIO, SESC, SENAC), Global Entrepreneurship Week (SEBRAE), StartupON Aracaju (ABStartups), and many others.

On participation in these events, it was said:

> *We have already held several meetings with Finep itself and BNDES, we have held events and talks, we have supported Caju Valley, we have done two pre-acceleration programs with SEBRAE, so we are already talking about 30 startups with at least one well-organized idea. So, we have taken interesting, concrete steps (Actor E).*

About the main actors for organizing events, the interviewees were convergent in indicating the state's federal university: “Among all [organizers], I believe that universities are our greatest partners. UFS is the greatest partner we have, a great partner that assists us in each of our events” (Actor A). During the interviews and participation and organization of events, other actors were identified as members of the network, namely: Aracaju/SE City Hall, Federal Government, municipal and state secretariats, IFS, UFS, UNIT, FECOMERCIO, FIES, Caju Valley, SEBRAE, Finep, BNDES, Tiradentes Innovation Center (UNIT), Entrepreneurship Center (UFS), SERGIPETEC, Accelerase, Fanese, FAPITEC and Rede+.

Regarding these events, although they are believed to serve to strengthen engagement and connection among actors (Wiele, 2017) and are held with considerable frequency in the Sergipe ecosystem, contrary to what has been observed in Amsterdam (Castagnetti & Zelatti, 2018), their practical impact depends on the elaboration of an action plan that defines contributions, deadlines, and responsibilities among participants, thus, these events must lead to integrated actions and not just thematic meetings and/or lectures.

Moreover, networks and collaborations in entrepreneurship ecosystems, whether at events or other forms of networking, should include many potential partners besides universities (that stand out in the case analyzed), including emerging entrepreneurs, micro and small businesses, venture capitalists, key users, end users, academics, mentors, and negotiators (Scott et al., 2022).

In terms of leadership, responses differed by actor group - startups or other actors. The evaluation of the different actors was positive (actors A; B; C; D; E; H; I; J). Only one startup indicated that leadership exists, although it does not consider it effective (Startup E), and the others rated this element mostly negatively (Startups A; B; C; D). The leaders mentioned by the respondents were: the Inova + Sergipe movement (Actors B; C; D; E; I; J); Clube Impulse (Startups D; E); LIDE Group (Startup D); and the Council of Young Entrepreneurs - CJE (Actor J).

It was said:

> *At the time of the Caju Valley, it was even more active, the person in charge was able to gather [and] publicize the ecosystem. But now, it no longer has strong startup leadership. The Caju Valley is deactivated. [...] And we are looking for leadership. [...] So the Caju Valley is now at a time of rethinking, to see what it is really going to do to help the community and who is going to be ahead of it (Actor G).*

> *The leadership of this ecosystem, which was very dispersed, returned with Inova + Sergipe [...] these leaderships are important. And you can clearly see that when there is a lack of leadership. This happened*

> *with the Caju Valley, where there were no more meetings [...] it was stopped and there were no actions, no meetings or anything (Actor D).*

Regarding accessibility to entrepreneurial leaders, it was noted that: "We have a lot of access, both to the authorities and to people in general, that is a very clear feature here in Sergipe. It is very easy for you to talk to the Secretary of State or even the mayor" (Actor H).

> *Access to Inova + Sergipe is a very simple matter. Since almost all economic institutions are involved, it is enough to contact one of them to get access. If you are from the commercial or services sector, contact FECOMÉRCIO; from the industrial sector, contact the Federation of Industries; if you have a technology-based company, contact Technological Park. So, you have institutions from different areas. If you do not know who to contact, just contact one of them. So, access is easy. What we still need to improve is communication, so that people know that we exist (Actor I).*

Regarding leadership, the Sergipe ecosystem is limited to the performance of a few groups, which makes its development difficult. For this reason, it is necessary that this leadership be reinforced by entrepreneurs, government officials, and university members with effective thinking and knowledge of the peculiarities of the region, in order to stimulate, support, and promote local entrepreneurship (Roundy, 2021).

However, entrepreneurial leadership outcomes tend to be more effective, including in the Sergipe ecosystem, when a collective and bottom-up approach is taken, when formal and informal leaders are present (and recognized), when social proximity is encouraged, when leadership is guided by mentoring (Castagnetti & Zelati, 2018), when leadership is flexible, when innovative practices are disseminated, when networks and resources schemes sharing are created (Roundy, 2021).

Concerning mentoring, Startups A and D reported offering this service to the Tiradentes Innovation Center, but not to specific startups. The owner of Startup B, on the other hand, reported being mentored by another startup and an accelerator.

> *Mentoring I had from Lumengames, but it was informal mentoring. The mentoring is Accelerase, we have weekly meetings with them. [...] The existence of Lumengames was certainly a motivating factor for the creation of my startup, because its owner has always opened many doors for me, even when I was a nobody and did not know how to program or illustrate and I was trying to do something [...] Our own initiative and the doors that Lumengames opened for me, along with the mentors who showed me how to think, what events to attend, and what people to meet, created a climate of collaboration and learning that allowed me to build my initiative in a more solid and sustainable way (Startup B).*

There is low interaction between startups in terms of mentoring, knowledge and experience sharing, which weakens the emergence of leaders in this ecosystem (Castagnetti & Zelati, 2018). The limited practice of mentoring activities affects the development of the ecosystem, as these activities are essential for business success, as mentors help entrepreneurs overcome setbacks in the early stages of company (Sanchez-Burks et al., 2017).

As regard financial capital, some of the respondents indicated that there are enough sources for the State of Sergipe (Actors A, C; D; E; F; G; I; Startups A; B; D; E) and others reported that these sources are scarce (Actors A; H; Startup C). It was said that:

> *Money has! [...] The point is that the startups are not organized and showing their projects. I think that the moment we manage to organize startups and create events for investors, investments will appear. [...] So there is an investor, there is money to invest, but these startups have to present good products (Actor G).*

It follows that investment capital is available in the assessed ecosystem, but few have access to it, certainly due to the lack of innovative projects (Penkov et al., 2021) and a legal structure that encourages investors to invest in startups and newly formed companies (Torres & Souza, 2016). Some sources of investment were highlighted by interviewees, such as the Centelha Program (Actors B; D; H; J); SEBRAE (Actors B; D); BNB (Actors C; D; E; F; Startup B); Bank of Brazil (Actor C); Santander (Actor C); Petrobras (Actor D); Banese (Actors E; F); Finep (Actor E); BNDES (Actor E); and sergipanas investment organization - FASM Investments (Actor C).

Thus, the financing options and investment sources available in the Sergipe ecosystem are similar to other ecosystems in that they are distributed among government capital, banks, and private institutions. However, to avoid dependence on governments and banks, a greater diversity is needed of private institutional actors, such as angel investors, private investment funds, venture capital, and corporate finance (Frimanslund, 2022).

In terms of human capital, opinions were predominantly negative, with nine of the fifteen actors interviewed stating that the talent in Sergipe is not trained for entrepreneurship and the creation of startups (Stakeholders C; D; G; I; J; Startups A; B; CD).

In this regard, the respondents said:

> *The point is that depending on the startup, it can be difficult to find talent. We work with technology and creation, so it's harder [to find professionals]. It often happens that companies that need similar talent here in Aracaju fight for the same names. That's good for the professionals, but bad for the company (Startup B).*
>
> *In our case, we do not find qualified professionals here in Sergipe. [...] What we have done is to change our selection process. Before, the focus was on people who knew how to make games, now we work with people who have soft skills [...] If you do not have technical skills, but you can communicate well, solve problems, we give you a 6-month training to be able to enter a project (Startup D).*

To reverse this situation, it was said:

> We have good universities here, good degree programmes, but I have already talked to most of the people who are part of the academy that we need to improve the curriculum. In other words, in the world we live in [...] and driven by new technologies, curricula should cover topics like artificial intelligence, Internet of Things, augmented reality, etc. This conversation with the academy has been going on for some time, but it does not resonate as much with universities. It's about linking emerging knowledge to market demand. [...] And also, the number of graduates in the technology areas is minimal (Actor D).
>
> *When you leave college, you are a graduated student, not a professional. And companies need professionals. So, this mismatch between universities and the job market is a big problem. The model, the system itself, is very outdated. It's almost as if the market has to adapt to the universities and not the other way around. In practice it is not like this, because real life is different (Startup A).*

Nevertheless, some respondents see a first movement to change this reality, as they say:

> We are on a good path [...] there is a specific sector of entrepreneurial education at SEBRAE itself, which has already been doing quite a bit of work, the state government itself [has] initiatives to include entrepreneurship in secondary education schools (Actor E).

Given the dissatisfaction of respondents and the emerging actions to improve the quality of human capital in the studied ecosystem, initiatives to value and identify work skills should be promoted and implemented; desirable knowledge and experience need to be defined; and innate or learned entrepreneurship should be valued (Østergaard & Marinova, 2018), including from the incentive and academic-managerial monitoring of startup activities in universities (Maritz et al., 2022).

In order for human capital to be qualified to meet the demands of the ecosystem, universities and other educational and training institutions need to foster students' entrepreneurial intentions by highlighting the personal and professional skills valued by the market and by offering a mentoring program with methodical supervision and a high degree of mentor specialization (Ferrandiz et al., 2018).

Still on the human capital element, it was commented on the access to talents from other countries. In this regard, it was observed that:

> There is one thing that leaves a lot to be desired in Aracaju, and I do not think there will be a solution for it: the local infrastructure for people who speak English. We spent a year and a half with a game designer from Vancouver who came here [and had difficulties with the language]. If you want to bring the game industry here, working in English is one of the first requirements, because the market is international. [...] We only hire people with fluent English (Startup D).

The local difficulty in finding spaces and establishments able to receive native speakers from other languages demonstrates a barrier of national proportions and not only of the ecosystem studied. On the other hand, in search of growth and professionalization, the actors of the Sergipe ecosystem should stimulate the training of bilingual professionals and the internationalization of startups, which tends to make it aware that the English language is the global language of business (Vendruscolo & Galina, 2020).

4.4. Material elements

The material elements are represented by the regulatory environment, markets, supporting infrastructure, and universities. Regarding the regulatory environment, it was noted that the government takes few measures to support entrepreneurship, especially startups, on the other hand public institutions do not play a negative role according to the respondents. Regarding this aspect, the following was noted, "I think the government is taking measures that promote and improve

[entrepreneurship], but they are extremely timid measures" (Actor F); "The government doesn't help, but it doesn't hinder either" (Actor G).

Regarding the timing of opening businesses, the actors gave a positive assessment, highlighting the performance of the Chamber of Commerce of Sergipe (JUCESE): "The time to open a business here in Sergipe is still shorter than in other states" (Actor C); "The Chamber of Commerce here has made great progress, in terms of opening a business, we are doing very well" (Actor H).

Regarding legislation related to entrepreneurship, respondents rated this element negatively, mainly due to the lack of local laws regulating startups (Actor E; Startups A; E), they said that: "there are currently no state or municipal laws that directly affect our business model" (Startup A). Actor E also said:

> *We do not have a state innovation fund, we do not have legislation that favors innovation or the establishment of new companies, like the regions that are marked as development poles, with tax breaks. There is nothing in this direction to encourage entrepreneurship and innovation, such as innovative companies, income tax breaks, or anything else that could serve as an incentive (Actor E).*

In fact, the tax system in Sergipe, as in the rest of Brazil, is a restrictive factor for the growth of the ecosystem, mainly due to high interest rates, slow processes, and few incentives for business practices (Torres & Souza, 2016).

It is clear, then, that while the government's actions in Sergipe have not been effective, they have not been a hindrance to the actors. On the other hand, this timid action by the government has limited the growth potential of this ecosystem, which, as in Germany, requires improvements in the regulatory environment, entrepreneurship education, creation and dissemination of support and financing programs for new businesses, creation of spin-offs, efficiency of the judiciary (for commercial disputes and bankruptcies), and business qualification so that companies are prepared for the changes in the market (Fuerlinger et al., 2015).

Regarding markets, respondents were asked about local, national and international market. Regarding access to these markets, most respondents indicated that this is not a problem in the entrepreneurship ecosystem of Sergipe (Actors A; D; E; Startups A; B; C; D; E), as long as they are startups in specific areas such as information technology. Regarding the international market, some interviewees stressed that: Here we have access to everything. It does not matter if you are in Aracaju, Fernando de Noronha or in the middle of the Amazon. You can be anywhere, because with a good Internet you can sell software [and] international services (Startup D).

> *If you work with a physical product and you want to export it, you have problems with customs, with export processes that are much more complex. [...] For us, it's easier to sell abroad than to São Paulo (Startup E).*

However, with respect to the local market, the assessment was mostly negative (Actors A; D; G; I; Startups A; B; D; E). According to the interviewees, there is no sufficient market for the performance of local startups, as companies in Sergipe do not absorb startups and there is no demand for new startups, as reported below:

> *Our main customers are located outside of Sergipe. In fact, we even have some customers in Sergipe, but nothing representative. The biggest customers are in Recife, São Paulo and Minas Gerais. So, we can enjoy the quality of life we have in Aracaju without depending on the local market, because if I depended on the local market, I probably would have left it already (Startup A).*

> *Local companies do not take advantage of startups founded here, that's an obstacle [...] But you cannot blame one side or the other, because if you do not have good projects that attract companies to work side by side with startups, then that relationship does not develop. I think there is a gap on both sides. First, startups are starting to better understand how companies work here, how they need to develop solutions for the local market [...] and when you develop something here, the tendency is for it to be scalable to other markets (Actor D).*

This statement points to the need for leadership in the ecosystem under study, as this element includes building networks of contacts and studying the characteristics of the region to stimulate, support, and promote innovation and local entrepreneurship (Roundy, 2021). In addition, startups in the Sergipe ecosystem must conduct careful analysis and market research to identify the needs of their corporate clients and demonstrate that the products and services offered have the potential to increase the visibility of the client company, highlight the brand, and facilitate their expansion processes into new markets (Hubert, 2017).

The infrastructure and facilitators element examined aspects of physical infrastructure, supporting professions, facilitators, and supporting organizations. Physical infrastructure, in the form

of the Internet, was rated well by the respondents. One of them said: “It has improved a lot, we have access to fast internet, fiber optic cable and high connectivity” (Startup D).

The logistics and transport infrastructure were not rated well by the respondents.

> *And there is one more thing that we need to improve here, which is our distribution network. We have Internet, energy [...], a thermoelectric power plant. So, our problem is the roads networking's. Our air network is bad for our state. In the road network, we have lost time compared to other regions of the country. Our rail network does not exist, and our maritime network has some difficulties (Actor F).*

Whether or not it is an entrepreneurship ecosystem, the diversity of transport modes and logistics infrastructure has a positive impact on the region's GDP and international trade (Wang et al., 2021), for this reason should be the subject of public and private policies and investments in the ecosystem studied.

When asked about the existence of support professions in Sergipe, actors indicated that there are few professionals specialized in startups in the state (Actors A; B; C; D; E; G; I; J). All startup managers indicated that there are no specialized professionals and that in some cases legal and accounting advice is provided in other states: "Nothing is from here. Our legal advice comes from São Paulo, our accounting from Recife" (Startup A); "There are two offices in São Paulo that give us legal advice. We also have a law office in Vancouver" (Startup D); "I cannot find an accountant to help me close or open a business abroad. And that is critical for many startups (Startup E). This view is shared by another respondent who said:

> *We have thought about opening another company outside the country, whether in the United States, Canada, or Ireland [...], but the accountant here has no idea how to do it. He knows Brazilian law, but not from outside [...] that is sorely missed (Startup D).*

Although respondents emphasized the need for international accounting specialists, the consolidation and maturation of this ecosystem will also require trained and experienced professionals in marketing, management, and recruitment (Brow & Mason, 2017).

Regarding facilitators, respondents were asked about the performance of incubators, accelerators, coworking spaces, and technology parks. Regarding these elements, they reported that this is a timid scenario (Actors C; D; E; F; Startups A; B; C; D; E) but that it has improved (Actors B; C; G; H; I; J; Startups B; D).

As for accelerators, in Sergipe there is only Accelerase, founded in 2018. On this topic, respondents said that "there is only one accelerator [...] but it is a very small accelerator. I think other accelerators should come here too; I think there is a market for it" (Actor G); "The first accelerator in Sergipe is Accelerase. They are attracting investment funds to here" (Startup B).

Regarding incubators, respondents consider that there were few of them (Actors B; C; D; G; Startups A; E). They also indicated that four incubators have already been closed in the state of Sergipe (Actors B; D). A problem highlighted by some interviewees (Actors D; G; H; Startup C) regarding incubators is the fact that there is a physical structure but no support for incubated startups, because: "this still needs to develop, because an incubator is not just a physical space, but a whole support and assistance service that we do not have here yet" (Actor G).

It was also mentioned about the emergence of other incubators in Sergipe:

> *The Tiradentes Innovation Center will work with EdTech [education startups] and have incubation space and shared space. The structure is cool. And the managers there are very open, they have a very good mind and the idea is that we are building a good way (Actor J).*

> *Tiradentes Innovation Center of UNIT for two reasons: first, because it is a private initiative and needs results [...] and second, because the investment has been made, the partners they have are big companies in the business field, which focus on entrepreneur, they have a lot of expertise. So, there is a very high probability that the outcome will be very positive (Startup A).*

Whether Accelerase or Tiradentes Innovation Center, for incubators to achieve results, they must attract the attention of economic and social actors such as universities, research centers, entrepreneurs, financial agents, venture capitalists, government agencies and research institutions in an environment that brings together that brings together infrastructure, management, human resources, funding (Rizzi et al., 2017), and mentoring (Assenova, 2020).

In the context studied, only one technology park was identified: Sergipetec. Regarding Sergipetc, there was a mostly negative evaluation (Actors C; D; E; F; G; Startups A; D; E). It was said:

> *Sergipetec today practically only gives courses, I have no news that it effectively helps the companies founded there, this is a very bad thing, a very needy service offer. [...] The problem of Sergipetec is the lack of understanding of its role and the political issues. Today, Sergipetec works more like a secretariat or a government agency than like a technology park itself. [...] It does not facilitate the main function, which is*

> *the location and development of technology-based companies, a strong involvement with universities and research centers. [...] There is none of that (Actor E).*

In addition, the reasons for the negative evaluation of Sergipetec were different: lack of an incubation process (Actors C; E; G; Startup E), no promotion of entrepreneurship and innovation (Actors C; D; E; F), and location (Startup D).

In order to reverse the poor impression of the performance of this technology park and achieve the expected results, Sergipetec must work on the elaboration and implementation of activities and strategies for better allocation and efficient use of regional resources; provide specialized training; accelerate technology transfer and innovation processes; reduce business risks for startups and entrepreneurs; allocate and share resources; provide financial support for business scalability; provide services (mentoring, consulting, legal advice, etc.); creating and managing collaborative networks; and working with universities to generate entrepreneurial and academic knowledge (Konarev & Konstantinova, 2019).

Concerning coworking spaces, interviewees reported that there are already several of these spaces in Sergipe (Actors A; C; D; E; G; I): "We have 15 to 20 coworking spaces here in Aracaju today" (Actor A); "it is one of the largest numbers of coworking spaces in the country, it is even difficult to explain" (Actor I). However, in relation to the performance of these spaces, the same problem was mentioned: there is a physical structure, but no guidance and support, because "there is no coworking space that is not offered only for rent" (Startup E).

Finally, the support organizations component was valued differently by respondents depending on the group they belong: startups or different actors. For the actors interviewed, this component was unanimously analyzed as positive, while for the startup managers it was analyzed as negative. However, the most mentioned organizations were convergent: SEBRAE, FECOMERCIO, FIES and IEL. It was said that: "SEBRAE, FECOMÉRCIO, all these people like IEL, FIES, all the people from Inova + Sergipe [...] work together us" (Actor B).

Sebrae was the most frequently mentioned support organization among the actors surveyed and the only one among the startup managers who also stated: “Sebrae helped well in the beginning. Organization itself I never felt much about Sebrae. I think SEBRAE helps the more traditional companies a lot, but for startups, I think Sebrae are more events than things that really help” (Startup B).

The universities were evaluated positively by the interviewees. On the other hand, while some actors consider Sergipe universities to be very active in terms of entrepreneurship and the creation of startups (Actors A; C; D; E; I; J; Startups B; D; E), others claim that this action is shy (Actors B; F; G; H; Startups A; C). About these institutions, respondents said:

> *The University Federal of Sergipe (UFS) into the process of entrepreneurial education, demystifies what entrepreneurship is, and encourages students to come up with creative ideas. The Federal Institute from Sergipe is also strong, it has created an entrepreneurship and innovation area and now has an innovation directorate and an entrepreneurship directorate. The Tiradentes University (UNIT) with Tiradentes Innovation Center now has its own environment for this [innovation and entrepreneurship]. Estácio Faculty has an industrial fair program that was even awarded the SEBRAE prize for entrepreneurial education [...] but these are isolated actions (Actor C).*

> *[At UFS] the entrepreneurship area has become the Entrepreneurship Center, which is connected to the rectory and already says something; UNIT's millionaire investment in the Innovation Center [also]. So, I think that everyone needs to come, that other universities can also get involved in this environment [...] UFS and UNIT have made great strides in departments and areas dedicated to entrepreneurship, this also shows the real interest of these institutions in entrepreneurship and innovation (Actor E).*

In addition, universities – especially UFS and UNIT – were evaluated favorably for other reasons: Incorporating entrepreneurship into the curriculum (Actor E); improving courses (Startups B; D); fostering a culture of innovation, creativity, and knowledge (Actor E); creating new courses, such as games (Startups B; D); partnering with international institutions (Actor E); partnering with players in the entrepreneurship ecosystem (Actor A).

On the other hand, some issues related to universities in Sergipe were considered negative, including lack of appropriateness of courses for the market (Actor D; Startup A); initiatives aimed at the smooth running of the university, making it difficult for other actors to access what is produced (Actor J; Startup E); and the lack of interaction between startups and universities (Actor B).

Although the performance of universities in Sergipe is not unanimously assessed by respondents, these institutions have built initiatives focused on innovative ideas, teamwork, networking, development of strategic relationships, funding, ideas induction, training, and education in

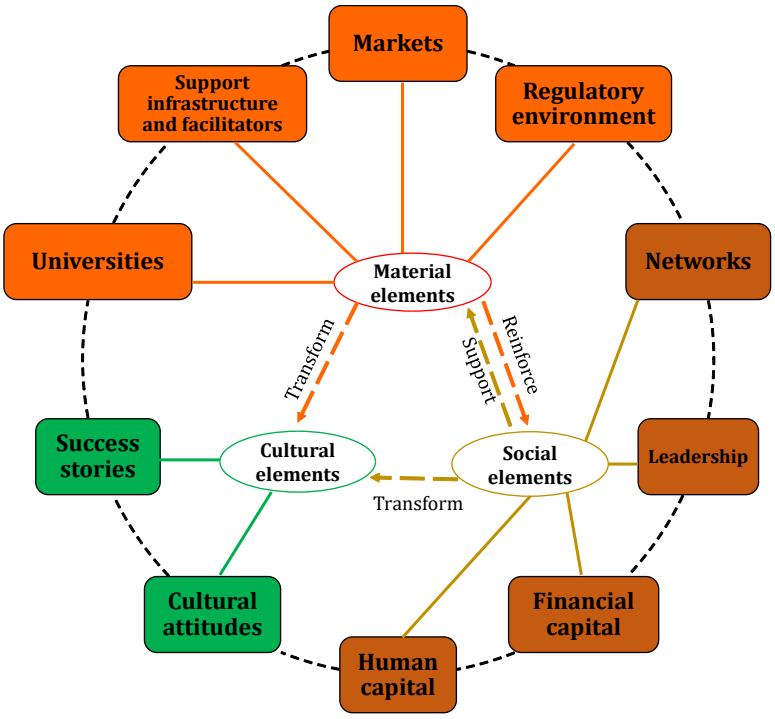
business management (Shil et al., 2020) that should produce positive results in this ecosystem in the coming years.

4.5. The elements of Sergipe's entrepreneurial ecosystem

Given the analysis of all the elements of the entrepreneurship ecosystem of Sergipe, it is not possible to perceive the relationships previously established by Spigel (2017) and preserved in the framework proposed in Figure 1. First of all, it is assumed that the ecosystem in question is in an initial phase (Martins, 2020) and therefore not all elements are present and can be found in the state. In addition, the cultural elements should be the foundation for the ecosystem, but cultural attitudes and success stories were the elements with the worst ratings by respondents. Consequently, the relationship that the cultural elements support the emergence of the other elements is not supported in this case.

Therefore, in the proposed framework, the cultural elements should support the emergence of the social elements and then the material elements. In Sergipe, however, the process was identified differently: The social elements and the material elements were first encouraged and promoted, so that subsequently the local culture would transform. In other words, the Inova+Sergipe program was created, acting as a network in addition to some financial incentives (social elements). The performance of universities and other material elements were also evaluated positively in the state, but the local culture is not yet oriented towards entrepreneurship, according to the interviewees, although this situation seems to be gradually changing.

Figure 2 – Elements of the Sergipe's entrepreneurial ecosystem



Source: The authors (2022) .

Thus, the result of the research is that in the case of Sergipe, the social elements support the emergence of the material elements that reinforce them (maintain frame relationship), but the material and social elements change the local culture that, contrary to what was initially proposed, has been less resistant to entrepreneurship, innovation and creativity, as can be seen in Figure 2.

5. Conclusions

Considering the academic and business significance of entrepreneurship ecosystems, this study sought to analyze the existence of critical elements and challenges to the success of the Sergipe entrepreneurship ecosystem. In this scenario, it was found that although the ecosystem studied is in its nascent stage, the critical elements arranged in cultural, social and material elements are present. However, these elements are underutilized and represent both opportunities and challenges for the Sergipe entrepreneurship ecosystem.

Regarding the cultural elements, there is a need for greater dissemination of success stories, including in digital and traditional media, in order to share successful business and technological

actions capable of encouraging potential entrepreneurs. In this context, it was also perceived local and state authorities need to promote the local entrepreneurial culture through educational and promotional campaigns that activate the belief in entrepreneurship and highlight the benefits in creating jobs, income, attracting investment and legitimizing businesses in the region. In addition, it is important that entrepreneurship is a cultural element of the entire population and not only of the actors engaged in institutional, commercial and/or technological activities.

Concerning the social elements, the main finding is that the actors involved must act in an integrated and continuous manner (without interruptions) under the direction of a business and/or government leader. In the ecosystem studied, it became clear through the events and processes discussed that this leadership must be shared by universities, support organizations and government agencies, which must not only maintain institutional relationships, but also establish responsibilities, timelines, and goals for ecosystem development.

Another aspect that should be highlighted is the dependence on direct and/or indirect government investment. In order to realize the potential of this ecosystem, it is necessary to improve the forms of presentation and communication of innovative projects and to attract a greater variety of investors in the form of angel investors, private investment funds, venture capital, and corporate financing. Furthermore, the capital invested in the activities of this ecosystem should not only generate new products and services, but also stimulate technical-technological processes and promote the legitimacy and reputation of the Sergipe ecosystem.

Some dependence on universities for the "functioning" of the ecosystem under study was also noted. However, although universities are fundamental actors for entrepreneurship and innovation, institutional and corporate diversity is required for ecosystem actors to generate innovation, knowledge, technology transfer, and economic development. In addition to their institutional actions, it is necessary for universities to expand their teaching to include topics such as digital transformation, Industry 4.0, and artificial intelligence, which are fundamentals topics for entrepreneurship ecosystems.

As for material elements, the need was realized to optimize the state's modes of transport, especially the air and road network, which has higher costs than other states and affects the competitiveness of this ecosystem. Although it is not an exclusive reality of the Sergipe ecosystem, there is an urgent need for specific legislation for entrepreneurial activities and innovation, which with the support of ecosystem actors, should be a priority of the legislative houses in Sergipe.

In general, it is perceived that the critical elements to the Sergipe ecosystem, although present, are perceived only as formal, bureaucratic and physical aspects, needing, therefore, “to assume" its basic assumptions to guarantee the innovative-entrepreneurial development of the state. In this way, ecosystem agents must effectively cooperate to overcome the limitations and challenges presented and create strategies and policies to overcome them.

Thus, the main theoretical contribution of this research lies in the elaboration and use of a theoretical framework that integrates critical elements and components to each of the cultural, social, and material regional resources. Moreover, although the model considers national specificities, it can be replicated in other contexts in Brazil and in similar ecosystems in Latin America. From a practical perspective, an empirical portrait of the Sergipe ecosystem is presented with a discussion of elements and challenges that can support the analysis and formulation of strategies and public policies in others entrepreneurship ecosystems.

This case also contributes to new forms of existing relationships in ecosystems, taking into account, above all, that there are different stages and contexts in the regions where they are located. In the case of Sergipe, as can be seen in Figure 2, the relationships did not correspond to the original framework and relationships proposed by Spigel (2017), which reinforces the contributions of this research. Therefore, for future research, it is proposed to verify if in the other entrepreneurial ecosystems such relationships are found as originally proposed or in other ways and if there is a relationship with the stage of the ecosystem. Further studies on ecosystems in Brazil are recommended, such as those by Matos (2018) and Martins (2020), in order to make a larger in-country contribution and to make comparisons between local ecosystems.

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