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**INNOVATION ECOSYSTEMS AND STRATEGY IN THE COVID-19 CRISIS**

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WESLEY DA PAIXÃO DE OLIVEIRA

**INNOVATION ECOSYSTEMS AND STRATEGY IN THE COVID-19 CRISIS**

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Advisor: Professor Dr. João Eduardo Azevedo Ramos da Silva

Co-advisor: Professor Dr. Márcia Regina Neves Guimarães

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#### Comissão Julgadora:

Prof. Dr. João Eduardo Azevedo Ramos da Silva (UFSCar)

Profa. Dra. Márcia Regina Neves Guimarães (UFSCar)

Prof. Dr. Milton Vieira Junior (UNIMEP)

Profa. Dra. Rosângela Maria Vanalle (UNINOVE)

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## ABSTRACT

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The COVID-19 pandemic is a disturbance that forced enterprises to rethink their strategies and ecosystems to keep running. Nevertheless, there is a lack of prior register to show the best policies to adopt in such circumstances. Hence, researchers and practitioners must comprehend how companies are responding to this unprecedented health crisis. Furthermore, it is of equal importance to comprehend the pandemic consequences on ventures' strategies and ecosystems. In this sense, the research identified how four ventures handled such a situation. Through a multiple and holistic case study, supported by exploratory and qualitative approaches, the research provided a detailed description of their competitive strategies, innovation ecosystems, and the adopted measures against the crisis. The main findings were as follows: (i) The pandemic affected the studied ventures and ecosystems at different levels. The crisis severely hit the approached enterprises and ecosystems from the event and consultancy industries, especially the former. For example, the former entirely ceased their activities for a while, impacting the ecosystem activity flow. However, the pandemic boosted the businesses of the organizations and ecosystems from the telehealth and medication industries. For example, the medication case showed no change in its ecosystem composition and further capitalized from new projects that emerged due to the COVID-19 disruption. (ii) The ventures proposed changes related to the value proposition, interaction process, and activities and information flow across the ecosystem to keep running. For example, those severely affected by the COVID-19 succeeded in delivering their solutions entirely online (the consultancy industry case) or avoiding crowds (the event industry case). Further, those less affected benefited by adopting work from home (the medication industry case) or serving occupational health and safety care entirely online (the telehealth industry case). (iii) The enterprises employed these modifications mainly by adopting (the medication and telehealth industries cases) or increasing (the event and consultancy industries cases) digital solutions internally and crosswise the ecosystems. Therefore, the studied cases' competitive strategy and innovation ecosystems goals have not changed due to the pandemic: what changed was the means to achieve these objectives to respond to the crisis and keep moving forward.

Keywords: COVID-19 crisis. Competitive strategy. Innovation ecosystems. Value creation. Value capture. Resilience.

## RESUMO

A pandemia da COVID-19 é uma disrupção que obrigou as empresas a repensarem suas estratégias e seus ecossistemas para continuarem operacionais. No entanto, faltam registros que indiquem as melhores políticas a serem adotadas nessas circunstâncias. Portanto, pesquisadores e gestores devem compreender como as organizações estão agindo contra essa crise sanitária sem precedentes. Além disso, é de igual importância compreender os impactos da pandemia nas estratégias e nos ecossistemas das organizações. Nesse sentido, a pesquisa identificou como quatro companhias lideraram com tal situação. Através de um estudo de casos múltiplo e holístico, apoiado em abordagens qualitativas e exploratórias, a pesquisa trouxe uma descrição detalhada das estratégias competitivas, dos ecossistemas de inovação e das medidas adotadas para lidar com a crise. Os principais resultados encontrados foram: (i) A pandemia afetou os ecossistemas e as empresas estudadas em diferentes níveis. A crise atingiu severamente as companhias e os ecossistemas dos setores de eventos e de consultoria, principalmente a primeira. Por exemplo, a primeira interrompeu completamente suas atividades por um tempo, impactando o fluxo de atividades do ecossistema. Contudo, a pandemia impulsionou os negócios das organizações e dos ecossistemas dos setores de saúde e de medicamentos. Por exemplo, no caso dos medicamentos, não houve nenhuma mudança na composição de seu ecossistema e ainda, houve um benefício trazido por novos projetos que surgiram devido à pandemia. (ii) Os empreendimentos propuseram mudanças relacionadas à proposta de valor, aos processos de interação e aos fluxos de atividades e de informações ao longo do ecossistema para continuar as operações. Por exemplo, aqueles severamente afetados pela pandemia conseguiram entregar suas soluções completamente online (caso do setor de consultoria) ou evitando aglomerações (caso do setor de eventos). Ademais, os menos afetados se beneficiaram a partir do *home office* (caso do setor de medicamentos) ou atendendo a área de saúde e segurança ocupacional totalmente online (caso do setor de telemedicina). (iii) As organizações empregaram essas modificações principalmente através da adoção (casos dos setores de medicamentos e de telemedicina) ou do aumento na utilização (casos dos setores de eventos e de consultoria) de soluções digitais internamente e ao longo dos ecossistemas. Portanto, os objetivos da estratégia competitiva e dos ecossistemas de inovação dos casos estudados não mudaram devido à pandemia: o que mudou foram os meios para atingir tais objetivos para lidar com a crise e seguir em frente.

Palavras-chave: Crise da COVID-19. Estratégia competitiva. Ecossistemas de inovação. Criação de valor. Captura de valor. Resiliência.



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## **LIST OF ABBREVIATIONS AND ACRONYMS**

ANPD	National Data Protection Authority
ANS	National Agency of Supplementary Health
Anvisa	Brazilian Health Regulatory Agency
API	Application programming interface
BNI	Business Network International
BU	Business unit
CEO	Chief executive officer
CMO	Chief marketing officer
COVID-19	Coronavirus disease 2019
CTO	Chief technical officer
DCV	Dynamic capabilities view
Eurostat	European Statistical Office
FAPESP	São Paulo Research Foundation
FINEP	Funding Authority for Studies and Projects
GDP	Gross domestic product
HRM	Human resource management
ICT	Information communication technologies
IO	Industrial organization
IT	Information technology
ISO	International Organization for Standardization
JHCRC	John Hopkins Coronavirus Resource Center
OECD	Organization for Economic Cooperation and Development
P&G	Procter and Gamble
R&D	Research and development
RBV	Resource-based view
SARS	Severe Acute Respiratory Syndrome
SEBRAE	Brazilian Micro and Small Business Support Service

SEFAZ	Secretariat of Finance
SME	Small and medium-sized organization
UFRJ	Federal University of Rio de Janeiro
UNIFESP	Federal University of São Paulo
USP	University of São Paulo
WFH	Work from home
WHO	World Health Organization

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## 1 INTRODUCTION

This chapter presents an overview of the topics approached in this research. First, it shows the main ideas about innovation ecosystems and strategy and their relation to the pandemic. After, the chapter presents the research objectives and relevance. Finally, it ends by showing a brief description of the structure of this thesis.

### 1.1 CONTEXTUALIZING AND RESEARCH QUESTION

Innovation consists of transforming opportunities into ideas and knowledge successfully applied or introduced in the market by the innovator, which generates value for the organization (KARLSSON; TAVASSOLI, 2016; LORENZ, 2010; POPADIUK; CHOO, 2006; TIDD; BESSANT, 2009). These offers can be new (for the world, a nation, or even a firm) or improved products, services, processes, or organizational structure (GRANSTRAND; HOLGERSSON, 2020; LORENZ, 2010; OECD/EUROSTAT, 2018). Lego has a perfect example of innovation through products: it develops new products based on customer's ideas. Morikawa (2016) presented as examples the mini-Big Bang Theory Lego and the Beatles - Yellow Submarine set. Morikawa (2016) affirmed that this company has online platforms in which customers share their ideas, design, and pictures for possible new products. If Lego approves an idea for a product and starts to produce it, the community responsible for the proposal earns an amount of money as a reward.

Innovation is an interactive process composed of a set of activities tied together at the firm level. It also involves interactions internally (i.e., relationship within the given firm) and externally (i.e., the relationship between the given firm and its suppliers, competitors, and other entities) (FISCHER, 2001). Innovation became a crucial factor in economic development due to the expansion of information communication technologies (ICT) caused by globalization (MERCAN; GÖTKAS, 2011). Furthermore, it is responsible for boosting technology, which "has never been more influential than it is today." (KLARIN, 2019, p. 1).

The ecosystem approach is a topic that awakens the interest of researchers and managers because it is a new way to observe and describe competitive business environments, even if it is not a new theme (ADNER, 2017; BIRKINSHAW, 2019; HAKALA *et al.*, 2019; JACOBIDES; CENNAMO; GAWER, 2018). Within the topic of innovation ecosystems, besides researchers and practitioners, its coordination and building mechanisms have also caught the attention of policymakers recently, becoming an emerging topic in the literature of strategy, innovation, and entrepreneurship (GOMES *et al.*, 2018; JIANG; HU; WANG, 2019).

Although innovation ecosystems still lack conceptual consistency (GOMES *et al.*, 2018; OH *et al.*, 2016; RITALA; ALMPANOPOULOU, 2017), they are considered an evolving network with

interdependent and interconnected actors. Such actors are the focal firm, suppliers, customers, and complementary innovators, which co-create and deliver value for end-users (GOMES *et al.*, 2018; GRANSTRAND; HOLGERSSON, 2020; WALRAVE *et al.*, 2018). Procter and Gamble (P&G) is a case that typifies value co-creation within an ecosystem. According to Seulliet (2018), P&G not only creates new products in its research and development (R&D) laboratories, but the company also identifies the potential for innovation in the offers of suppliers, competitors, and customers. Furthermore, instead of discarding ideas that do not match their strategies, P&G now prefers to develop patents and licenses that the ecosystem can exploit.

A strategy is a group of behaviors or policies mutually reinforcing and coherent that, when followed, provides a particular competitive objective (PISANO, 2015). Then, strategy is developed based on companies' mission, goals, and strategic analysis (e.g., competitor analysis, assessment of internal strengths and weakness, forecasting, and market trends). A strategy also needs supporting organizational arrangements to be put into practice (e.g., structure, processes, activities, people, and policies) (HAMBRICK; FREDRICKSON, 2001). The core of the strategy is that it allows companies to perform different activities from rivals or similar tasks in different ways, enabling them to achieve sustainable competitive advantage. Hence, it is necessary to make trade-offs in competing and match firms' set of diverse activities to create a valuable and unique position (PORTER, 1996).

The literature has different understandings (some overlapping and others divergent) about what strategy is and how to obtain competitive advantages. Hence, there are several approaches, concepts, and models with different focuses. For example, some of them had considered the internal environment of companies, while others the external. Moreover, there are divergences about these proposals' dynamism or static nature, including their assumptions (MAIA, 2010).

Innovation and strategy are correlated since the former needs to be addressed by the latter to be fully improved. Then, based on a clear business strategy, innovation strategy links different perspectives of functional areas to reach a common goal (PISANO, 2015). Therefore, innovation is a vital topic within firms' strategies because it allows obtaining a sustainable competitive edge, joining new marketplaces, and increasing the current market share (GUNDAY *et al.*, 2011; KARLSSON; TAVASSOLI, 2016; TIDD; BESSANT, 2009). Besides, when innovation requires changes in activities within the given ecosystem, in entities that carry on such tasks, in the position of these actors, and in the way that transfers occur within the ecosystem, it is essential to consider the dynamics of this network for developing and comprehending strategy (ADNER, 2017).

After the beginning of the infection on humans (JHCRC, 2020; WHO, 2020), the coronavirus disease 2019 (COVID-19) has spread worldwide, becoming pandemic (WHO, 2020).



The entire world is suffering from the effects caused by COVID-19 and, as Kuckertz *et al.* (2020, p. 1) affirmed, the efforts and actions “[...] taken to slow the spread of COVID-19 exert tremendous pressure on large parts of a nation’s economy.”. The lockdown measures applied almost everywhere turned the current situation into a severe crisis (KUCKERTZ *et al.*, 2020). For example, the forecast shows a global gross domestic product (GDP) in 2020 by -4.5 % due to COVID-19 and the measures taken to contain its transmission. Moreover, the best scenario shows that the monetary GDP loss would be near \$77 billion (STATISTA RESEARCH DEPARTMENT, 2020). However, such a complex experience increases the importance of entrepreneurs and innovators for businesses’ survival (WITTMEIER, 2020). On the one hand, lockdown and quarantines can potentially to damage businesses in the short term (TURNER; AKINREMI, 2020). On the other, this unusual situation could favor a creative economy, disruptive innovation, and labor-saving technology (TING; LING; CHEAH, 2020).

In a globalized world, the effects of COVID-19 go beyond fatality (FERNANDES, 2020). Due to the disruptive nature of the pandemic (OBAL; GAO, 2020), all businesses will be affected (TURNER; AKINREMI, 2020) since the entire globe has stopped (TING; LING; CHEAH, 2020). Consequently, various supply chains have quickly broken down due to interruptions in materials flow (CHOI; ROGERS; VAKIL, 2020; FERNANDES, 2020; GOVINDARAJAN; BAGLA, 2020; TURNER; AKINREMI, 2020; WITTMEIER, 2020). Further, consumption patterns and customers’ needs have changed, resulting in a widespread shortage of goods worldwide (FERNANDES, 2020; TURNER; AKINREMI, 2020). Therefore, customers’ behavior after the pandemic will differ before the COVID-19 crisis (GREEVEN; YU, 2020). Then, there is an urgent need to comprehend and elucidate how organizations and networks, including ecosystems, are responding to the COVID-19 effects.

Such a situation requires that companies reconsider their activities and strategies (TING; LING; CHEAH, 2020). For example, innovation strategies are critical factors of Chinese firms’ survival during the pandemic crisis (WANG *et al.*, 2020), and also, innovation will be crucial in the recovery process from the pandemic (CHESBROUGH, 2020). Whereas some companies have been severely damaged by the pandemic, in Greeven and Yu’s (2020) vision, firms under the ecosystem regime can deal with such critical situations because they have competitive advantages in crises. These firms can continuously adapt their offerings to meet the needs of a changing customer basis by powering up alliances, partnerships, and investments.

In this context, the COVID-19 pandemic is changing paradigms. Customers’ needs abruptly changed, many networks disrupted, and several firms are striving to remain operational. The entire situation is forcing firms to, at least, rethink their competitive strategies and to be innovative to

address their short-term needs and the demands of their ecosystems. Moreover, this is causing changes across the networks to which they belong. Therefore, the following research question has arisen: how have companies reshaped their competitive strategies and managed their innovation ecosystems in the context of the pandemic? A multiple and holistic case study in four companies from different sectors answered this question.

## 1.2 OBJECTIVES

The main objective was to identify how firms have reshaped their competitive strategies and managed their innovation ecosystems in the pandemic situation. The following specific goals had to be satisfied to fulfill the main objective:

- a Defining the concepts related to innovation ecosystems.
- b Characterizing the concepts related to competitive strategy.
- c Identifying the current competitive strategy of the studied companies.
- d Understanding the relationship of the studied firms with their innovation ecosystems.
- e Indicating changes in the studied organizations' competitive strategy and innovation ecosystems due to the COVID-19 pandemic.

## 1.3 JUSTIFICATION

Evidence suggests that the COVID-19 crisis is different from others (TURNER; AKINREMI, 2020). Despite some previous crises that have occurred at a specific point in time and region (e.g., Katrina hurricane in 2005) or “[...] developed over a longer period of time with global effects (e.g., the 2008 financial crisis) [...]”, the COVID-19 pandemic has developed globally and the countermeasures taken have severely damaged economies (KUCKERTZ *et al.*, 2020, p. 2).

From the economic perspective, it is impossible to compare this crisis with any other (including, for example, the 1918 flu pandemic) because the circumstances are very distinct. Although not having labor shortages, the interest rates are at historical lows, the world is much more integrated than ever, supply chains are disrupting, and supply and demand are being simultaneously affected (FERNANDES, 2020; TURNER; AKINREMI, 2020). In such conditions, a global recession seems inevitable (FERNANDES, 2020). Further, prior economic studies about pandemics heavily focused on macroeconomic indicators (e.g., GPD) instead of the effects on micro or firm-level (TURNER; AKINREMI, 2020).

From the management perspective, the literature has concentrated on crises from economic or weather disasters. Some researchers have approached health crises in a limited manner (RATTEN, 2020). For example, the literature about the effects of pandemics on companies is scarce

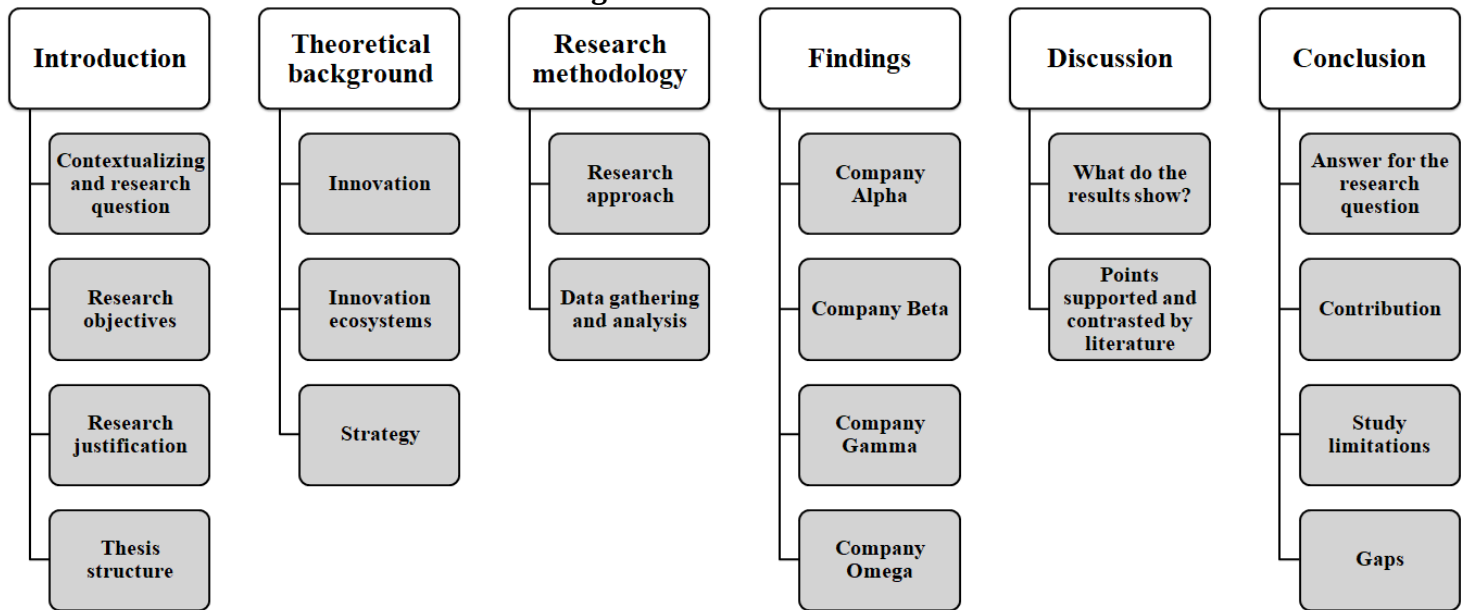
(TURNER; AKINREMI, 2020). Even so, the crescent number of unexpected disruptive events made companies willing to understand why some can overcome these problems while others fail to survive. Consequently, companies are placing their efforts to build systems that overwhelm these uncertainties (RAMEZANI; CAMARINHA-MATOS, 2020). Hence, this willingness and the COVID-19 pandemic evidence the well-known concept of resilience (e.g., CHROUST; FINLAYSON, 2016; RAMEZANI; CAMARINHA-MATOS, 2020), a solution to save and manage businesses and firms' networks. Thus, given the presented peculiarities of the COVID-19 context, the research is relevant by indicating the impacts of this health situation on companies' competitive strategy and ecosystems. Furthermore, the research shows the responses policies against the crisis.

Innovation ecosystems are still a black box for the scientific community. Some authors consider innovation ecosystems as synonyms of business ecosystems (e.g., ADNER; KAPOOR, 2010), whereas some perceive the former as entirely distinct from the latter (e.g., VALKOKARI, 2015). Therefore, the research contributes to the literature by showing what constitutes an innovation ecosystem.

The ecosystem approach is modifying the rules of strategy (BIRKINSHAW, 2019). Based on Adner and Kapoor (2010) and Pierce (2009), Gomes *et al.* (2018) affirmed that business and innovation ecosystems changed the understanding about competition since, in this environment, multiple ecosystems are trying to conquer the same customers. Besides, as Adner (2017, p. 53) noticed, just like the existence of interactions among competitive and corporate strategy, it is possible to have strong interactions between competitive and ecosystem strategy. The latter situation occurs, for example, by “[...] leveraging partner relationships in one setting to advantage position in a different setting (e.g., Apple’s using its position in music players to align operating network partners in the mobile phone space)”. Hence, the research adds to the literature by highlighting the relationship between these topics.

#### 1.4 THESIS STRUCTURE

Besides this introducing chapter, this thesis has five more chapters (Figure 1): the second chapter presents the necessary theoretical background for understanding the innovation concept, the premises of innovation ecosystems, and what constitutes a competitive strategy; the third chapter describes the approach, method, units of analysis and procedures for collecting and analyzing data; the fourth chapter shows the results obtained; the fifth chapter presents the discussion regarding these findings; the last chapter shows the conclusions of the work, presents propositions for further investigations and the limitations of this research.

**Figure 1: Thesis structure**

Source: Author.

## 2 THEORETICAL BACKGROUND

This chapter presents the necessary conceptual background to comprehend the studied theme. The intention was not to exhaustively discuss all the theories highlighted here but to provide the main ideas and propositions. The chapter starts by introducing the innovation concept. Next, this chapter presents innovation ecosystems, their differences and similarities with business ecosystems, and an overview of the strategy area, focusing on the competitive strategy. Later, the chapter shows possible complements for Porter's propositions.

### 2.1 INNOVATION

In the 1930s, innovation's importance was first recognized by the Austrian economist Joseph Schumpeter (1883-1950) (BREZNIK; HISRIC, 2014; LORENZ, 2010; TIDD; BESSANT, 2009). Schumpeter (1983) stated that innovation focuses on introducing the marketplace to something new and applicable on the industrial or commercial ground. It can be any novelty such as introducing a product, production method, or process, exploiting a distinct market segment or niche, other sources of supply, and different organizational structures. Table 1 contains other definitions for the innovation construct.

Table 1: Concepts of innovation

Author(s)	Definition
Baregheh, Rowley and Sambrook (2009, p. 1334)	“Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace.”
Crossan and Apaydin (2010, p. 1155)	“Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome.”
Damanpour (1996, p. 694)	“Innovation is conceived as a means of changing an organization, either as a response to changes in the external environment or as a preemptive action to influence the environment. Hence innovation is here broadly defined to encompass a range of types, including new products or services, new process technologies, new organizational structures or administrative systems, or new plans or programs pertaining to organizational members.”

Dosi (1990, p. 299)	“[...] innovation concerns processes of learning and discovery about new products, new production processes and new forms of economic organisation, about which, ex ante, economic actors often possess only rather unstructured beliefs on some unexploited opportunities, and which, ex post, are generally checked and selected, in non-centrally planned economies, by some competitive interactions, of whatever form, in product markets.”
Karlsson and Tavassoli (2016, p. 1484)	“[...] innovation, which can be conceived as the transformation of ideas, information and knowledge to increased competitiveness and sustained competitive advantage, overall constitutes an indispensable component of firm strategies.”
Lorenz (2010, p. 72)	“Innovation can be defined as a new or an improved product, process, or organisational structure, that is perceived as new by the innovator and is successfully implemented in the organisation or at least once successfully introduced into the market.”
OECD/EUROSTAT (2018, p. 20)	“An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”
Plessis (2007, p. 21)	“[...] innovation as the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services. Innovation encompasses both radical and incremental innovation.”
Popadiuk and Choo (2006, p. 308)	“Innovation consists of new ideas that have been transformed or implemented as products, processes or services, generating value for the firm.”
Tidd and Bessant (2009, p. 16)	“[...] innovation is a process of turning opportunity into new ideas and of putting these into widely used practice.”

Source: Author.

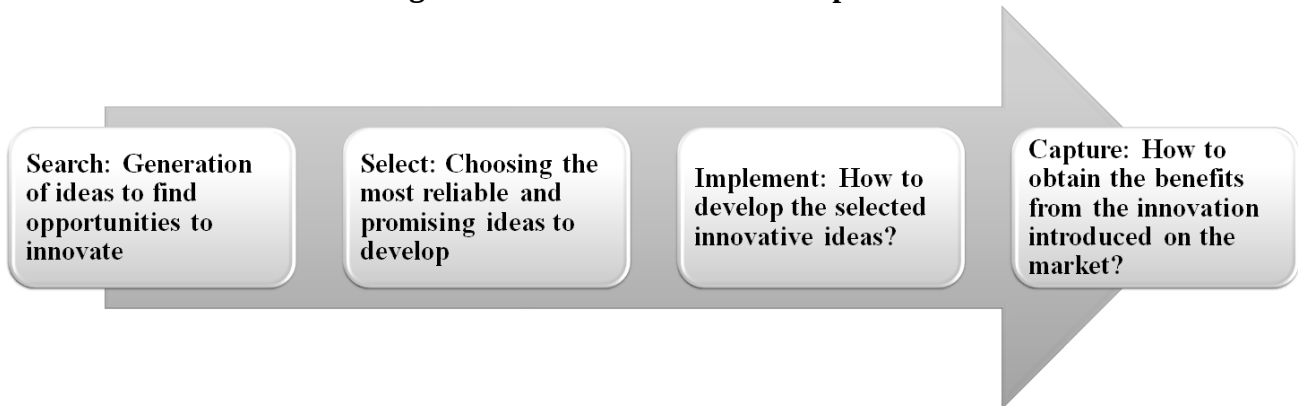
According to these definitions, innovation is a process of generating new knowledge and ideas transformed in an output characterized as new (for innovators or customers) or improved products or services, organizational processes, or structure. This output needs to be successfully applied and widely used by innovators or inserted in the marketplace. As an outcome, companies

will capture value, and these innovators will somehow differentiate themselves within a competitive environment. Therefore, innovation has strategic importance for companies and also for economic growth (MERCAN; GÖTKAS, 2011; SCHUMPETER, 1983; TIDD; BESSANT, 2009). Besides having the power of assuring the survival of organizations through products, services, and renewal of organizational systems, it is crucial to consider environmental and social issues for innovation becoming sustainable and a key component of firms' strategies (ADAMS *et al.*, 2016; KARLSSON; TAVASSOLI, 2016).

Innovation is a process and “[...] needs to be organized and managed to enable the renewal of any organization.” (TIDD; BESSANT, 2009, p. 44). The chance of innovation being successful increases if the whole process is well managed (TIDD; BESSANT, 2009). In general, there is a traditional model that represents a process view of innovation (illustrated in Figure 2) (SALERNO *et al.*, 2015; TIDD; BESSANT, 2009) composed by the following phases:

- Search: Innovation starts with good ideas and can arise from several sources (e.g., R&D, market signals, and collaboration with external partners). It is crucial to organize a well-structured mechanism to ensure a steady flow of ideas generation, considering insights that also flourish externally (e.g., end customers, universities, and competitors) (HANSEN; BIRKINSHAW, 2007; TIDD; BESSANT, 2009).
- Select: It is necessary to establish a strategy to select the ideas to help firms grow and develop. Managers and decision-makers need to assess the competitive scenario and the capabilities to underpin good portfolio management (HANSEN; BIRKINSHAW, 2007; SALERNO *et al.*, 2015; TIDD; BESSANT, 2009).
- Implement: The most challenging task in this phase is developing something that the company probably never did before. It involves a high level of uncertainty and the management of many resources (TIDD; BESSANT, 2009).
- Capture: After searching, selecting, and implementing the new idea, this “something” developed by the firm still needs to be accepted and approved by customers and stakeholders (HANSEN; BIRKINSHAW, 2007; TIDD; BESSANT, 2009). In this step, the firm is concerned about obtaining the benefits from the developed innovation (TIDD; BESSANT, 2009).

**Figure 2: Traditional innovation process**



Source: Adapted from Hansen and Birkinshaw (2007), Salerno *et al.* (2015), and Tidd and Bessant (2009).

Bellow, there are the main features of innovation, based on the observations made by Lorenz (2010):

- Innovation is not an invention simply because “an invention has first to be commercialized to be called an innovation.” (LORENZ, 2010, p. 65).
- Innovation is more than an idea because firms will develop only a few of them. When developed, they become an innovation.
- Innovation has creativity as a basis, which is the generation of novel ideas.
- Innovation needs support from culture to increase the chances of success.
- It also needs entrepreneurial action.
- Innovation is a process.
- It can be an imitation if the imitating enterprise recognizes it as new and if a market for the imitated product already exists.
- Innovation requests successful implementation.
- It generates a new product or process and can create new markets.
- Innovation creates value for the company, customers, or other business partners.
- Innovation depends on diffusion, in which quick dissemination raises the volume of sales.

Therefore, innovation in this work is a strategic factor that enables companies to develop and deliver their offers. Then, firms could conquer market share and achieve a competitive advantage.



## 2.2 INNOVATION ECOSYSTEMS

In 1993, the term “business ecosystem” was proposed by Moore (1993) (ADNER, 2017; GOMES *et al.*, 2018) to explain “[...] the managerial challenges of nurturing the complex business communities that bring innovations to market.” (MOORE, 1993, p. 75). The business ecosystem approach highlight that companies cannot compete individually anymore, and this network provides resources, information about market conditions, and collaboration between these firms to obtain competitive advantages (HAKALA *et al.*, 2019; LI, 2009; ZAHRA; NAMBISAN, 2012). In a business ecosystem, firms (from different sectors) share the destiny of the network, co-evolve, cooperate and compete together, support new products, and satisfy customer’s needs through innovation (IANSITI; LEVIEN, 2004; MOORE, 1993).

The term “ecosystem” came from biology (JACOBIDES; CENNAMO; GAWER, 2018), “where ecologically homogenous units constitute a community of living organisms interacting as a system with various components of their environment.” (SCARINGELLA; RADZIWON, 2018, p. 61). Moore (1993) affirmed that this ecological approach helps executives making strategic changes by systematically analyzing the following features: if the company has a link with the best suppliers and partners, if the organization is betting its future on the most promising ideas, if suppliers are leading the way in commercializing innovation, and if the firm will maintain sufficient autonomy and bargain power to obtain financial returns over the long run. The ecosystem approach also helps to understand what is being developed by key competitors, suppliers they cooperate with, and their relationship with customers. Moreover, this approach enables preparing the ground for organizational breakthroughs.

Adner (2006) and Adner and Kapoor (2010) were responsible for disseminating the term “innovation ecosystem” (GOMES *et al.*, 2018). This term has its central roots in the concept of business ecosystems used by Moore (1993) and other authors (GRANSTRAND; HOLGERSSON, 2020). Beginning the discussion, Table 2 presents some definitions of innovation ecosystems.

Table 2: Concepts of innovation ecosystems

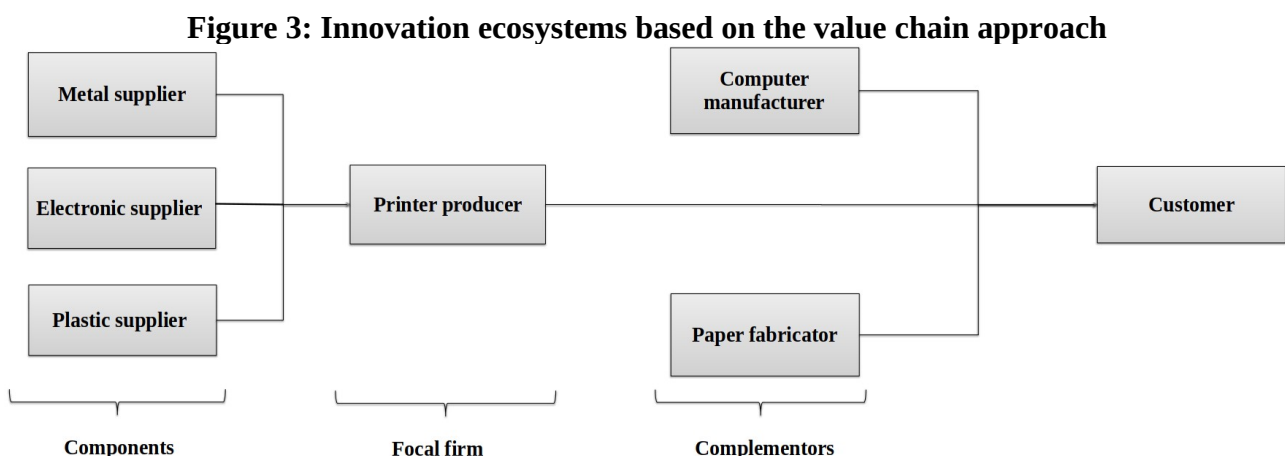
Author(s)	Definition
Adner (2006, p. 2)	“[...] innovation ecosystems – the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution.”
Gomes <i>et al.</i> (2018, p. 45)	“An innovation ecosystem is set for the co-creation, or the jointly creation of value. It is composed of interconnected and interdependent networked actors, which includes the focal firm, customers, suppliers, complementary innovators and other agents as

Granstrand and Holgersson (2020, p. 3)	regulators. [...] members face cooperation and competition in the innovation ecosystem; and an innovation ecosystem has a lifecycle, which follows a co-evolution process.” “An innovation ecosystem is the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors.”
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Source: Author.

According to these definitions, innovation ecosystems represent a set of interdependent actors in which they compete and cooperate for co-creating value. Adner and Kapoor (2010, p. 309) linked “[...] the dynamics of value creation and their implications for value capture to the structure of interdependence in a firm’s ecosystem.”

Like Adner (2006), Adner and Kapoor (2010) associated the innovation ecosystem with the value chain concept. According to Adner and Kapoor (2010), the outputs of upstream suppliers (referred to as components) are inputs to the focal actor, and the focal firm’s product is an input for customers. In some cases, a customer may need other products or services that work jointly with the focal firm’s product to use it. These offers are downstream of the chain (referred to as complementors). For example, a printer manufacturer needs metal, electronic, and plastic suppliers to assemble its product, enabling posterior delivery to customers who need computers and papers to use the printer. Figure 3 illustrates the printer producer example based on the generic configuration of ecosystems by Adner and Kapoor (2010).



Source: Adapted from Adner and Kapoor (2010).

## 2.2.1 Similarities Between Innovation and Business Ecosystems

According to Gomes *et al.* (2018), the common factors between innovation and business ecosystems are the following<sup>1</sup>:

- Both ecosystems have an interconnected and interdependent network composed of the focal firm<sup>2</sup>, customers, suppliers, and complementary innovators.
- Both ecosystems are built on platforms.
- Many authors agree that both ecosystems may be led by a keystone actor or by a platform leader.
- Members within business and innovation ecosystems deal with competition and cooperation.
- Both ecosystems might have a life cycle that follows a co-evolutionary process.

### 2.2.1.1 An Interconnected and Interdependent Network

Iansiti and Levien (2004) characterized business ecosystems as a “loosely network” composed of suppliers, distributors, outsourcing companies, technology providers, makers of complementary products, competitors, and customers, as well as regulatory agencies and media outlets. Authors such as Adner (2006), Adner and Kapoor (2010), and Walrave *et al.* (2018) presented this notion of a network in their definitions of innovation ecosystems. Furthermore, Adner and Kapoor (2010) stressed the importance of suppliers, complementors, and customers for innovation ecosystems. Additionally, Dedehayir, Mäkinen, and Ortt (2018) identified the roles of actors responsible for developing a nascent innovation ecosystem. They classified them into the following four groups: leadership, direct value creation, value creation support, and entrepreneurial ecosystem roles.

- Leadership roles have the duty of setting the role of other actors and coordinating the interactions between them. They are also responsible for managing value, the platform, and fostering partnerships.
- Direct value creation roles have the responsibility of describing the actors' position within the extended value chain. They also represent particular groups of activities undertaken by ecosystem members (i.e., supplier, complementor, customer, and assembler).

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<sup>1</sup> In Subsections 2.2.1.1 to 2.2.1.5, the ideas presented for business ecosystems are also valid for innovation ecosystems and vice versa because the discussion is about the similarities between both concepts.

<sup>2</sup> Ikenami (2016) asserted that the focal firm is the organization that is the reference point for the study. According to Ikenami (2016), if the focal firm changes, all the other actors may alter their characteristics (e.g., a supplier may become a client).

- Value creation support roles represent those that do not add value directly through delivering products, components, or services (e.g., universities, public research institutions, and entrepreneurs). They support direct value creators by providing consultancies and advice, generating knowledge from research, and assisting technology transfers (known as the expert role). Moreover, they help build the ecosystem by developing connections and alliances between stakeholders and facilitating access to nonlocal and local markets (known as the champion role).
- Entrepreneurial ecosystem roles have the responsibility of establishing a network linking internal (e.g., staff) and external (e.g., complementors, suppliers, and customers) collaborators. Further, they create a connection among actors conducting researches (e.g., universities) and those that commercialize technologies (known as the entrepreneur role<sup>3</sup>). They also provide resources and financial assistance to entrepreneurs (referred to as the sponsor role). Additionally, they catalyze new ventures by creating feasible economic, regulatory, and political conditions (referred to as the regulator role).

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#### 2.2.1.2 Platforms

A platform is an asset in tools, services, or technologies that offer solutions to actors within the ecosystem (IANSITI; LEVIEN, 2004). A platform is the interaction interface among ecosystem members and is the starting point of the value creation process since it allows these actors to enhance their performance (DING; YE; WU, 2019; LI, 2009; RONG *et al.*, 2013). In addition, platforms need complementary innovations to be valuable and vice versa (GAWER; CUSUMANO, 2015). Platforms can be an intellectual asset (e.g., the Windows software platform) or a physical asset (e.g., the efficient manufacturing capabilities offered by Taiwan Semiconductor Manufacturing to computer-chip design organizations that do not have their own silicon-wafer foundries) (IANSITI; LEVIEN, 2004).

In summary, platforms include the following three main functions: interaction interface, in which the ecosystem's members use the platform as a toolkit to develop their products; creation of value since the platform allows the ecosystem's actors to work closely to co-create value; and network formulation since these actors will build specific network patterns to compete against other ecosystems (RONG *et al.*, 2013).

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<sup>3</sup> Although the entrepreneur role partially overlaps with the ecosystem leader activities, the former does not necessarily occupy the leadership function. Moreover, the latter is also responsible for governance, value, and platform management (DEDEHAYIR; MÄKINEN; ORTT, 2018).

### 2.2.1.3 The Keystone Leadership

Keystones have a critical role in business ecosystems since “they aim to improve the overall health of their ecosystems by providing a stable and predictable set of common assets [...] that other organizations use to build their own offerings.” (IANSITI; LEVIEN, 2004, p. 6). The keystone can increase ecosystems’ productivity by simplifying the network connection between actors or turning the development of new products by third parties more efficient. It can also improve ecosystems’ robustness by incorporating technological innovations and supporting actors within the ecosystem to respond well to new and uncertain conditions. Further, it encourages ecosystems’ niche creation by offering innovative technologies to various organizations. In summary, the survival and success of keystones depend on their efforts to continuously support and improve their ecosystems (IANSITI; LEVIEN, 2004). Dedehayir, Mäkinen, and Ortt (2018) also stressed the importance of the leadership role in the genesis of innovation ecosystems.

Keystone actors are similar to the so-called “platform leaders”, which are “central players in an ecosystem” (GAWER; CUSUMANO, 2014, p. 423) and “[...] must create economic incentives for ecosystem members to invest in creating complementary innovations and to keep doing so over time.” (GAWER; CUSUMANO, 2015, p. 70). The ecosystem leader is also known as hubs, established firms with a disproportionately high number of links offering platforms that enable interoperability within the network (IYER; LEE; VENKATRAMAN, 2006). Additionally, they are called hub firms, which “runs the show”, defining the core value proposition and offering the essential innovation platform for other actors to develop their complementary innovations (NAMBISAN; BARON, 2013).

### 2.2.1.4 Cooperation and Competition

Several authors already highlighted a cooperation-competition relationship between actors inside business and innovation ecosystems (e.g., ADNER, 2006; ADNER; KAPOOR, 2010; GRANSTRAND; HOLGERSSON, 2020; LI, 2009; MOORE, 1993; RONG; SHI; YU, 2013). Firms depend on each other to create value and collectively provide consumers components (HANNAH; EISENHARDT, 2018). Cooperation and competition can occur concurrently and in different ways at multiple ecosystem levels: inside components, firms in a focal ecosystem, and rival ecosystems. Thus, the procedure of balancing cooperation and competition by firms within ecosystems has its complexity increased (HANNAH; EISENHARDT, 2018).

Cooperation is a joint work in complementary activities with information exchange and some coordination. It also might involve sharing resources to accomplish mutual benefits and compatible goals (CAMARINHA-MATOS; AFSARMANESH, 2008; HANNAH; EISENHARDT,

2018). According to Bengtsson and Kock (1999), firms needing resources held by competitors and without a strong position in the market are well suited for a cooperative relationship. Through cooperation, these firms can obtain competence, reputation, market knowledge, and access to other products and resources crucial to their businesses.

Competition represents organizations pursuing their own goals at the expense of others to maximize their benefits (HANNAH; EISENHARDT, 2018; RUSKO, 2012). For Bengtsson and Kock (1999, p. 181), “an action-reaction pattern arises as competitors follow each other; if one of the competitors launches a new product line, the other will immediately follow. Interaction is therefore simple and direct.”. Firms with a strong position in the market and not needing external resources from competitors will probably prefer this type of relationship. Moreover, it forces organizations to improve their offerings continually (BENGTSSON; KOCK, 1999).

Coopetition is “a paradoxical relationship between two or more actors simultaneously involved in incooperative and competitive interactions, regardless of whether their relationship is horizontal or vertical.” (BENGTSSON; KOCK, 2014, p. 182). Bengtsson and Kock (1999) asserted that firms with a strong position in the market and needing resources from competitors must focus on this relationship. Long-term coopetition will enable the actors to learn and understand what the other is capable of through: analysis and observation of patents and products of each other; and joint development of projects. Hence, organizations can still focus on their core businesses and offer a wide range of solutions than if they stood alone.

#### 2.2.1.5 Life Cycle of Ecosystems

Moore (1993) highlighted that every business ecosystem follows four co-evolutionary phases: birth, expansion, leadership, and self-renewal (or death).

- Birth: In the initial stage, there is the definition of the value proposition and how to deliver it to customers. The keystone "prepares the ground" by searching for partners that fulfill the proposed product or service requirements. Cooperative challenges reside in working with customers and suppliers to define the new and innovative value proposition. Competitive challenges are related to the protection of ideas from rivals developing similar offers, and building the ecosystem (i.e., connecting key customers, suppliers, and the development of interaction channels).
- Expansion: In this phase, the focal ecosystem will compete against rival ecosystems to conquer market share. Here, established companies can smash lower ecosystems by managing large-scale production and distribution and their immense power in marketing and sales. Managers also need to prepare for the next stage by

maintaining core value centers, innovation, and careful customer relationships. Besides, it is necessary to establish a relationship with suppliers to prevent them from becoming a keystone. Cooperative challenges reside in bringing the new offer to a large market by working with partners to stimulate demand at a maximum level and not exceed the capacity of attending it. Competitive challenges remain in defeating alternative introduced offers in the market. Moreover, it is mandatory to dominate key market segments to guarantee that the focal ecosystem approach is the market standard.

- **Leadership:** It is necessary to consider two factors before initiating a fight for ecosystem leadership. First, the ecosystem must have grown strong enough and must provide acceptable profitability to be worth fighting for the leadership. Second, the architecture of the value-adding processes and components that are the ecosystem core must be relatively stable. Such stability encourages ecosystem participants to expand their businesses by taking over activities close to them in the value chain. Consequently, it reduces the dependence of the whole ecosystem on the keystone. It is also critical maintaining the bargaining power by controlling critical elements within the ecosystem. This bargaining power comes from being the only source having something essential for the ecosystem. The leadership role enables the major firm to bargain for a higher share of the value produced because the other members cannot survive without that keystone. The leader is responsible for guiding the entire ecosystem by determining the subsequent steps. Cooperative challenges are managing and keeping the members motivated to continue improving and working on the offer. Competitive challenges are present in the maintenance of solid bargaining power.
- **Self-renewal (or death):** In this phase, new offers and ecosystems threaten the focal ecosystem. There are three options for this stage, which work alone or in combination. The focal ecosystem could set entry barriers to avoid or slow down the growth of a new (rival) ecosystem. Another option is to incorporate innovations and solutions in the focal ecosystem. It is even possible to rebuild the entire ecosystem to deal with a new reality and start over again. Cooperative challenges are related to bringing new ideas to the ecosystem. Additionally, competitive challenges are related to creating high barriers for new entrants and high customer switching costs to have sufficient time to incorporate new solutions into the offers.

### 2.2.2 Differences Between Innovation and Business Ecosystems

Considering the co-evolutionary life cycle process introduced by Moore (1993), Ikenami (2016) affirmed that innovation ecosystems represent the birth and self-renewal phases (stages with high levels of uncertainty and instability) due to the core idea of the former in building a novel ecosystem until its consolidation. Furthermore, Gomes *et al.* (2018) highlighted that the difference between these ecosystems is the focus on value creation (in innovation ecosystems) and value capture (in business ecosystems), which corroborate the previous affirmation.

The ecosystem construct comprises two sides in the management field: innovation, which is related to creating value, and business, which encompasses value capture. This differentiation makes it possible to investigate different features related to value creation (which is more concerned with innovation issues) and associated with value capture (which is more concerned with competitive or economic aspects) (GOMES *et al.*, 2018).

Value creation is a “[...] collaborative processes and activities of creating value for customers and other stakeholders.” (RITALA *et al.*, 2013, p. 248). It depends on the amount of value internally realized by the target customer. Moreover, this subjective value realization must, at least, make the target customer desire to exchange an amount of money for the value received (LEPAK; SMITH; TAYLOR, 2007).

According to Ritala *et al.* (2013, p. 248), value capture “[...] refers to the individual firm-level actualised profit-taking; that is, how firms eventually pursue to reach their own competitive advantages and to reap related profit.”. The newly created value will often lead to a situation in which the demand is high, and the supply is limited. Therefore, the competition will increase the supply, declining the value created to the point that supply equals the demand. At this point, the value created will be shared with rivals. Other competitors will join the market, creating a high use value and low monetary exchange rate for the source (LEPAK; SMITH; TAYLOR, 2007).

Value creation and capture are distinct processes since the creator of the value may not retain the value in the long term. Furthermore, the value created by an individual can be captured by a society or organization, for example (LEPAK; SMITH; TAYLOR, 2007).

Therefore, innovation and business ecosystems are similar in terms of being composed of an interconnected and interdependent network and having platforms, a leadership to manage such network, a co-evolutionary process of the life cycle, and a relationship within members composed by cooperation and competition. Regarding the differences among them, the former represents the birth and self-renewal phases of the life cycle proposed by Moore (1993), whereas the latter, the leadership and expansion stages. In the birth and self-renewal stages, value creation aspects are predominant since the ecosystem members are more concerned with building up and maintaining a



beneficial structure for developing and delivering innovative solutions to customers. The expansion and leadership phases are predominantly dominated by competitive features, in which the actors are more concerned with how to maximize their gains and profits.

### 2.3 STRATEGY

In the 1950s, the strategy started to be associated with the management field "when the Ford Foundation and the Carnegie Corporation funded research into the curricula of schools of business administration." (RONDA-PUPO; GUERRAS-MARTIN, 2012, p. 164). However, there was little academic and research interest in this subject (RONDA-PUPO; GUERRAS-MARTIN, 2012). Finally, in the 1960s, strategy emerged from the need to help managers understand their companies' position within the environment in which they operate, all based on analyzing daily events and decisions (PORTER, 1983; RONDA-PUPO; GUERRAS-MARTIN, 2012).

Before the 1970s, there was no academic subject called "strategy" at business schools. Instead, there was a "business policy" built on Chester Barnard's concern and interest in strategy challenges faced by general managers. After that period, the strategy became taught at business schools with that name as a subject (MAIA, 2010).

Strategy is a word widely used, posing many different definitions, and due to that, it has lost much of its uniqueness and meaning within the practice of management (RONDA-PUPO; GUERRAS-MARTIN, 2012; WHEELWRIGHT, 1984). Nevertheless, Mintzberg (1987) affirmed that multiple definitions for strategy in the strategic management domain could help researchers and practitioners deal with this complex field's matters. Hence, Mintzberg (1987) proposed five different definitions for strategy:

- Strategy as plan: Strategy is a guideline (or a set of) to handle a determined situation. Thus, a strategy has two characteristics: it is elaborated before the necessary actions to realize it and is developed consciously and with a purpose.
- Strategy as ploy: As a plan, a strategy can also be a ploy or some sort of maneuver to outperform a competitor.
- Strategy as pattern: The two previous definitions do not embrace the resulting behavior from adopting a specific strategy. Therefore, strategy as a pattern represents consistency in behavior, whether intended or not.
- Strategy as position: This strategy can be compatible with all the previous concepts: a position (physical location of a company) can be initially selected through a plan or a ploy and can be achieved, or even found, through a pattern of behavior.

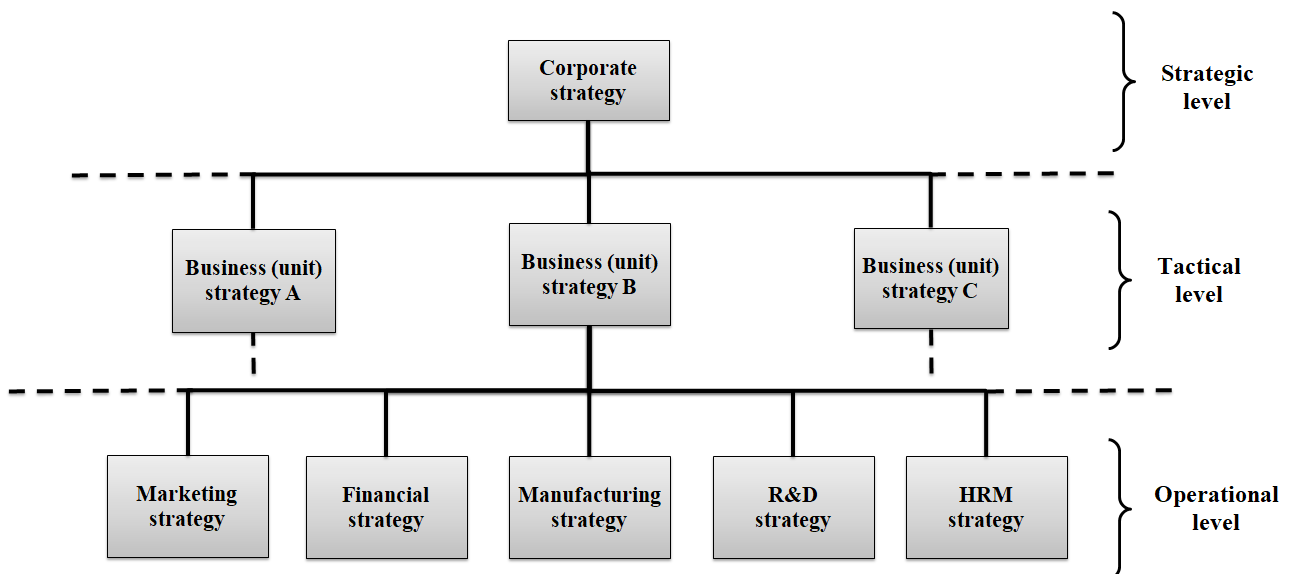
- Strategy as perspective: While strategy as position is concerned with the external environment, strategy as perspective looks to the internal environment.

Strictly related to Mintzberg's (1987) definitions of strategy, there are ten schools of thought for strategy formulation. Each school focuses on a specific issue of the formulation process (MAIA, 2010). According to Mintzberg, Ahlstrand, and Lampel (2000), these ten schools are the following: the design school, the positioning school, the entrepreneurial school, the cognitive school, the learning school, the power school, the cultural school, the environmental school, and the configuration school.

The first three schools (design, planning, and positioning) are concerned with establishing strategies. The following six schools (entrepreneurial, cognitive, learning, power, cultural, and environmental) are concerned with describing the formulation process itself, and the last school (configuration) combine the content of other schools to describe the life cycle of organizations (MINTZBERG; AHLSTRAND; LAMPEL, 2000). However, for Maia (2010), it is an overstatement to delineate ten schools of thought for strategy formulation. Several schools overlap with each other, whereas others over-detail the description of the strategy-making process.

Wheelwright (1984) stated that there are three (hierarchical) primary ranks of strategy (Figure 4): corporate strategy, business (or competitive) strategy, and functional (e.g., marketing, financial, and manufacturing) strategy.

**Figure 4: Hierarchical levels of strategy**



Source: Adapted from Wheelen *et al.* (2018) and Wheelwright (1984).

Corporate strategy is an “[...] overall plan for a diversified company [...]” (PORTER, 1987, p. 1), primarily concerned with the choice of direction for the entire company and the management of its business and product portfolio (WHEELEN *et al.*, 2018). This diversified organization defines its objectives or purposes, the primary plan, and policies to achieve these goals. Further, there is the definition of the business that the company will and will not participate in, the economic and human enterprise the company is or want to be, and the acquisition of corporate resources. The firm also defines the nature of all economic and non-economic contributions that it intends to make to its customers, employees, shareholders, and communities (ANDREWS, 2006; WHEELWRIGHT, 1984).

Many diversified companies may have to define a strategy (the business scope and resource allocation) for each group or sector. The definition of which businesses the company will participate in considers dimensions such as materials, markets, and technologies. The purchase and arrangement of resources (including human resources) “[...] usually results in a strong finance function at the corporate level.” (WHEELWRIGHT, 1984, p. 82).

According to Porter (1987), every successful corporate strategy considers the following premises:

- Competition occurs at the business unit (BU) level of diversified companies. A successful corporate strategy needs to nurture the success of each unit and reinforce the competitive strategy.
- Diversification brings costs and constraints to BUs that can be reduced, but not eliminated; shareholders can quickly and cheaply diversify themselves when compared with organizations since “[...] they can buy shares at the market price and avoid hefty acquisition premiums.” (PORTER, 1987, p. 3).

Competitive strategy is concerned about how a company can create competitive advantages in each business it competes (PORTER, 1987). Therefore, it is necessary to establish the boundaries of each BU in a manner that operationally links the competitive to the corporate strategy. These specified boundaries will clarify the base on which the BU will maintain a competitive edge, preventing, for example, direct competition between the firm's BUs. Thus, it will be defined the product, market, or service addressed by each BU (WHEELWRIGHT, 1984). For a competitive strategy to be effective, it must “[...] fit the business unit's resources, recognize competitors' strategies, and fit the definition of product/market/customer segments to be pursued.” (WHEELWRIGHT, 1984, p. 83).

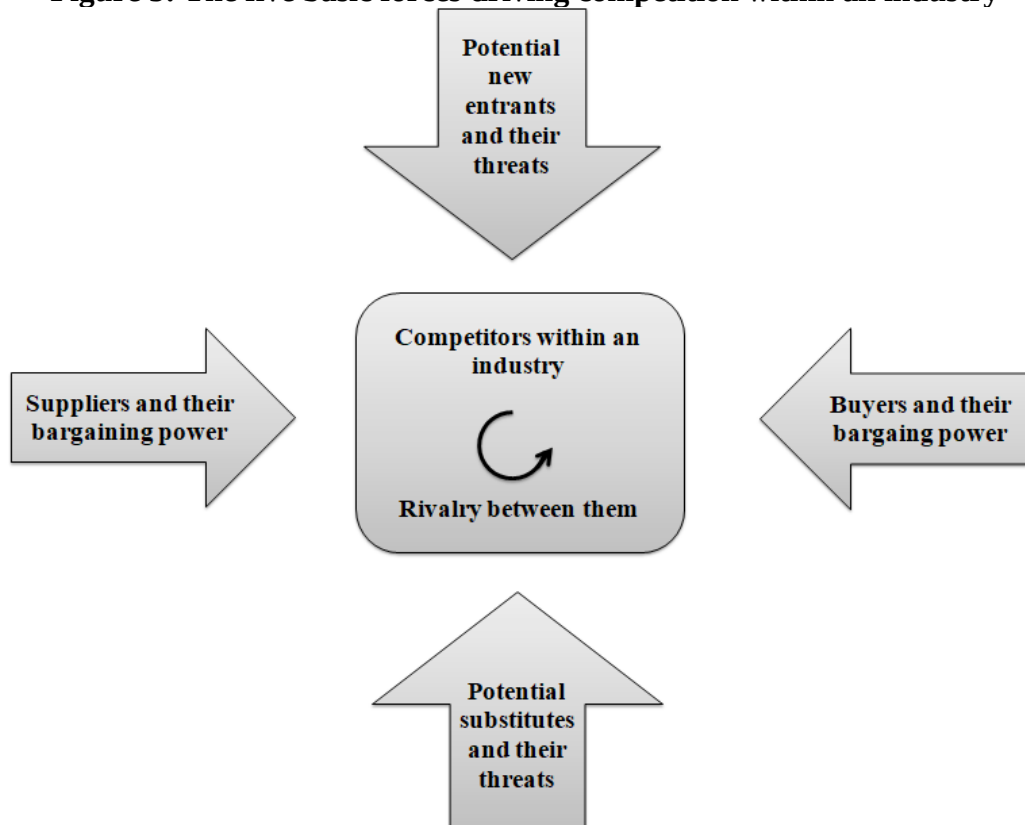
"Functional strategy is the approach a functional area takes to achieve corporate and business unit objectives and strategies by maximizing resource productivity." (WHEELEN *et al.*,

2018, p. 252). Each functional area will develop a specific competence based on trade-offs among competing priorities and a consistent set of decisions. Thus, these areas will support the competitive advantage of their respective BU (WHEELEN *et al.*, 2018; WHEELWRIGHT, 1984). For example, a BU following a differentiation strategy through high levels of quality might have: a manufacturing functional strategy focused on expensive processes that assure the demanding quality; an human resource management (HRM) functional strategy concentrated on the hiring and training of highly skilled (and costly) labor; and a marketing functional strategy focused on advertising to increase demand and a "pull" distribution channel, instead of "push" (WHEELEN *et al.*, 2018).

### **2.3.1 Competitive Strategy**

Porter (1998) affirmed that the essential aspect of competitive strategy is to correlate a firm to its environment, considering social and economic matters. This environment is the industry (or industries) structure that the company competes. This structure determines the competitive rules and the strategies available for the given firm. Porter (1998) identified five elemental competitive forces (Figure 5) that define the state of competition within an industry, which determine the potential of profit inside that. Porter developed such propositions and assumptions based on contributions from the industrial organization (IO) field, which is part of the economic domain (MAIA, 2010). Based on Porter (1998), there is an explanation of each force organized in topics. Furthermore, the examples presented in each topic are based on the author's perception or from other referenced sources.

**Figure 5: The five basic forces driving competition within an industry**



Source: Adapted from Porter (1998).

- The threat of new entrants: They threaten firms within the industry since they bring novel capacity, substantial resources, and the need to obtain market share. Hence, prices could reduce, or costs could inflate, resulting in low profitability. This threat is low if there are high entry barriers or fierce retaliation from competitors inside the industry. These entry barriers derive from economies of scale, product differentiation, capital requirements, switching costs, access to distribution channels, cost disadvantages, and government policy. The case of Google joining the smartphone market through the development of the android system and the nexus smartphone would represent this threat.
- Bargaining power of buyers: Buyers can affect the industry profitability since they can force down prices, bargain for more services or higher quality, and play competitors against each other. A buyer has a high bargaining power if: purchases large volumes of products from sellers; the products purchased represent a high fraction of the buyer's costs; the products purchased have no differentiation; faces few switching costs; earns low profits; poses a dangerous threat of backward

integration; the products purchased have no impact in the quality of buyer's product or service; is well informed about demand, market prices, and supplier costs. The case of Apple changing the Intel processors of its Mac computers for the ARM ones would be an excellent example of this situation.

- **Bargaining power of suppliers:** Suppliers can erode the industry profitability by raising prices or reducing the quality of their offered goods and services. A supplier has a strong bargaining power if: there are few supplying companies and its segment is more concentrated than the industry of it sells to; do not compete with substitute goods and services; the supplied industry is not an important customer; its goods and services are valuable inputs for the customer's business; there are switching costs and the offered goods and services are differentiated; poses a critical threat to forward integration. These conditions tend to mirror those making buyers powerful. Boeing and Airbus are perfect examples of this situation. In the airline industry, they are the two major suppliers for organizations in this sector that use them as inputs for their flights (BUSINESS TO YOU, 2016).
- **The threat of substitute products or services:** All firms compete with other industries developing substitute products. These substitutes can perform the same functions as the industry's product and restrain profitability by limiting prices. Substitute products that deserve special attention improve the price-performance trade-off in the industry and provide high profits for producers. iFood and Uber would be a typical example of this threat. Uber now has the so-called Uber Eats platform, which delivers food and meal for customers, just like iFood.
- **The rivalry between current competitors:** Rivalry results from the opportunity seen by a competitor to improve its position in the industry or just because it feels the pressure. Competitive moves made by one firm impact others, resulting in retaliation or countermoves. This action and reaction pattern may cause the firms within the industry to be worse than before. On the one hand, price competition may turn the entire industry worse from a profitability perspective. On the other hand, advertising battles may increase demand or enhance product differentiation in the whole industry, benefiting every firm.

In some industries, a rivalry is characterized as a war scenario, whereas in others, it occurs peacefully. Thinking of Uber as a service platform in the private urban transportation area, there are several concurrent platforms like 99 App and Didi

Chuxing. Didi bought 99, expanding its business worldwide (REUTERS, 2018), posing a powerful rivalry for Uber.

Porter (1998) also proposed the generic competitive strategies to defensively cope with the five forces, in the long run, outperforming competitors within the industry. Porter (1998) proposed three generic strategies which can be used alone or integrated. In some cases, the adoption of only one strategy is enough to obtain acceptable returns. However, there are two primary risks when adopting generic strategies: failure to achieve or sustain the strategy, and the strategic value obtained can erode with the industry evolution.

- Overall cost leadership: It is necessary to build efficient-scale facilities, cost reductions from experience, rigid cost and overhead control, and cost minimization in areas such as R&D, service, and advertising to achieve this strategy. The risks involved in the adoption of this strategy are the following: technological change that wipes out past learning or investments; low-cost learning by new entrants through imitation or investment on state-of-art facilities; inability to see changes on requirements due to the attention placed on costs; inflation in costs that limits maintaining a price differential to offset competitors' approaches to differentiation. The case of McDonald's typifies an overall cost leadership strategy because the company can use economies of scale and produce its offers at low costs. Thus, this company offers its products to customers at low selling prices (CORPORATE FINANCE INSTITUTE, c2020).
- Differentiation: In this generic strategy, the whole industry perceives the product or service offered by a given firm as unique. Companies can differentiate themselves across several dimensions, such as technology, design, features, and customer services. Costs are not the main target when adopting a differentiation strategy. Therefore, differentiation is a powerful tool to raise entry barriers. Differentiation also reduces the buyer's bargaining power because there are few (or any) comparable options in the market. The set of risks for this generic strategy are the following:
  - ◆ Differential costs between low-cost firms and differentiation companies become very high for differentiation to hold brand loyalty. Buyers sacrifice some of the differentiation features for huge saving costs.
  - ◆ The need for differentiation reduces when, for example, buyers become more sophisticated.

- ◆ As industries reach the maturity level, imitations decrease the perceived differentiation.

The case of Apple is an example of this type of strategy. This organization offers high-quality products with high prices and unique features. Consequently, it reinforces the perception of added value by customers, as well as the exclusivity factor. Consequently, its brand loyalty increases with these measures (FAROOQ, 2018).

- Focus: Unlike the other generic strategies that possess settled objectives to achieve the whole industry, this one concentrates the entire effort on a particular group. The premise is that this strategy enables firms to serve more effectively the target group than competitors with a broad market. Companies that adopt this strategy may achieve either differentiation by meeting the requirements of a narrow market or lower costs by serving the particular group, or both simultaneously. Although obtaining the gains in a narrow segment, the returns may impact the whole firm's industry. The focus strategy presents the following risks when adopted: competitors find submarkets inside that reduced market, outperforming the focused firm; differences in the desired offers among the entire market and the reduced market decrease; differential costs increase among the broad-range competitors and the focused firm, eliminating the cost advantage of serving a narrow target or offsetting the differentiation achieved by the focus strategy. The case of Louis Vuitton is an example of a differentiation-focus strategy because the company “[...] is able to be a leader in the luxury market and command premium prices through product uniqueness.” (CORPORATE FINANCE INSTITUTE, c2020).

Porter (1998) also highlighted the so-called “stuck-in-the-middle” position, representing a firm that does not adopt any generic strategy. Firms that are “stuck-in-the-middle” have a great chance of reaching low margins of profitability. Because of that, these companies must choose: to adopt the cost-oriented strategy, focus on a specific market group, or develop some degree of uniqueness. Of course, this choice needs to consider firms’ limitations and capabilities (PORTER, 1998).

Wright (1987) stated that larger companies would not compete only with the focused strategy because it is not an attractive option. For example, larger companies that chose the differentiation strategy may use only this strategy or adopt the focus strategy simultaneously. On the other hand, smaller companies only can compete through focus due to their limited access to resources.



Several works investigated the adherence between Porter's generic strategies and startups (AL-ABDALLAH; FRASER; ALBARQ, 2021; BLOCK *et al.*, 2015; DAVIS; OLSON, 2008; SLAVIK; HANAK; HUDAKOVA, 2020) and small and medium-sized organizations (SMEs) (ALSTETE, 2014; ANWAR; SHAH, 2021; MARQUES; GUEDES; FERREIRA, 2017).

Regarding the first association, the literature has divergences. Block *et al.* (2015) affirmed that startups often chose to compete by differentiation or cost leadership. Al-Abdallah, Fraser, and Albarq (2021) identified that the three generic strategies in internet-based startups have a direct and positive influence on their performance. They identified that the differentiation strategy has the highest impact, while the focus has the lowest. For Davis and Olson (2008), startups commonly succeed by differentiation strategies than by cost leadership. It is rare to see the second situation because low-costs usually come from economies of scale, and small enterprises do not benefit. Nevertheless, Slavik, Hanak, and Hudakova (2020) did not find a correlation between Porter's generic strategies and startups' performance.

Regarding SMEs, Marques, Ferreira, and Guedes (2017) identified all three generic strategies in different Portuguese SMEs in the footwear industry. Moreover, Alstete (2014) observed, based on SMEs' business plans, a vast adoption of a focus-differentiation strategy and also the occurrence of the other generic strategies. Although not studying the focus strategy, Anwar and Shah (2021) approached the remaining typologies in their studies concerning SMEs.

Despite the enormous reconnaissance of Porter's contributions, there are critiques about and propositions to improve the five forces model and the generic competitive strategies. During a certain period, the strategy area, in general, overemphasized the external environment when analyzing threats and opportunities, for example. Works such as Barney (1991), Grant (1991), and Kraaijenbrink, Spender, and Groen (2010) sustain this affirmative. "During the 1980s, the principal developments in strategy analysis focused upon the link between strategy and the external environment.", with Porter's works as prominent examples of this focus (GRANT, 1991, p. 114). Building on these critiques, there were developed alternative propositions and refinements for the approaches presented by Porter (1998).

### **2.3.2 Alternatives to Porter's Propositions**

Alternative approaches like resource-based view (RBV) and dynamic capabilities view (DCV) add a different perspective to deal with the overemphasis on firms' external environment. Maia (2010) stated that both RBV and DCV focus on internal features of a firm as a source of competitive edge.

RBV first appeared in Wernerfelt's (1984) work (BARNEY; KETCHEN JR.; WRIGHT, 2011) by suggesting a new way of analyzing firms: from the resource perspective instead of the product side (WERNERFELT, 1984). After that, Barney (1991) developed the RBV model, focused on the base of resources possessed by a firm, affirming that these resources are heterogeneous and not easily transferable to other companies. Such resources enable firms to achieve a sustained competitive advantage only if they are VRIN: valuable (i.e., allowing firms to improve both efficiency and effectiveness); rare (i.e., not being possessed by various companies); imperfectly imitable (i.e., difficult to be imitated by rivals); and non-substitutable (i.e., the nonexistence of other resources that are valuable, rare, difficult to copy and strategic equivalent to the given resource).

RBV may be a complement for Porter's propositions (KRAAIJENBRINK; SPENDER; GROEN, 2010; MAHONEY; PANDIAN, 1992). It is necessary to assess the internal strengths and weaknesses and the environmental threats and opportunities to understand the sources of competitive advantage (BARNEY, 1995).

Teece and Pisano (1994) and Teece, Pisano, and Shuen (1997) introduced DCV to assess how companies create and maintain competitive advantages in environments with fast technological change. It highlights the sources of value creation and capture of companies within a Schumpeterian scenario with "[...] innovation-based competition, price/performance rivalry, increasing returns, and the "creative destruction" of existing competences." (TEECE; PISANO; SHUEN, 1997, p. 509).

The word "dynamic" shows the capacity of a firm to renew competencies and harmonize itself with the transforming business environment. The term "capabilities" means to attend to the needs of a changing business environment by strategically managing adaptation, reconfiguration, and integration of internal and external organizational skills, functional competencies, and resources (TEECE; PISANO; SHUEN, 1997). Then, DCV reflects the organizational and strategic routines to obtain new resource configurations as markets change (EISENHARDT; MARTIN, 2000).

Simply put, companies need to follow a three-step cycle to achieve high-order competencies (or dynamic capabilities) (TEECE, 2007, 2012): First, organizations scan the marketplace to find opportunities (known as the sensing phase). After, enterprises exploit the best opportunities (known as the seizing phase). Later, ventures may reorganize assets and structures (known as the reconfiguring stage) (TEECE 2007).

Innovation capability, "[...] the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders." (LAWSON; SAMSON, 2001, p. 384), is a topic that has a strong link with DCV. Both have the Schumpeterian innovation scenario as a basis (BREZNIK; HISRICH, 2014). Hence, there is a link with Porter's

propositions. Companies need to consider how innovation will create value for potential customers, capture part of such value after, and the necessary resources for each innovation that allows them to create and capture value. Therefore, the capacity of innovating starts with strategy (PISANO, 2015). Influenced by the increase in competition on markets, companies perceive innovation as a crucial factor of strategic decisions (and corporate strategies) for joining new markets, increasing the current market share, and providing a competitive advantage (GUNDAY *et al.*, 2011).

The literature has an extensive discussion concerning internal and external organizational factors to strategize, which complements Porter's ideas. For example, Porter (1998) does not consider the influence of regulators and complementors in his five forces approach. In general, companies develop their strategies based on internal (e.g., owned technologies and organizational factors) and external (e.g., the whole business context) environments (GUO *et al.*, 2017; HALDMA; LÄÄTS, 2002). Furthermore, different researches investigated the relationship between these factors and startups (PAVLATOS, 2021; SHEORAN; KUMAR, 2020) or SMEs (GOSENPUD; VANEVENHOVEN, 2011; KRAJA; ELEZ, 2015; RAMSEY; IBBOTSON; MCCOLE, 2008).

Sheoran and Kumar (2020) verified the influence of internal and external environments in startups' capacity to structure networks. They considered the organizational culture as internal factors and the network partners as external. Pavlatos (2021) studied tourism startups' management systems and considered the resources and the organizational features as internal environments. As an external environment, everything outside the company and related to the business.

Regarding SMEs, Gosenpud and Vanevenhoven (2011) asserted that these companies need to analyze the external (i.e., the whole market and the relationship and needs of the network) and internal (i.e., the established competencies and the acquiring of business skills) environments to adapt themselves to a dynamic business environment. Further, Kraja and Elez (2015) and Ramsey, Ibbotson, and McCole (2008) identified in their respective works the presence of specific competencies, the organizational culture, resources, and the acquisition of new abilities as internal factors and the network and market as external factors that impact the activities of SMEs.

Therefore, in this work, the competitive strategy provides BUs what they need to focus on and develop to achieve a competitive edge. The BUs must observe every relevant aspect from the external and internal environments to do so. In theory, BUs have four options to follow: cost leadership, differentiation, and focus strategies, and stuck-in-the-middle position.

### 2.3.3 Resilience

First, Ratten (2020) defined a crisis as an event that is not frequent but has high uncertainty and causes disturbance in society. Consequently, it demands an urgent countermeasure. Ratten (2020) also stated that crises have diverse magnitude, type, and length, depending on their impact on society. Gundel (2005) provided a typology for crises according to the proactive or reactive measures to avoid or fight them. Then, Gundel (2005) proposed four types of crises: conventional, unexpected, intractable, and fundamental.

- Conventional crises: Although causing severe damage, losses, or political consequences, those affected by these crises can easily manage them (GUNDEL, 2005). Technological disorders such as computer bugs or ill-structured systems exemplify these situations (GUNDEL, 2005; RATTEN, 2020).
- Unexpected crises: Their causes are by technological systems posing anomalous or infrequent features. The accident with a funicular railway in a tunnel that happened in Austria in 2000 typifies these problems. This system was estimated as fire-proof because it had no engine, but it blazed down and killed 151 people. No one considered that such a mechanism could cause this kind of incident. Hence, there was no structural fire protection (GUNDEL, 2005).
- Intractable crises: Their menaces are well-known and easy to locate in time and space, but they are too complex to allow rapid countermeasures (GUNDEL, 2005). Incidents like the Chernobyl nuclear accident and natural disasters such as earthquakes and hurricanes represent these disruptions (GUNDEL, 2005; RATTEN, 2020).
- Fundamental crises: The lack of predictability and limited or absence of influence possibilities gives them a huge potential for unprecedented consequences. Then, it is challenging or almost impossible to prepare against them. They tend to have a long duration and high magnitude, affecting several companies, communities, and people (GUNDEL, 2005). Natural disasters in this group should include health crises such as the Ebola epidemic in 2014 (e.g., ARSLAN; TARAKCI, 2020), the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 (e.g., OLSSON, 2015), and the COVID-19 pandemic in 2019 (e.g., KUCKERTZ *et al.*, 2020).

It is worth highlighting that since the beginning of the pandemic, the literature presented several conceptual (e.g., CHOI; ROGERS; VAKIL, 2020; CRICK; CRICK, 2020; DONTU; GUSTAFSSON, 2020; GOVINDARAJAN; BAGLA, 2020; RASHID; RATTEN, 2021) and empirical (e.g., APEDO-AMAH *et al.*, 2020;

BHATTACHARYYA; THAKRE, 2021; DILLETTE; PONTING, 2020; MOORE; HAWARDEN, 2020; SERAPHIN, 2021) works. In general, the goal is to clarify the COVID-19 crisis effects on businesses and propose alternatives to surpass them.

Building on Kumar, Tiwari, and Babiceanu (2010), Ramezani and Camarinha-Matos (2020) stated that crises could arise from internal (i.e., failures within the ecosystem) and external (i.e., failures from outside the network) sources. For example, they established that these internal disorders are related to uncertainties emerging from the companies' interaction in the ecosystem, ruptures in material, financial, and information flow, and supplier bankruptcy. Moreover, the external disruptions are related to natural disasters, political risks like war and embargoes, policy risks such as regulatory and bureaucracy issues, and economic risks from a recession and high bank interests.

Resilience represents a system's capability to overcome a disruptive phenomenon and keep running, but probably in different stability than before this crisis (ASBJØRNSLETT; RAUSAND, 1999; CHROUST; FINLAYSON, 2016). Such stability may represent an advance to a level more suitable to face future disasters (DAHLBERG, 2015). Focusing on the entrepreneur figure, Castro and Zermeño (2020) showed that a resilient manager is proactive, flexible, motivated, and perseverant. Such attributes help an organization to be responsive during a crisis. Brunet, Malas, and Fleury (2020) affirmed that resilience helped their university health center respond rapidly to the COVID-19 second wave. Moreover, Parker and Ameen (2018) identified that a firm could be more resilient if it can reorganize its resource base.

Ramezani and Camarinha-Matos (2020) highlighted that resilience is also vital for ecosystems to overwhelm disruptions. Hence, there is an extensive list of capabilities that should provide resilience for those networks. For example, ecosystems should have capabilities like: agility (i.e., rapid response to unexpected); adaptability (i.e., modifying operations to deal with disruptions); diversity (i.e., multiple talents and work methods that allow innovation to be a response to crisis); organizational capability (i.e., benchmarking, human resources, experience, culture, and skills); and market position (i.e., product differentiation, market share, and customer relationships) (RAMEZANI; CAMARINHA-MATOS, 2020).

### 3 RESEARCH METHODOLOGY

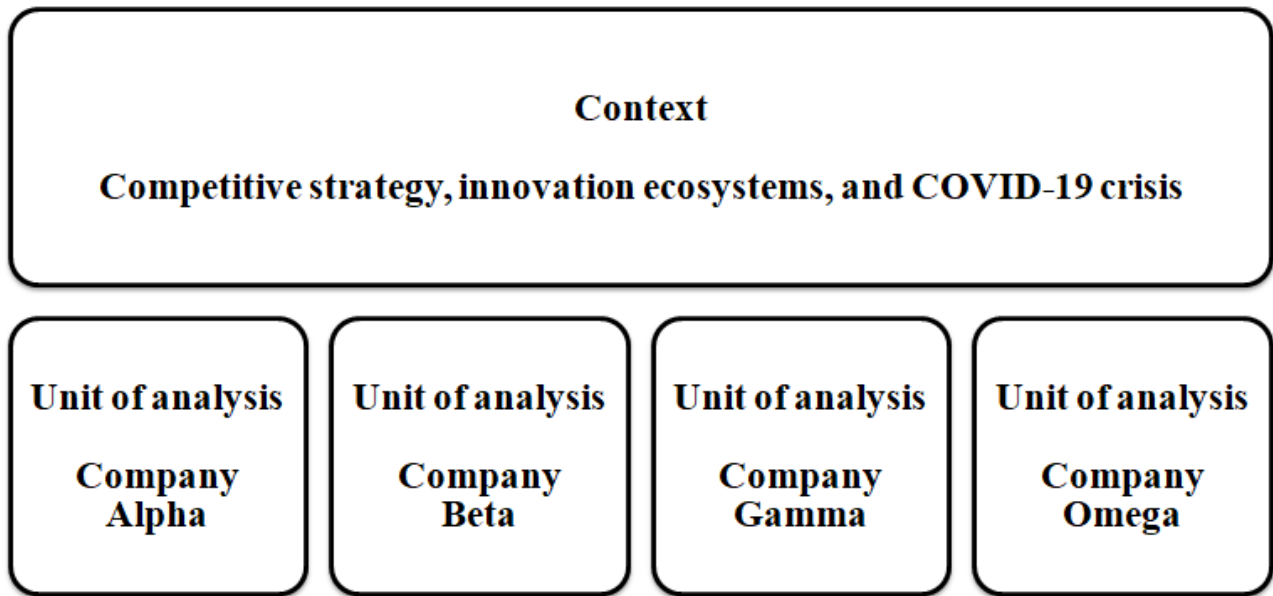
Considering that the consequences of the COVID-19 pandemic are not fully comprehended, the premise of this research was an exploratory approach. According to Babbie (2014), exploratory studies usually verify a new emerging interest or investigate a relatively new subject study. Therefore, these studies allow investigators to deeply comprehend the subject study, verify the necessity of carrying out more studies regarding the phenomenon, and develop methods to be employed in further studies.

This study is also qualitative research. Qualitative research aims to comprehend and describe the phenomenon being observed by transcribing people's experiences via an interview with open-ended questions and through observation (YILMAZ, 2013). In other words, qualitative studies emphasize the "[...] social construction of reality [...]" (EISENHARDT; GRAEBNER, 2007, p. 28).

The case study approach was a viable option for carrying on this exploratory and qualitative research. A case study allows researchers to investigate an actual phenomenon with details and within its natural environment of occurrence. That is notably when the relationship between the boundaries and the context of the studied phenomenon is not known (YIN, 2018). Consequently, case studies are more suitable to answer "how" and "why" research questions, which are related to "[...] the dynamics of the temporal dimension through which the events of the phenomenon unfold [...]" (MEREDITH, 1998, p. 443; YIN, 2018).

The type of case study applied in this research was the multiple and holistic case. Such a study had four cases with only one unit of analysis in each (i.e., each case was indeed the unit of analysis). Besides, neither investigated the specific features from a determined functional area of the firms nor collected any systematic data from it (which each of them would configure an embedded unit of analysis). It is worth mention that each studied case had the same context (i.e., innovation ecosystems and competitive strategy in pandemic circumstances). Figure 6 illustrates the schematic of this holistic multiple case study.

**Figure 6: Arrange of the holistic multiple case study**



Source: Adapted from Yin (2018).

The study had a developed script to carry on semi-structured interviews, direct observation when possible, and documentation like the company’s website, business plan, and institutional presentations to collect the necessary data. Case studies rely on a great variety of data sources such as e-mails, archives, organizational charts, business plans, direct observations of the studied events, interviews with people that may still be involved in these events, among others (BARRATT; CHOI; LI, 2011; EISENHARDT, 1989; EISENHARDT; GRAEBNER, 2007; MEREDITH, 1998; YIN, 2018). A case study needs to utilize multiple sources of evidence to support the findings, assuring “[...] that the facts being collected are indeed correct.” and a “[...] stronger substantiation of constructs and hypotheses.”, thus achieving the so-called data triangulation (EISENHARDT, 1989, p. 537; MEREDITH, 1998, p. 443; YIN, 2018).

Admitting that all businesses have been affected by the crisis, the research initially considered every company a potential case study. Hence, there was no limitation regarding the enterprises' geographic location and size. However, the main criteria for selecting the cases to be studied considered companies' availability to contribute to the research due to the pandemic consequences.

Science parks, business incubators, and other ecosystem champions had a crucial role in successfully establishing an initial interaction with partner enterprises. Nevertheless, technology-based startups and smaller ventures were more likely to participate in the research. It is worth highlighting that the researcher chose ventures from different sectors to carve out as many elements and features as possible from the investigated phenomenon.

Due to the restrictions imposed by the COVID-19, all the interviews were online. Furthermore, company Gamma did not have an office, and the employees were working at home, which made it impossible a direct observation in that case. In the others, the security and health procedures were followed during the visit. For the interview, I talked to the founders of the selected companies. These founders were also chief executive officers (CEOs) and managers of these ventures. These people had the necessary background to cover topics related to competitive strategy and innovation ecosystems.

Although there is no exact number of cases to study in a multiple case approach, Eisenhardt (1989) affirmed that a number between four and ten cases is the best choice, especially for theory building. It is hard to generate a robust theory with less than four cases. Further, it is arduous to deal with a large volume of data with more than ten cases (EISENHARDT, 1989). As observed by Barratt, Choi, and Li (2011, p. 331), “multiple cases can augment external validity and help guard against observer bias.”. Furthermore, there is no need for stratified or random sampling when the objective is to develop a theory (EISENHARDT; GRAEBNER, 2007). Table 3 presents preliminary information regarding the selected cases.

Table 3: Chosen companies

Company generic name	Alpha	Beta	Gamma	Omega
<b>Founding</b>	2019	2017	2009	2018
<b>Location (city, state)</b>	Sorocaba, São Paulo	Ribeirão Preto, São Paulo	Sorocaba, São Paulo	Rio de Janeiro, Rio de Janeiro
<b>Product/Service</b>	Event management	Solutions using nanotechnology	Consultancy and development of information systems	Online occupational health and safety care
<b>Size<sup>4</sup></b>	Micro	Micro	Micro	Micro
<b>Capital</b>	Brazilian	Brazilian	Brazilian	Brazilian
<b>Interviewees</b>	Chief marketing officer (CMO) and co-founder CEO and co-	R&D manager and co-founder Financial manager and co-founder	Co-founders	CEO and co-founder Chief information officer (CIO) and

<sup>4</sup> Based on the number of employees typology proposed by the Brazilian Micro and Small Business Support Service (SEBRAE). Source: [https://www.sebrae.com.br/Sebrae/Portal%20Sebrae/UFs/SP/Pesquisas/MPE\\_conceito\\_empregados.pdf](https://www.sebrae.com.br/Sebrae/Portal%20Sebrae/UFs/SP/Pesquisas/MPE_conceito_empregados.pdf)



	founder			co-founder
<b>Interviewees' generic name</b>	CMO and co-founder → A1 CEO and co-founder → A2	R&D manager and co-founder → B1 Financial manager and co-founder → B2	First co-founder → C1 Second co-founder → C2	CEO and co-founder → O1 CIO and co-founder → O2
<b>Other sources of information</b>	Direct observation Company's website	Direct observation Institutional presentation Online folder Company's website	Company's website Institutional presentations Registration of deployment or installation of the system	Direct observation Business plan Company's website
<b>Number of visits</b>	One	One	-	One

Source: Author.

Alpha was the pre-test company of the study, which helped in the interview script development (Appendix A<sup>5</sup>). As a result, modifications were made to the script (Appendix C) to avoid repetitive queries and improve the respondents' understanding. This upgraded script is in the case study protocol in Appendix D<sup>6</sup>. Furthermore, such protocol also has the objective of this study and the steps followed in conducting this research. It is worth noting that I asked the questions according to the answers given by the respondents to maintain the fluidity of interviews. For example, it was not mandatory to ask all the inquiries about competitive strategy (board B from the case study protocol) before asking about the innovation ecosystem's maturity (board E from the case study protocol).

Data analysis is the most complex and critical part of the entire process (EISENHARDT, 1989; MCCUTCHEON; MEREDITH, 1993). Such analysis occurred according to the hints presented by authors like Bardin (2011), Barratt, Choi and Li (2011), Eisenhardt (1989), McCutcheon and Meredith (1993), and Silva and Fossá (2015). The steps followed were:

- The first stage was the answers' transcription from the interviews to allow the building and description of the cases.
- After, a descriptive write-up was created for each case based on the interviews' data and complemented by information from other sources like direct observations and documentation. These write-ups, following a pattern, present the characteristics of

<sup>5</sup> Appendix A has a Portuguese version, which is in Appendix B. I developed the Portuguese version because the interviews occurred in that language to avoid misinterpretations.

<sup>6</sup> Appendix D has a Portuguese version, which is in Appendix E. The reason is the same as appointed in the previous footnote.

each case. They enabled comparisons with theory and between them. Further, such a pattern facilitated the readers' understanding.

- The last step consisted of confronting all the cases to identify similarities and divergences among them. Concurrently, there was a comparison between these results and theory to find supporting or contrasting backgrounds. That was a crucial phase because it helped to maintain the quality and rigor of the work. Moreover, it was possible to evaluate the constructs and provide insights for further studies.

Case studies need to be conducted with suitable rigor (VOSS; TSIKRIKTSIS; FROHLICH, 2002) to provide reliable results and with high quality. Based on the positivism perspective (GIBBERT; RUIGROK; WICKI, 2008), four relevant tests evaluate the quality of this research method (YIN, 2018):

- Construct validity: It expresses the “[...] correct operational measures for the concepts being studied.” (VOSS; TSIKRIKTSIS; FROHLICH, 2002, p. 211). When collecting the data, it is possible to verify the construct validity by establishing a chain of evidence and achieving triangulation. The former shows how the findings obtained through the case study derived from the gathered data, and consequently, from the case study protocol and the research questions (YIN, 2018). It is also possible to assess the construct validity by having key informants reviewing the draft case study report (VOSS; TSIKRIKTSIS; FROHLICH, 2002; YIN, 2018).
- Internal validity: This can also be called “logical validity” and is concerned with the ability of a researcher to sustain the conclusions of the study by providing consistent and logical arguments (GIBBERT; RUIGROK; WICKI, 2008). According to Yin (2018), in case studies, the internal validity problem is related to the difficulty of making inferences. Inference occurs when it is not possible to observe a determined event. Building on evidence from interviews and documents collected for the case study, the researcher will infer that a specific event resulted from an earlier occurrence, which may be incorrect. During the analytical phase of case studies, the internal validity can be assured by following pattern matching, explanation building, addressing rival explanations, or using logic models. Internal validity is mainly a matter for explanatory studies since the researcher is concerned to demonstrate how and why event A causes event B. If the investigator finds a relationship between A and B without considering an event C that may lead to event B, the study lacks internal validity. Internal validity tends not to be a problem for exploratory and descriptive studies since they do not approach this type of causal relationship.

- **External validity:** This can also be called “generalizability” and is related to whether the findings obtained in the case study can be extended beyond the analyzed settings (GIBBERT; RUIGROK; WICKI, 2008; YIN, 2018). Case studies do not allow statistical generalization since the case or cases investigated did not derive from a sampling technique. Then, these cases are not sufficient to be classified as a sample, and consequently, to represent a larger population (YIN, 2018). However, that does not mean that the findings from case studies cannot be generalized (GIBBERT; RUIGROK; WICKI, 2008). A viable option is an analytical generalization, characterized as a process apart from the statistical generalization that allows case studies to extend their findings to other scopes beyond the investigated situation (GIBBERT; RUIGROK; WICKI, 2008; MEREDITH, 1998; YIN, 2018). Furthermore, the researcher needs to observe if the studies answer the “how” or “why” questions defined earlier (YIN, 2018).
- **Reliability:** It is critical to guarantee that other researchers may replicate the same case study conducted by an earlier researcher and obtain the same findings from the previous research. Researchers must be sufficiently transparent to enhance the reliability of their works by developing: a case study protocol, which explains how they built and conducted the entire study; and a case study database, which organizes study's documents, the responses of the interviews, and any other source of evidence that investigators may access later (GIBBERT; RUIGROK; WICKI, 2008; YIN, 2018).

Table 4 summarizes how this study addressed each of the mentioned criteria:

Table 4: Validity and reliability of the research

Criteria	Procedure
Construct validity	Review of the research protocol by experienced researchers; A consistent conceptual background of the research; Establishing a chain of evidence; Multiple sources of evidence (semi-structured interview, documentation, and direct observation); Maintenance of gross data; A full transcription of the data; Review of the draft case study report by key informants.
Internal validity	Not applicable for exploratory studies.
External validity	Answer the “how” question of the research;

	Analytical generalization; Comparison among findings and theory.
Reliability	Develop of research protocol; Development of case study database; Maintenance of chain of evidence; Recording and taking notes during the interviews; Avoiding influence on behavior and responses of interviewees;

Source: Author.

## 4 FINDINGS

This chapter presents descriptive case write-ups. First, it shows a brief description of the companies to elucidate their propositions and goals. After, the chapter shows the results regarding organizations' strategies, innovation ecosystems, and the COVID-19 crisis consequences in each case.

### 4.1 BRIEF DESCRIPTION OF EACH COMPANY

Alpha was a startup that provided individual contractors with the complete party project. Through that offer, Alpha was responsible for managing their social events (e.g., marriages and debutante ball), including finding the ideal service providers to carry out the project. The venture had a single unit and a workforce smaller than nine employees. Alpha's goal was to become a reference in the event industry by providing a secure business with innovative practices for both customers (i.e., contractors and providers).

Beta was a startup that provided nanotechnology solutions to develop intelligent asset release systems using natural ingredients. The venture focused on R&D to develop formulations (e.g., Vitamin D and Coenzyme Q<sub>10</sub>) for pharmaceutical, cosmetic, food, and veterinary industries. The company also had a manufacturing plant to supply the cosmetic and food industries on a large scale. Beta had a single unit and a workforce smaller than 19 employees. The startup's goal was to achieve a competitive edge from developing innovative solutions. Therefore, the venture offered superior stability, better absorption and higher solubility of assets, and higher compatibility with other formulations.

Gamma was a micro-enterprise that offered consultancy in business management and process improvement for large, mid-sized, and downwards companies. The company also provided to these customers generic and customized integrated information systems. The company had a single unit and a workforce smaller than nine employees. Gamma's goal was to become a reference in the consultancy, and design and implementation of integrated systems, especially for the so-called emerging companies (i.e., mid-sized and downwards organizations that could no longer control their operations through spreadsheets).

Omega was a startup that offered online occupational healthcare for the marketplace. The enterprise developed an application/platform to connect, in a practical and fast way, patients and doctors at any time. The idea was to make the patient feel at ease and satisfied with the care provided and the doctor with the data confidentiality. The entity had a single unit and a workforce smaller than nine employees. Omega's goal was to become one of the ten largest Brazilian ventures

in the telehealth industry within four years. Hence, the startup offered an innovative solution to develop an ethical and transparent relationship between doctors and patients.

## 4.2 COMPETITIVE STRATEGY

### 4.2.1 Alpha

Following Porter's (1998) generic strategies, data showed that Alpha adopted the focus strategy by offering differentiated features and services with lower prices for both customers. The venture provided security in payment method, event execution, and a rigorous choice of providers to join the ecosystem to achieve such a strategy. Moreover, Alpha provided management assistance for providers and organized monthly networking. The respondents also highlighted that other market solutions just offered greater visibility to service providers and easier access to contractors.

Through the complete party project (as described later in Subsection 4.4.1, a solution created after reviewing the business model), Alpha guaranteed events' execution under any circumstances and a secure payment method for contractors. Consequently, as stated by A2, providers could focus only on their activities. Furthermore, the interviewees affirmed that the startup only chose reliable and credible providers to join the ecosystem. Alpha assessed the quality of the service offered by these providers. Together with a financial consultancy, they also evaluated providers' financial health.

Concerning the management support for service providers, the interviewees affirmed that these customers had deficiencies in the management part despite some presenting acceptable operational solutions. Hence, there was the availability to talk to financial, legal, and marketing consultants, who also provided services for Alpha.

The networking promoted by Alpha aimed to increase the connection between providers. Then, A1 stated that these events were well-received because they improved the relationship among providers, especially those involved in the same project. Table 5 summarizes these main points of Alpha's competitive strategy.

Table 5: Alpha's strategy main points

Strategic pillar	Premises
Security	Secure payment method Guaranteed execution of the events Careful selection of service providers to join the ecosystem
Management support for service providers	Consultants could aid service providers in the management area
Networking	Monthly face-to-face meetings to establish a connection between providers

Source: Author.

The interviewees affirmed that cashback and events' security (addressed earlier) were two crucial innovation pillars to achieve a competitive edge. Alpha brought the former to the event industry, in which contractors got back an amount of the contract value through a voucher. Contractors could use such vouchers to pay any service provider. However, during data gathering, the startup was no longer offering cashback temporarily due to problems with providers (that problem was addressed later in Subsection 4.3.1). Moreover, data showed that innovation was present in Alpha's mission, vision, and values.

Alpha also considered several internal and external organizational factors when developing and adjusting the mentioned strategy. Following Barney's (1991) propositions, the interviewees highlighted the importance of Alpha's resource base and competencies for the former. The startup considered its human, financial, and technological resources. Considering Porter's (1998) five forces, Alpha considered the environment outside the company's borders (e.g., customers' demands and behavior, and the emergence of new platforms) for the latter. Furthermore, Alpha had also considered the pandemic and potential ecosystem complementors.

As an example, the respondents affirmed that Alpha identified the need for an application/platform to attract complementary innovations into the ecosystem. Consequently, the venture perceived the need for information technology (IT) knowledge and then incorporated a new partner from that area. Therefore, the development of such a platform would require new assets and methods, resulting in a new organizational routine (or competency). Another example presented by the respondents would be obtaining knowledge (human capital acquiring new abilities) in marketing before defining new publicizing procedures (resulting in new competencies).

#### 4.2.2 Beta

Following Porter's (1998) generic strategies, data revealed that Beta adopted the focus strategy. The startup developed differentiated nanotech products that could deliver benefits

customers perhaps had not achieved, regardless of whether this could result in a higher selling price or costs. Therefore, the enterprise provided nanotech solutions demanding lower dosages, with natural ingredients and a supplementary process to achieve such a strategy. Further, the company constantly scanned the market and had high flexibility.

B1 stated that nanotechnology was the basis of the business to meet the different needs of customers. The respondents emphasized that natural raw materials allowed Beta to provide healthier and high-quality products than competitors. On the one hand, these products were more expensive. On the other hand, B2 declared that users would obtain, with lower quantities, the same effectiveness as competing offers. Furthermore, B2 asserted that the startup had partnerships to carry out tests to guarantee that the customer's product was absorbing the given asset properly. B2 also stated that only a few competitors had such a concern.

B1 and B2 highlighted that another critical point of Beta's strategy was scanning the national and international market to find opportunities to innovate. Regarding the flexibility, B1 asserted that Beta could adjust itself to meet the customer's requirement, provided it was an advantageous proposal. Within the R&D area, Beta could produce a given input for the customer, carry out a technology transfer, formulate the finished product, and participate in patent development. Table 6 summarizes the main points of Beta's competitive strategy.

Table 6: Beta's strategy main points

<b>Strategic pillar</b>	<b>Premises</b>
Nanotechnology	Basis of the business to meet divergent needs of diverse clients
Natural ingredients	Healthier, more expensive, and higher-quality products than the concurrents
Solution with lower dosages	Solutions with the same effectiveness as competing offers.
Supplementary processes	Tests to guarantee the effectiveness of formulations
Critical window	Scan of national and international market trends to find possibilities to exploit
Flexibility	Beta could easily adjust itself to meet the customer's requirement

Source: Author.

The interviewees asserted that nanotechnology, natural raw materials, critical window, and external demand were Beta's innovation pillars in achieving competitive advantage and delivering sustainable products. The external demand was related to when customers directly requested an innovation, such as an improvement or higher stability of a particular formulation. Furthermore, B1



and B2 highlighted that innovation was present in the venture's mission, vision, and values. However, it is worth noting that such information was not available in any data source provided.

The respondents also affirmed that the startup considered various internal and external organizational factors for the competitive strategy establishment and adjustment. Following Barney's (1991) RBV propositions, B1 and B2 highlighted the critical role of Beta's resource base and competencies for the former. The venture considered resources such as the organizational culture, human capital, technologies, and finances. For the latter, following Porter's (1998) five forces approach, Beta acknowledged the external environment (e.g., customers' demands, market trends, suppliers, and concurrent solutions). Moreover, the startup had also considered regulators and the pandemic.

For example, the interviewees highlighted the importance of acquiring human capital (new resources) with nanotech knowledge (their specific competence) to deliver the proposed value. These employees would define a new organizational routine (another competence) by establishing the necessary tools and assets (e.g., technological resources) to perform daily activities related to product formulation and manufacturing processes. Regarding the organizational culture, B2 emphasized the commitment to improve the offers and deliver sustainable products constantly.

#### **4.2.3 Gamma**

Following Porter's (1998) generic strategies, data exposed that Gamma adopted the focus strategy by offering differentiated and simple solutions. Further, the organization modified the business scope to embrace emerging companies. G1 stated that initially, Gamma served only firms with more than 100 employees. However, the enterprise noticed high competition levels with traditional companies within this market niche.

G2 stated that the systems offered by the micro-enterprise were more general, smaller, and more uncomplicated than competitors'. Consequently, those offers brought more dynamism and possibilities for end-users, resulting in a grand differential (e.g., use of cloud servers). The interviewees affirmed that generic (or standard) systems were cheaper and less-effort demanding than the customized ones. Hence, updates in the former would benefit a larger audience than in the latter. Furthermore, through the adoption of cloud servers, a single script was enough to update several systems. In traditional servers, Gamma needed to access each customer manually to deliver updates.

G2 asserted that at the end of 2019, Gamma realized that large organizations had hard times trying to meet the emerging companies' needs. G2 also affirmed that the systems offered by these corporations were too complex and static. Therefore, the respondents affirmed that they deactivated

Gamma's office to give employees enough autonomy and mobility to be wherever the customer was. By doing that, they believed the venture would consolidate and succeed within this market niche. Table 7 summarizes these main points of Gamma's competitive strategy.

Table 7: Gamma's strategy main points

<b>Strategic pillar</b>	<b>Premises</b>
The product's simplicity	More functional systems than concurrents'
Focus on generic systems	Generic systems were better than customized ones
Focus on emerging companies' market	Unique business opportunity within this market niche

Source: Author.

The respondents asserted that product simplicity, the offered systems, cloud servers, and external demand were crucial innovation pillars to achieve competitive advantage. G2 affirmed that Gamma smoothly introduced cloud servers into the systems offered, as occurred technological advances in storage servers and the internet. Regarding the external demand, G1 stated that customers directly required innovation in the solutions offered. Furthermore, the respondents reported that innovation was in Gamma's values, vision, and mission. Nevertheless, such information was not available in any data source provided.

G1 and G2 affirmed that Gamma considered several internal and external organizational elements when establishing and adjusting the competitive strategy. Following Barney's (1991) propositions, the respondents highlighted the importance of resource base and competencies for the former. The firm considered resources like technology assets, human capital, and finances. For the latter, following Porter's (1998) five forces proposition, the co-founders highlighted the importance of Gamma's external environment (e.g., customers' needs and competitors). Further, Gamma had also considered the available technological infrastructure and the pandemic.

For example, data showed that when including cloud servers in the offered systems, Gamma updated the technological assets (resources) and considered the available budget (financial resources). Moreover, the company relied on the knowledge possessed by employees (human resources) to improve internal processes and deliveries to end-users, resulting in a new organizational competence. Another example presented by the interviewees would be acquiring knowledge in finance (human capital obtaining new abilities) to provide new features and functionalities in both offers (which would result in a new competence).

#### 4.2.4 Omega

Following Porter's (1998) generic strategies, data showed that Omega adopted the focus strategy by offering differentiated functionalities and services with lower prices for both customers (i.e., doctors and patients). The interviewees highlighted that it was impossible to compete against traditional institutions to serve the whole telehealth industry. Therefore, the startup decided to focus on the online occupational market niche. The organization had a demand-oriented business model and provided a simple offer with a geolocation system. Further, the platform provided training for doctors and conflict mediation for both clients.

O1 stated that the startup had a demand-oriented business model. O1 affirmed that the segmentation to occupational medicine began due to a company's demand in the Federal University of Rio de Janeiro's (UFRJ) science park. This organization was looking for a solution to bring doctors into their work environment at lower costs. Therefore, Omega perceived an opportunity and began to develop its value proposal to serve this need and the whole market.

The respondents stated that the goal was to offer a user-friendly platform for the market. Additionally, O1 highlighted that the offer was the first national platform to allow patients to find doctors through geolocation functionality. Data also exposed that the platform was the first to train doctors to attend to patients virtually. Omega was also the first to provide financial incentives for medics to obtain knowledge and competence regularly. Finally, the startup also provided conflict mediation to solve problems related to the doctor-patient relationship. Table 8 summarizes the main points of Omega's competitive strategy.

Table 8: Omega's strategy main points

<b>Strategic pillar</b>	<b>Premises</b>
Demand-oriented business model	Platform completely adherent to the customer's necessities
Platform simplicity	Offering a platform with uncomplicated use for the parties
Geolocation system	The first national platform in the area to provide such functionality
Online training	Preparing medics on the use of the platform and how to serve the patient virtually
Continuous learning	Doctors received financial incentives to acquire new knowledge and competence regularly
Conflict mediation	Solve problems related to the doctor-patient complex relationship

Source: Author.

Data showed that telehealth, georeferencing, and value proposal simplicity were the innovation pillars for Omega obtaining a competitive edge. O1 asserted that the idea of aligning traditional medicine with technological advances induced a very sudden paradigm shift. Telehealth could replace face-to-face assistance in specific cases. O1 also affirmed that the latter had higher costs and demanded commercial hours availability from both customers. Furthermore, data showed that innovation was present in the enterprise's mission, vision, and values.

O1 and O2 declared that Omega considered several internal and external organizational factors when developing and adjusting the competitive strategy. Following Barney's (1991) propositions, the interviewees highlighted the importance of resource base and competencies for the former. Omega considered human, financial, and technological resources. Following Porter's (1998) five forces, the respondents highlighted Omega's external environment (e.g., market demands, suppliers, and competitors' solutions). Moreover, the venture had also considered other ecosystem participants and the pandemic.

For example, data displayed that Omega considered its human capital abilities (human resources) in occupational medicine and IT applications when focusing on occupational telehealth. Further, the startup also considered technology assets (technological resources) and available budget (financial resources).

## 4.3 INNOVATION ECOSYSTEMS

### 4.3.1 Alpha

The respondents affirmed that Alpha had set an objective for the ecosystem: creating value and nurturing consolidation. As a keystone, Alpha tried to attract new participants for the ecosystem, especially complementors, besides managing and connecting the existing network members. However, the startup faced several challenges to succeed in delivering value and structuring the ecosystem.

The interviewees stated that service providers posed the biggest problem. For example, cashback revenue got compromised because some providers did not issue vouchers. These participants did not perceive value in such practice. Furthermore, the fierce competition between providers from the same segment hindered the cooperation across Alpha's ecosystem. The complete party project was a solution to handle these problems. The respondents stated that before that project, Alpha did not take the lead to manage the events. Alpha's proposition was only to provide an interface connecting contractors seeking service providers to organize their events.

The respondents also affirmed that Alpha's ecosystem had problems attracting complementors such as construction and technology firms and financial institutions. Besides the

technology deficiency and the solution found (as addressed earlier in Subsection 4.2.1), the ecosystem's proposal was unknown outside the event market. Therefore, Alpha was studying new approaches for publicizing the value proposition.

Following Dedehayir, Mäkinen, and Ortt (2018), Gomes *et al.* (2018), and Iansiti and Levien (2004) propositions, the ecosystem was composed of the following group of stakeholders: keystone, customers, suppliers, experts, and champions (Table 9).

Table 9: Alpha's ecosystem structure

<b>Role</b>	<b>Participants</b>
<b>Leadership</b>	Alpha
<b>Customers</b>	Contractors Service providers
<b>Suppliers</b>	Service providers
<b>Experts</b>	Financial consultancy Marketing consultancy Legal consultancy SEBRAE
<b>Champions</b>	Business Network International (BNI) Sorocaba Trade Association SEBRAE

Source: Author.

The interviewees stated that the interaction with customers happened mainly through social networks such as Instagram, Facebook, and WhatsApp. With contractors, the communication process sought to create and maintain proximity to the group and understand their needs. With service providers, the contact was more frequent on WhatsApp and aimed to establish a close relationship.

Service providers could be classified as suppliers of Alpha's ecosystem as well. For example, suppliers provide products, components, or services essential for a given company to elaborate its offer. Then, what service providers offered was indispensable for Alpha developing its value proposal. The complete party project illustrated this situation. When asked if this observation had any basis, A1 replied that it seemed to make sense to have this view of service providers, while A2 stated it was more logical to perceive them only as customers.

A2 highlighted that the relationship with the experts was traditional and formal. A1 pointed out that there was also a win-win relationship between Alpha and the consultancies, as they had free access to service providers. Additionally, Alpha joined the SEBRAE acceleration program, which supported the startup to structure its business, process, and activities, besides identifying market opportunities. Regarding the champions, A1 asserted that this group provided networking with

several entrepreneurs. Therefore, they assisted in promoting the offer and increasing credibility in the market.

Concerning the interaction process across Alpha's ecosystem, it occurred mainly through WhatsApp and less often through other social media. Such a process happened in a disassociated way. That is, Alpha usually interacted with each group separately. Although the ecosystem used these platforms, there was no active participation of their developers in the network. The ease that social media provided was a great advantage, as countless people could easily access them. On the other hand, there was no complete interaction between the entire ecosystem, which was a disadvantage. By developing the already mentioned application/platform, Alpha believed to overcome such disadvantage. Furthermore, specific providers with party halls shared their space for networking and events execution.

Regarding competition, the interviewees perceived the occurrence within the ecosystem (e.g., the competition between service providers mentioned earlier) and with other networks. The latter happened when potential competitors presented without success similar offers, including the use of cashback. However, the respondents perceived cooperation only inside the ecosystem. They asserted that cooperation efficiently occurs between providers from different segments and the startup. Otherwise, it would be hard to manage and deliver the project. Following Bengtsson and Kock's (2014) propositions, although the respondents affirmed that cooperation and competition occurred concurrently inside the ecosystem, it did not characterize a coopetition relationship. None of the mentioned participants faced simultaneous competition and cooperation. Table 10 summarizes the described relationships with other networks and inside the studied ecosystem.

Table 10: Competition, cooperation, and coopetition relationships in Alpha's case

	<b>Competition</b>	<b>Cooperation</b>	<b>Coopetition</b>
<b>Within the ecosystem</b>	Yes	Yes	No
<b>With rival systems</b>	Yes	No	No

Source: Author.

#### 4.3.2 Beta

The interviewees affirmed that the customers had the leading role in Beta's ecosystem due to their large client base and ease of selling products. Nevertheless, data exposed that Beta was also a keystone because the startup attracted participants (e.g., assemblers, experts, and sponsors) to the ecosystem and nurtured the interaction across the network. These leaders had set the focus on

creating and capturing value, as well as consolidating the network. Besides, B1 and B2 highlighted challenges when creating value and strengthening the ecosystem.

The respondents affirmed that the startup usually co-developed several projects with the University of São Paulo (USP). B1 highlighted that the low financial capacity of both entities had limited the ecosystem development. Beta had difficulties in infrastructure improvement and conducting projects. Therefore, B1 emphasized the grand dependency on development agencies such as the São Paulo Research Foundation (FAPESP) and the Funding Authority for Studies and Projects (FINEP) to overcome this challenge.

B1 also asserted that although the business incubator provided good support and infrastructure, there was a lack of a shared place for coworking with companies. Further, B1 highlighted problems like lack of maintenance and calibration with equipment provided by universities. Thus, the interviewees affirmed that Beta established partnerships with specific laboratories to face this challenge.

Following Dedehayir, Mäkinen, and Ortt (2018), Gomes *et al.* (2018), and Iansiti and Levien (2004) proposals, the ecosystem was composed of the following group of stakeholders: keystone, customers, suppliers, assemblers, complementors, experts, sponsors, champions, regulators, and tendency creators (Table 11).

Table 11: Beta's ecosystem structure

<b>Role</b>	<b>Participants</b>
<b>Leadership</b>	Beta
<b>Customers</b>	Customers Pharmaceutical companies Veterinary companies Cosmetic ventures Food organizations
<b>Suppliers</b>	Chemical enterprises Pharmaceutical companies
<b>Assemblers</b>	Specific laboratories
<b>Complementors</b>	Medics from clinical nutrition Nutritionists Gyms
<b>Experts</b>	USP Federal University of São Paulo (UNIFESP) Companies running tests Legal consultancy
<b>Sponsors</b>	FAPESP FINEP Banks Investment funds
<b>Champions</b>	Business incubator

	Science park
<b>Regulators</b>	Brazilian Health Regulatory Agency (Anvisa)
<b>Tendency creators</b>	The media Social media influencers

Source: Author.

The respondents affirmed that the relationship with customers tended to start in their R&D sector. Further, there was a close connection with this group since the formulations developed by Beta tended to be customized to be entirely adherent to the demand. B1 also highlighted that Beta prioritized suppliers with a solid scientific link or enough knowledge concerning a given input. B1 stated that as many of them were companies located overseas, the receiving process of these elements was slightly complex, but it did not hamper product development.

Regarding the assemblers, the specific laboratories mentioned earlier in this Subsection composed this group by helping Beta develop formulations. As complementors, the interviewees stated that medics and nutritionists only recommended products with Beta's offers as inputs to their patients. Further, Gyms suggested Coenzyme Q<sub>10</sub> produced in the ecosystem to their customers.

The interviewees asserted that the startup regularly interacted with USP (as mentioned earlier) and less often with the Federal University of São Paulo (UNIFESP) to co-develop projects with pharmacy, dentistry, and medical faculties. The companies that provided support by running tests to assure offers' quality (as discussed in Subsection 4.2.2) and service providers in the regulatory part also belonged to this group. The latter consisted of actors located in São Paulo who assisted Beta in the documentation and regulation procedures vis-à-vis the Brazilian Health Regulatory Agency (Anvisa).

Concerning the sponsor group, B1 affirmed that the projects supported by FAPESP and FINEP were related to discovering new assets or helping validate products through scientific studies. Although less used, banks and investment funds were also an option. The respondents stated that the champions supported the startup and ecosystem development by providing resources, infrastructure and organizing product fairs, webinars, and seminars. Such events helped to attract new ecosystem members.

B1 and B2 emphasized that Anvisa was responsible for the supervision and approval of products or services related to health. B2 declared that if a product was not a medicine, the startup could not state its use had a determined benefit. Otherwise, Anvisa would not allow the production and commercialization of this product. Concerning the tendency creators (social pressure groups), B2 affirmed that the influencers formed an opinion about improving health and well-being and then



indicated and publicized the ecosystem's offers. At the same time, the media encouraged the population to adopt healthier habits.

Regarding the interaction process across Beta's ecosystem, the interviewees highlighted that it occurred through video conferencing platforms such as Microsoft Teams and Google Meet. B1 also emphasized the importance of confidentiality agreements for sharing information with other ecosystem members. Despite using these online tools, their developers had no active participation in the ecosystem. The faster communication and the possibility of meeting with several people in a short time was an advantage appointed by the interviewees. However, the need to observe a given product still required face-to-face meetings. It is worth reminding that customers' R&D sectors and business incubators facilities were physical platforms with the same purpose of interaction and ecosystem development.

Concerning competition, the respondents affirmed that it occurred inside the ecosystem. That situation happened between Beta and customers with similar offers and among suppliers from the same segment. Regarding cooperation, the interviewees perceived the occurrence inside the ecosystem and with other networks. Within the ecosystem, Beta cooperated with other ecosystem members, including the customers with similar products. With other networks, B1 highlighted that those to provide quality of life tended to cooperate with Beta's ecosystem. Following Bengtsson and Kock's (2014) propositions, the interviewees affirmed that cooperation and competition occurred concurrently inside the ecosystem, characterizing a coopetition relationship. Beta and customers with similar products competed and cooperated simultaneously. Table 12 summarizes the described relationships with other networks and inside Beta's ecosystem.

Table 12: Competition, cooperation, and coopetition relationships in Beta's case

	<b>Competition</b>	<b>Cooperation</b>	<b>Coopetition</b>
<b>Within the ecosystem</b>	Yes	Yes	Yes
<b>With rival systems</b>	No	Yes	No

Source: Author.

### 4.3.3 Gamma

The interviewees affirmed that Gamma led the ecosystem renewal process. Moreover, the objective was value capture and creation and consolidation of the network in the market. As a leader, Gamma aligned the ecosystem members to meet the emerging companies' needs. The firm also attempted to attract new experts such as universities and attach complementary innovations to

the offers. However, the respondents asserted that Gamma faced challenges in this renovation process.

The interviewees assumed that the most challenging point was to align the value proposition with the emerging companies' necessities. G1 stated that work from home (WFH) and remote technologies were not part of emerging companies' culture, different from large organizations. Therefore, Gamma combined remote technologies solutions to attend to this target customer successfully. Moreover, G1 affirmed that two application programming interface (API) developers had joined the ecosystem (as complementors) since their solutions were adherent to the emerging companies' needs. Another challenge highlighted by the co-founders was Gamma and the ecosystem's difficulty in publicizing the value proposition. G2 asserted that Gamma made short investments in marketing because the budget available was limited.

Following Dedehayir, Mäkinen, and Ortt (2018), Gomes *et al.* (2018), and Iansiti and Levien (2004) proposals, Gamma's ecosystem was composed of the following group of stakeholders: keystone, customers, suppliers, assemblers, complementors, experts, champions, regulators, and tendency creators (Table 13).

Table 13: Gamma's ecosystem structure

<b>Role</b>	<b>Participants</b>
<b>Leadership</b>	Gamma
<b>Customers</b>	Large firms Emerging companies
<b>Suppliers</b>	Data centers Electronic document providers
<b>Assemblers</b>	Companies and individuals involved in consultancy, quality, and management areas
<b>Complementors</b>	API developers
<b>Experts</b>	SEBRAE
<b>Champions</b>	SEBRAE
<b>Regulators</b>	Secretariat of Finance (SEFAZ) International Organization for Standardization (ISO)
<b>Tendency creators</b>	The media

Source: Author.

Regarding the customers, G2 highlighted that the information exchanged had to be as open and honest as possible. Consequently, Gamma would develop and implement an effective system and carry out helpful consultancies. G2 affirmed there were no obstacles regarding information exchange with suppliers since the link with these participants was solid and transparent. G1 highlighted a special relationship of dependence with data centers because they were responsible for

hosting Gamma's database. G2 asserted that the supplier of electronic documents was also vital, as it allowed Gamma to put its efforts only on the development or improvement of its offers.

G1 declared that the presence of freelancers in the consultancy and systems market was natural. Therefore, Gamma reduced its staff, strengthening relations with this group of assemblers responsible for directly supporting Gamma. As complementors, the interviewees highlighted that the venture integrated into the offers several APIs to generate indicators and results. The respondents also emphasized that SEBRAE was an extraordinary entity in this ecosystem. First, SEBRAE was an expert that offered courses in the most varied areas correlated to entrepreneurship. Additionally, SEBRAE was a champion that promoted networking, helping to conquer new ecosystem members.

The co-founders highlighted that as Gamma used e-invoices frequently, it needed to provide information to the Secretariat of Finance (SEFAZ), a regulator responsible for validating or disapproving them. Moreover, G2 alerted that Gamma specified in its contracts that any modifications proposed by SEFAZ with impacts on e-invoices would not incur additional costs to the customer. Regarding the other regulator, the respondents stated that systems needed to be suitable for the International Organization for Standardization (ISO) certifications, as some customers dealt with them. G1 also informed that the media, as a social pressure entity, impacted Gamma's ecosystem affecting new and business expansion. According to G1, when the media propagated a very pessimistic scenario about the pandemic, customers and suppliers became afraid and retracted.

Concerning the interaction process within Gamma's ecosystem, G1 and G2 stated that it happened mainly through WhatsApp, especially with customers. The ecosystem also used platforms such as Microsoft Teams, Zoom, and Google Meet. Even using these solutions in the ecosystem, there was no active participation of its developers in the studied network. The popularity and familiarity with these solutions were the advantages appointed by the respondents. As a disadvantage, the interviewees recognized the users' dependency on a giant provider, which could modify its commercial policy at any moment and not be adherent to the ecosystem principles anymore. The interviewees stated that Gamma tried once to establish its platform for communication purposes. However, the firm did not succeed due to WhatsApp's popularity. It is worth noting that the customers' facilities were also physical platforms with the same purpose.

Regarding competition, G1 and G2 perceived its occurrence inside the ecosystem and with other networks. The former happened between data centers, while the latter with similar and cheaper offers. However, G2 affirmed that the quality of these offers was inferior compared to Gamma's. Concerning cooperation, the interviewees affirmed that it involved Gamma, suppliers,

and other ecosystem actors. Following Bengtsson and Kock's (2014) propositions, although the respondents affirmed that cooperation and competition occurred concurrently inside the network, it did not characterize a coopetition relationship. None of the mentioned participants faced simultaneous cooperation and competition. Table 14 summarizes the described relationships with other networks and inside Beta's ecosystem.

Table 14: Competition, cooperation, and coopetition relationships in Gamma's case

	<b>Competition</b>	<b>Cooperation</b>	<b>Coopetition</b>
<b>Within the ecosystem</b>	Yes	Yes	No
<b>With rival systems</b>	Yes	No	No

Source: Author.

#### 4.3.4 Omega

Data showed that Omega had the leading role in the ecosystem. The startup set as goals value creation and structuring the ecosystem. Furthermore, the venture was responsible for defining the paths followed by the network and attracting new ecosystem participants. However, the respondents faced challenges in creating value and structuring the ecosystem.

O1 highlighted that Omega had problems with app developers (described later as ecosystem assemblers) and doctors. Initially, the startup had difficulties in contacting the former to improve the platform. Regarding the latter, some would require specific functionalities that the platform could not deliver, primarily due to resources limitation. The interviewees stated that the best option was to yield to some of their requirements and forgive specific situations to handle the challenge imposed by these actors. These actors were important for establishing the ecosystem and the offer.

Another challenge highlighted by O1 and O2 was the group of doctors against telehealth (presented later as tendency creators). Before the pandemic, this group was prevailing in the discussion about telehealth approval. O2 asserted that Omega was studying alternatives to have the media on telehealth's side in such debate. The competition was another challenge for the ecosystem and the startup. O2 stated that these competitors presented several innovations and conquered the market. Therefore, Omega studied these concurrents solutions and found possibilities to improve its offer.

Data exposed that the contrasting perceptions that O1 and O2 had about the leadership position of the ecosystem could be another challenge. O1 stated that the startup should maintain this leadership and have rigorous control of the activities and information flows. At the same time, O2

thought that the ecosystem did not need a keystone "running the show". The first option was prevailing.

Following Dedehayir, Mäkinen, and Ortt (2018), Gomes *et al.* (2018), and Iansiti and Levien (2004) proposals, the ecosystem had the following group of stakeholders: keystone, customers, suppliers, assemblers, complementors, champions, experts, regulators, and tendency creators (Table 15).

Table 15: Omega's ecosystem structure

<b>Role</b>	<b>Participants</b>
<b>Leadership</b>	Omega
<b>Customers</b>	Doctors Patients
<b>Suppliers</b>	Data centers Internet providers Streaming services Telephone services Doctors
<b>Assemblers</b>	Big Data managers App developers
<b>Complementors</b>	Medical clinics Computer manufacturer
<b>Champions</b>	UFRJ Business incubator Science park
<b>Experts</b>	Financial consultancy Legal consultancy Mentor
<b>Regulators</b>	National Agency of Supplementary Health (ANS) Federal and regional medicine and nutrition councils State or municipal regulatory body National Data Protection Authority (ANPD)
<b>Tendency creators</b>	The media Doctors against telehealth

Source: Author.

The respondents affirmed that Omega had a close relationship with customers, especially with patients, to clarify what telehealth was and its positive points. O1 and O2 also highlighted a close relationship with suppliers, in which the information exchange occurred predominantly on a virtual basis or, less frequently, over the phone. O1 stated that doctors were also in this group since they provided essential services to operationalize the platform. Concerning the assemblers, data exposed that Big Data managers were responsible for processing information for the ecosystem.

They used the platform's information to develop electronic health reports. App developers assembled the operational part of the platform and provided updates. Therefore, they maintained close interaction with the startup's IT team.

O1 asserted that in specific circumstances, patients from occupational health need to do medical exams. Hence, data showed that Omega had medical clinics as complementors. Omega recommended these clinics to ecosystem patients, while clinics recommended the platform services for their patients. Further, Omega distributed its platform free of charge in computers developed by a manufacturer located in the UFRJ's science park. Data also showed that the mentioned champions supported the startup and ecosystem growth. O1 highlighted that this group provided networking and coworking with actors inside the science park. Furthermore, they favored brainstorming and assisted in market analysis.

Omega's business plan displayed that the relationship with the business incubator favored the connection with the experts mentioned in Table 15. Regarding the mentor, data showed a startup (located at UFRJ's business incubator) with a more advanced solution and higher experience in the healthcare industry. Data also showed the presence of several regulators within the ecosystem. O1 informed that together with the medicine and nutrition councils, the National Agency of Supplementary Health (ANS) approved the platform as a healthcare device. Moreover, O2 stated that the National Data Protection Authority (ANPD) was responsible for verifying personal data protection politics adopted by the ecosystem.

Besides the group of doctors against telehealth, the media was also a social pressure group inside Omega's ecosystem. O1 affirmed that with the COVID-19 outbreak, the media reinforced the positive side of telehealth because patients tended to search for face-to-face care. However, communication channels showed great concern and emphasized the absence of physical contact between doctors and patients initially.

Data exposed that between doctors, patients, and Omega, the interaction process happened mainly through the platform. Regarding Omega and other participants, the ecosystem used online tools such as Zoom and Skype. Despite using these tools in the network, there was no effective participation of their developers in the ecosystem. The interviewees perceived that these solutions brought flexibility, allowing the schedule of meetings or short-term conferences at any time. However, they pointed out the frequent instability and drop in connection as disadvantages.

Regarding the platform, data exposed that it succeeded in allowing doctors to deliver value through their services. Nevertheless, O1 appointed the connection instability in streaming servers as a disadvantage. It is worth highlighting the role of the business incubator's facilities as a physical platform for developing the ecosystem and also interaction purposes.

Regarding competition, the interviewees perceived its occurrence with networks offering similar platforms. Concerning cooperation, the respondents highlighted its occurrence only inside Omega's ecosystem. Therefore, following Bengtsson and Kock's (2014) propositions, no cooperation had occurred since none of the mentioned actors faced simultaneous cooperation and competition. Table 16 summarizes the described relationships with other networks and inside Beta's ecosystem.

Table 16: Competition, cooperation, and cooperation relationships in Omega's case

	<b>Competition</b>	<b>Cooperation</b>	<b>Coopetition</b>
<b>Within the ecosystem</b>	No	Yes	No
<b>With rival systems</b>	Yes	No	No

Source: Author.

#### 4.4 THE PANDEMIC EFFECTS

##### 4.4.1 Alpha

The respondents asserted that the pandemic crisis had several effects in Alpha's case. First, Alpha tried to expand the business to corporate events. However, the organizations decided to cancel these projects due to the pandemic. Secondly, the startup ceased its activities for a while because service providers also stopped theirs, freezing the network activity flow. A1 stated that Alpha had not had revenues from monthly fees paid by each of these providers since May 2020 (service providers needed to pay monthly fees to be part of Alpha's ecosystem). Further, the lack of financial resources caused several contracted services (e.g., some provided by the marketing consultancy) to be canceled or temporarily interrupted.

The interviewees also affirmed that the cease in the activities allowed Alpha to review the business model and then modify the value proposition. This review took place in the enterprises' acceleration program provided by SEBRAE, which was also helpful in defining new sales strategies such as the complete party project. The COVID-19 crisis also allowed the provision of new solutions, such as the elopement wedding. In this event, the guests would watch the ceremony through online transmission. The interviewees highlighted that besides avoiding the business being at a standstill, it was a viable solution to avoid crowds. Further, it also helped to test the complete party project proposition.

The interviewees also stated that social event sales (mainly weddings) did not stop. The contracted events were for subsequent years, but these sales maintained the startup's cash flow. Alpha took advantage of this period to publicize the offers. A2 affirmed that the startup heavily

used social media to grow in the digital environment. For example, the founders made sweepstakes on Instagram, including two elopement weddings. A1 said that this was such a positive idea that other companies outside Alpha's ecosystem copied it.

A1 and A2 also highlighted modifications in ecosystem composition. Initially, Alpha halved the fees charged to service providers as a measure to keep them in the ecosystem. However, some providers could not pay this reduced fee, and consequently, they would leave the ecosystem. Thus, the startup suspended the monthly fee and also allowed new service providers to join the ecosystem at no cost.

The respondents affirmed that happened changes in interaction across the ecosystem. All face-to-face events (including networking) had to go online for a while, intensifying the use of social media. These online meetings did not have the same effect that face-to-face would have. In a general manner, while replacing face-to-face events with remote ones was detrimental to the ecosystem, the possibility of performing virtual meetings with contractors was a positive point. For example, it was possible to solve doubts much more quickly.

A1 and A2 highlighted changes in the value proposition. Such changes were related to the complete party project proposal and the stop of cashback offers. A2 also stated that the competition decreased within the ecosystem. A2 also affirmed that the ecosystem would have lost several providers if the fierce competition between them endured. Table 17 summarizes the pandemic consequences in Alpha's case.

Table 17: The pandemic effects on Alpha's case

<b>Pandemic impact</b>	<b>Premises</b>
Corporate events cancelation	Alpha tried to expand the business to corporate events, but these prospective customers canceled their contracts
Cease in activities	The startup's activities had stopped for a while because the service providers also halted theirs
Review of the business model	The cease in the activities also allowed the startup to review its business model
New solutions to the market	Elopement wedding provision within the complete party project proposal
Uninterrupted sales	Although the cease of events, social event sales continued to occur
Brand expansion	The startup took advantage of this period to invest in publicizing the business
Modifications in ecosystem composition	Alpha's ecosystem increased its customer and supplier base by adding new providers
Changes in interaction inside the ecosystem	The pandemic intensified social media use as a platform within this ecosystem All face-to-face meetings became online



Changes in the value proposition	The offer of complete party projects and the stop in providing cashback
Competition inside the ecosystem	Competition decreased

Source: Author.

#### 4.4.2 Beta

The respondents highlighted few effects of the pandemic in Beta's case. First, the request for new formulations decreased, which had affected the routines in the factory and R&D area. As there was an immense dependency on the plant and laboratory, the daily activities became very limited for a while. Therefore, B1 stated that the startup reduced working hours and partially changed to WFH. Secondly, the respondents highlighted that the pandemic caused delays and even failure to receive some raw materials. Such problems hindered the ecosystem activities flow.

The interviewees also observed that the population's concern about well-being and health increased. Therefore, B2 asserted that new projects emerged, and Beta could join them due to its high flexibility and adaptability. Further, they considered that this population's concern would continue after the pandemic, creating other windows of opportunity.

B1 and B2 also asserted that changes occurred in interaction within the ecosystem. Before the pandemic, face-to-face interactions prevailed. The use of online tools emerged due to the pandemic and surpassed face-to-face solutions. Table 18 summarizes the pandemic consequences in Beta's case.

Table 18: The pandemic effects on Beta's case

<b>Pandemic impact</b>	<b>Premises</b>
Reduction of orders and work rate	The request for new formulations decreased, affecting the routines within the startup
Problems in receiving raw materials	The delays and failure in receiving inputs hindered the ecosystem activities flow
New business opportunities	The speedup of the trends towards healthy habits resulted in new projects
Changes in interaction inside the ecosystem	Face-to-face interaction decreased while online increased and surpassed the former

Source: Author.

#### 4.4.3 Gamma

The co-founders highlighted several impacts of the health crisis in Gamma's case. The firm had difficulties visiting prospective and customers already served due to the cease of face-to-face meetings. G1 stated that initially, it had been very arduous for this group to accept a physical distance. Afterwhile, there was a greater acceptance, although it was still problematic. The lack of

contact damaged the execution of projects, analysis of organizations, and improvement of processes. Furthermore, the interviewees stated that Gamma increased the investment in marketing, which also helped to get in touch with prospective clients.

G2 highlighted that the pandemic brought a spike in the adoption of cloud servers from customers. Perhaps such a spike resulted in the consolidation of this functionality within the ecosystem. Further, the adherence to remote technologies also changed Gamma's organizational routines. For example, G2 stated that Gamma initially stored the source codes in physical components. Afterward, they became stored in the cloud. Besides, the programming of these codes started to occur through Zoom. One person was responsible for the coding, and the other observed the coding task through a shared computer screen.

The respondents also stated that remote technologies improved the internal and across ecosystem meetings. All meetings became more valuable, frequent, and optimized. The pandemic also made Gamma increase the focus on emerging companies' market niche. The co-founders perceived that large customers were more fearful than the emerging. G1 thought this might happen because there was a higher burden for large firms than the latter group.

According to the respondents, the pandemic also resulted in changes in Gamma's ecosystem structure. On the one hand, two large clients could not keep their operations running and closed the doors. On the other hand, the ecosystem attached seven new emerging customers. A new data center offered services at a lower price and then joined the ecosystem. Besides, the two API developers mentioned earlier in Subsection 4.3.3 entered the ecosystem. G2 highlighted that no major losses occurred because Gamma took the initiative to renegotiate prices with the ecosystem members. Further, G2 also advised the ecosystem members to save financial resources before the first effect of the COVID-19 disruption in Brazil.

The co-founders also highlighted changes in interaction across the ecosystem. G1 declared that the modifications were more drastic to the customers since they were used to the physical presence of Gamma in their facilities. Regarding the other members, the crisis just intensified the use of the mentioned platforms.

The interviewees considered that competition levels within the network and with other systems decreased while cooperation inside the ecosystem increased. For G1, due to high levels of uncertainty, customers were more likely to accept help, especially smaller organizations. Therefore, G1 asserted that was the reason for the shift in competition and cooperation levels within Gamma's network. G1 also stated that the afraid of going bankrupt also influenced the decrease in competition with other systems. Table 19 summarizes the pandemic consequences in Gamma's case.

Table 19: The pandemic effects on Gamma's case

<b>Pandemic impact</b>	<b>Premises</b>
Physical distance from customers	Gamma had difficulties visiting prospective and customers already served by the venture
Higher investment in marketing	It was an alternative to publicize the offers and overcome the absence of visits to potential customers
Increased adoption of cloud servers	The pandemic heavily increased such adoption
Changes in organizational routines	Remote technologies modified Gamma's daily activities
Improvement in meetings	Due to remote technologies, internal and ecosystem meetings had optimized
Increased focus on emerging companies	Emerging companies sustained themselves better than large ones
Modifications in ecosystem composition	The ecosystem lost two large customers, but other actors joined the network
Changes in interaction inside the ecosystem	The use of intellectual platforms had increased
Competition and cooperation inside the ecosystem	The competition had decreased while cooperation increased
Competition with other systems	Competition had decreased

Source: Author.

#### 4.4.4 Omega

The interviewees reported some effects of the pandemic in Omega's case. O1 stated that until a month before the pandemic, telehealth was illegal in Brazil. However, regulators approved such a practice on an emergency basis for the market surprise. Therefore, as large organizations were already presenting their solutions, the startup decided to anticipate the platform launch to the market. The respondents also highlighted that the pandemic indirectly reinforced Omega's market segmentation to online occupational health. The startup perceived that traditional organizations continuously failed to embrace this market niche, which gave Omega a tremendous advantage.

The interviewees highlighted that the ecosystem had received several doctors since the pandemic beginning and approval of telehealth. The startup also had attached to the ecosystem other clinics and the computer manufacturer mentioned in Subsection 4.3.4. Data showed that the interaction within the ecosystem also changed. Before the pandemic, the interaction, information exchange, and platform development occurred essentially within the business incubator dependencies. With the crisis, the ecosystem adopted the online tools previously introduced. O1 stated that this forced migration to online interaction made experts like UFRJ and the business incubator distance themselves from the ecosystem. The respondents also perceived an increase in competition with other networks. O2 stated that telehealth practice approval and the pandemic rose

the number of concurrents from six to 20. Table 20 summarizes the pandemic consequences in Omega's case.

Table 20: The pandemic effects on Omega's case

<b>Pandemic impact</b>	<b>Premises</b>
The anticipated launch of the platform	As large organizations were already presenting their solutions, Omega decided to advance the platform launch
Market segmentation reinforcement	The pandemic indirectly reinforced such market segmentation
Modifications in ecosystem composition	Customers and complementors had joined the network
Changes in interaction inside the ecosystem	Adoption of remote technologies
Competition with other systems	The competition had increased

Source: Author.

#### 4.5 SUMMARY OF THE FINDINGS

Table 21 summarizes the findings obtained with the studied cases, facilitating the comprehension of the points discussed in the next chapter.

Table 21: Summary of the findings

<b>Parameters</b>	<b>Alpha</b>	<b>Beta</b>	<b>Gamma</b>	<b>Omega</b>
<b>Competitive strategy adopted</b>	Focus	Focus	Focus	Focus
<b>Strategic pillars</b>	Security Management support for providers Networking	Nanotechnology Natural ingredients Solution with lower dosages Supplementary processes Critical window Flexibility	The product's simplicity Focus on generic systems Focus on emerging companies' market	Demand-oriented business model Platform simplicity Geolocation system Online training Continuous learning Conflict mediation
<b>Innovation pillars</b>	Cashback Security	Nanotechnology Natural ingredients Critical window External demand	Product simplicity The offered systems Cloud servers External demand	Telehealth Georeferencing Value proposal simplicity
<b>Internal organizational factors</b>	Technological resources Human capital Financial	Organizational culture Human resources Technology assets	Technological resources Financial resources	Human capital Technology assets Financial resources

	resources	Available budget	Human resources	
<b>External organizational factors</b>	Customers' demands and behavior The emergence of new platforms Potential ecosystem complementors The pandemic	Customers' demands Market trends Suppliers Concurrent solutions Regulators The pandemic	Customers' needs Competitors The available infrastructure The pandemic	Market demands Suppliers Competitors' solutions Other ecosystem members The pandemic
<b>Innovation ecosystem characterization</b>	Value creation Ecosystem consolidation	Creating and capturing value Ecosystem consolidation	Creating and capturing value Ecosystem consolidation	Value creation Ecosystem consolidation
<b>Ecosystem keystone</b>	Alpha	Beta Customers	Gamma	Omega
<b>Ecosystem structure</b>	Keystone Customers Suppliers Experts Champions	Keystone Customers Suppliers Assemblers Complementors Experts Sponsors Champions Regulators Tendency creators	Keystone Customers Suppliers Assemblers Complementors Experts Champions Regulators Tendency creators	Keystone Customers Suppliers Assemblers Complementors Experts Champions Regulators Tendency creators
<b>Ecosystem participant with multiple roles</b>	Service providers (customers and suppliers) SEBRAE (champion and expert)	Customers' companies (also keystones)	SEBRAE (champion and expert)	Doctors (customers and suppliers)
<b>Interaction interface</b>	WhatsApp Facebook Instagram Specific place for face-to-face events	Microsoft Teams Google Meet Business incubator facility Customers' R&D sector	WhatsApp Microsoft Teams Zoom Google Meet Customers' facilities	Platform Zoom Skype Business incubator facility
<b>Competitive relationships</b>	Inside the ecosystem With rival networks	Within the ecosystem	Within the ecosystem With rival systems	With rival systems
<b>Cooperation relationships</b>	Inside the ecosystem	Inside the ecosystem With rival networks	Within the ecosystem	Within the ecosystem

Coopetitive relationships	No	Yes	No	No
<b>The pandemic impacts</b>	Corporate events cancelation Cease in activities Review of the business model New solutions to the market Uninterrupted sales Brand expansion Modifications in ecosystem composition Changes in interaction inside the ecosystem Changes in the value proposition Competition inside the ecosystem	Reduction of orders and work rate Problems in receiving raw materials New business opportunities Changes in interaction inside the ecosystem	Physical distance from customers Higher investment in marketing Increased adoption of cloud servers Changes in organizational routines Improvement in meetings Increased focus on emerging companies Modifications in ecosystem composition Changes in interaction inside the ecosystem Competition and cooperation inside the ecosystem Competition with rival systems	The anticipated launch of the platform Market segmentation reinforcement Modifications in ecosystem composition Changes in interaction inside the ecosystem Competition with rival systems

Source: Author.

## 5 DISCUSSION

This chapter presents a discussion of the findings obtained. The chapter has three sections: competitive strategy, innovation ecosystems, and the pandemic impacts on both. The discussions in the first two sections strictly consider the basic assumptions regarding the approached constructs. The discussion presented in the last section analyzes the pandemic implications on strategy and ecosystems.

### 5.1 COMPETITIVE STRATEGY

Although being organizations with a focus strategy (as summarized in Table 21), from different sectors, and consequently, with divergent service or product offerings, the results show that each venture aimed to achieve differentiation by matching the needs of a distinct narrow market. Alpha heavily focused on individual customers within the event industry, although unsuccessfully trying to serve corporate clients. Beta focused on organizations rather than individuals, while Gamma concentrated on emerging companies. Furthermore, Omega placed its efforts on the occupational medicine industry.

The findings of each organization adopting a focus-differentiation strategy align with Porter's (1998) generic strategies. These results also match specific assumptions regarding SMEs (in Gamma's case) and startups (the other cases). It is usual for smaller companies (WRIGHT, 1987), including SMEs (ALSTETE, 2014; ANWAR; SHAH, 2021) and startups (AL-ABDALLAH; FRASER; ALBARQ, 2021; DAVIS; OLSON, 2008), to compete by differentiation through a focus strategy (WRIGHT, 1987). However, there is evidence from the literature showing that Porter's generic strategies, suitable for mature organizations, do not have statistical support to explain startups' strategic behavior, dynamic ventures (SLAVIK; HANAK; HUDAKOVA, 2020).

From the approached cases, the results indicate that only Gamma aimed at reducing costs. Within the studied startups, Alpha and Omega tried to deliver solutions at reduced prices. Comparing the four cases, Gamma was the most mature company, while the others were in earlier stages. Then, Gamma had enough time to obtain the necessary knowledge and experience to reduce costs. Moreover, Gamma was competing on a traditional business, allowing benchmarking with competitors. In the startups' situation, they were into a new market, with competitors outside (in Alpha and Omega's cases) or within (in Beta's case) their ecosystems trying to establish themselves.

The choice of pursuing (in Gamma's case) or not (in other cases) cost leadership through a focus strategy matches Porter's (1998) assumptions. Regarding SMEs, they could achieve low costs through a focus strategy (ALSTETE, 2014). Concerning startups, it is not typical to observe them competing through cost leadership because it usually comes from economies of scale (DAVIS;

OLSON, 2008). Further, startups tend to (intuitively) focus on price features due to the lack of comprehensive strategic thinking (SLAVIK; HANAK; HUDAKOVA, 2020).

The findings also expose that innovation was an enabler for each studied organization to develop their respective strategies and achieve a competitive edge. In all cases, innovation was an element of the enterprises' mission, vision, and values. Furthermore, the propensity to offer a secure event for customers was a crucial pillar for Alpha. The use of nanotech and natural raw materials was vital for Beta's strategy. In Gamma and Omega's cases, providing user-friendly products was imperative for their strategies. Additionally, telehealth was the basis of the business for the latter. Therefore, that should explain the synergy between innovation pillars and competitive strategies' strategic pillars in all cases, in which most of them were similar (as exposed in Table 21).

There is a consensus in the literature regarding the synergistic relationship between innovation and strategy (ADAMS *et al.*, 2016; GUNDAY *et al.*, 2011; KARLSSON; TAVASSOLI, 2016; PISANO, 2015). Simply put, the link between both topics facilitates enterprises' efforts in obtaining market share and then competitive advantage (GUNDAY *et al.*, 2011; PISANO, 2015).

The results regarding internal and external organizational factors are similar in each case (as shown in Table 21). Concerning the former, the difference between the cases was that Beta also considered its organizational culture when developing and adjusting the strategies and means to achieve its goals. About the latter, the findings indicated that each organization considered the most important factors within their business context.

Acknowledging the resource base (which includes the organizational culture addressed by Beta) and competencies for building strategies and achieving a competitive edge (like all cases did) aligns with Barney's (1991) RBV assumptions. Moreover, considering the customers' (like all cases), suppliers' (like Alpha), and concurrent solutions' (like all cases) influences as external environment factors of their business match Porter's (1998) five forces propositions. Nevertheless, each case considered other external factors not embraced by Porter's (1998) five competitive forces but supported by other works (e.g. GUO *et al.*, 2017; HALDMA; LÄÄTS, 2002). Such factors were potential ecosystem complementors (in Alpha's cases), regulators (in Beta's), available infrastructure (in Gamma's), other ecosystem members different from customers and suppliers (in Omega's), and the pandemic (in all cases).

In general, companies, including SMEs (GOSENPUD; VANEVENHOVEN, 2011) and startups (SHEORAN; KUMAR, 2020), seek to structure themselves and make decisions based on internal and external environments (GUO *et al.*, 2017; HALDMA; LÄÄTS, 2002).



## 5.2 INNOVATION ECOSYSTEMS

### 5.2.1 Value Creation and Competitive-Cooperative Relationships

The results show that all cases had an innovation ecosystem, although each studied ecosystem had specific particularities contrary to basic premises. In the startups' cases, their innovation ecosystem was in the birth phase, in which the findings exposed challenges in structuring their nascent ecosystem. In Gamma's case, the ecosystem was more mature and passing through the renewal stage, in which the results show challenges related to the network's restructure. Furthermore, the findings reveal that traditional organizations and systems imposed threats to Gamma's network within the large companies' market niche. These results align with Ikenami's (2016) and Moore's (1993) propositions regarding ecosystems' co-evolutionary life cycle stages. Furthermore, all ecosystems had different challenges and uncertainties related to the network establishment, going in line with the literature (IKENAMI, 2016) concerning the uncertainties present in innovation ecosystems establishment.

The results indicate that all studied ecosystems emphasized creating value. However, Beta and Gamma's results show that these ecosystems equally emphasized the commitment to economic and competitive issues (i.e., capturing value). The literature proposes that the main difference between innovation and business ecosystems is that the former emphasizes value creation while the latter emphasizes value capture (GOMES *et al.*, 2018). Therefore, the literature (GOMES *et al.*, 2018) fully supports Alpha and Omega's findings and contradicts Beta and Gamma's results regarding the balance of capturing and creating value.

Some results regarding competitive relationships highlight points contrary to assumptions related to ecosystem life cycle. First, the competition occurred within Alpha, Beta, and Gamma's ecosystem (as shown in Table 21). Second, against rival systems, the results indicate that it happened in Alpha, Gamma, and Omega's cases. Concerning cooperative and cooperative relationships, the findings align with Gomes *et al.* (2018) propositions. The cooperation happened inside all ecosystems and against other networks in Beta's case, while cooperation occurred only in Beta's case.

Considering that innovation ecosystems in the birth stage (like Alpha and Beta) require efforts to build the entire network, it could be counterintuitive to expect a competitive relationship between the involved actors in the respective ecosystems. In Gamma's case, the same logic may suit ecosystems in the self-renewal stage, assessing the competition within the network. These ecosystems demand innovative alternatives and cooperative efforts between the actors to avoid ecosystem dissolution. Nevertheless, Alpha and Beta's findings seem logical compared to Hannah and Eisenhardt's (2018) results. Companies in nascent ecosystems could balance competition and

cooperation and successfully build the network instead of emphasizing cooperation for that purpose (HANNAH; EISENHARDT, 2018). Such affirmative also support the cooperative relationship (BENGTSSON; KOCK, 1999, 2014) found in Beta's case. Furthermore, ecosystem members may face competition (GOMES *et al.*, 2018).

Gamma's findings have the literature support (MOORE, 1993) when analyzing competition against rival systems. It is logical to occur competition between mature ecosystems and other networks that threaten their existence. Hence, ecosystems could at least slow down the progress of a rival ecosystem by setting high entry barriers (MOORE, 1993).

Concerning Alpha and Omega, the former had internal and external difficulties that reduced the startup's capacity to build connections and structure its nascent ecosystem, including the direct competition with rival systems. The latter had a more well-defined network, although facing a few problems related to the alignment of its ecosystem partners, including regulators. Like in Alpha's case, this ecosystem had such a competition since the beginning. However, in Moore's (1993) proposition, this type of competitive relationship only begins in the expansion phase. Therefore, these cases suggest that such a competition could develop in the birth phase in certain conditions. Business dynamism might be directly involved with such circumstances.

### **5.3.2 Ecosystem Structure and Platform**

The results expose that Alpha had much fewer actors in its ecosystem when compared to the other cases. One explanation should be the business context, which may require fewer actors to develop the value proposition. Another reason should be the difficulty of attracting other members. Furthermore, one might believe that Alpha's ecosystem was on an early stage compared to the others. Such affirmative is evident compared to Gamma, a more mature ecosystem. However, the comparison might not be so evident with other ecosystems at the birth stage. Therefore, it is hard to make such an inference without a framework to measure the progress of a focal ecosystem. Furthermore, it is challenging to assert if a focal ecosystem is in the early stage of a given phase or is almost going to the next phase. In general, the stakeholders identified in each case and their relationship align with the literature propositions (ADNER; KAPOOR, 2010; DEDEHAYIR; MÄKINEN; ORTT, 2018; GOMES *et al.*, 2018; IANSITI; LEVIEN, 2004).

The findings also expose ecosystem members with multiple roles within the ecosystem. For example, service providers were customers and suppliers in Alpha's case, while SEBRAE was an expert and champion in Gamma's. In Beta's, customers were also keystones. In Omega's, doctors were also ecosystems' suppliers and customers. In all cases, these participants with multiple roles had considerable decision-making power within the ecosystem and were crucial for developing the

value proposition. These ecosystems certainly would face severe problems in their growing and renewing (in Gamma's case) processes. Surprisingly, previous researches did not address ecosystem participants having varied functions in the same network (NG; ARNDT; HUANG, 2020).

Concerning ecosystem leadership, the findings expose that the studied ventures were the leaders of their ecosystems. In general, these ventures took the initiative of establishing connections across their ecosystems, attracting new stakeholders, and everything necessary to nurture the network and support the co-creation of value. Nevertheless, Beta shared the leadership role with the customers. As a result, the findings reveal that the customers were responsible for stimulating interaction and attracting ecosystem members (e.g., complementors).

The results regarding the keystone meet several works' (DEDEHAYIR; MÄKINEN; ORTT, 2018; GAWER; CUSUMANO, 2014; IANSITI; LEVIEN, 2004) ideas. Further, other works (DEDEHAYIR; MÄKINEN; ORTT, 2018; IKENAMI, 2016; JACOBIDES; CENNAMO; GAWER, 2018) already recognized the possibility of having multiple leaders in an ecosystem.

Omega's case also show a concern about the future steps of the studied network regarding the need for a keystone managing the ecosystem. Nevertheless, the leader is responsible for coordinating all the efforts to build the innovation ecosystem, increasing network productivity, providing the necessary conditions to maintain the operations, and overcoming uncertainties (DEDEHAYIR; MÄKINEN; ORTT, 2018; IANSITI; LEVIEN, 2004; IKENAMI, 2016). Therefore, if Omega abdicates its leadership position, it should be interesting to observe how the network would advance.

The results regarding the interaction interface inside the ecosystems have similarities between the approached cases. As summarized in Table 21, all cases had physical (i.e., physical spaces and facilities) and intellectual (i.e., multiple software) platforms that favored value co-creation and capture (in Beta and Gamma's cases). The findings reveal that each platform had specific advantages and disadvantages for each ecosystem in the keystones' perspective. These ICT tools and physical assets as an ecosystem enabler have support from several works (IANSITI; LEVIEN, 2004; GOMES *et al.*, 2018; RONG *et al.*, 2013) across the literature. However, the literature emphasizes the keystones' responsibility in creating, providing, and maintaining the platform (DEDEHAYIR; MÄKINEN; ORTT, 2018; GOMES *et al.*, 2018; IANSITI; LEVIEN, 2004). In all cases, intellectual platform providers did not belong to the ecosystems. Only Omega successfully developed a platform (i.e., its value proposition) that converges with the literature, although only embracing the customers in terms of interaction.

## 5.3 THE PANDEMIC CONSEQUENCES

### 5.3.1 Specific and General Effects

The findings show that the pandemic crisis affected the strategies and ecosystems of the studied companies. However, as shown in Table 21, some effects were exclusive in a specific case (e.g., modification in the business model in Alpha's case and problems in receiving raw materials in Beta's). In contrast, others were similar (e.g., changes in interaction within all studied ecosystems).

The results reveal that the startup and ecosystem approached in Alpha's case seems to be the most damaged by the pandemic, considering the business context of each case. Alpha and its ecosystem had entirely ceased their activities for a while and failed to embrace corporate customers in their value proposition. Such consequences align with works (DILLETTE; PONTING, 2020; SERAPHIN, 2021) regarding the pandemic impacts in the whole event industry.

The findings reveal that Alpha also capitalized from that situation by optimizing the cash flow, reviewing and modifying the business model, creating value by innovating in safety protocol through new value proposition (elopement wedding), and publicizing through digital solutions. These results align with recent works (BHATTACHARYYA; THAKRE, 2021; DILLETTE; PONTING, 2020; KUCKERTZ *et al.*, 2020) regarding companies' strategic and innovative measures to overcome the COVID-19 disruption.

The results expose that although Beta faced negative consequences, the pandemic boosted its business. Beta and its ecosystem had a decrease in orders requisition and raw materials receive. The literature has several works (CHOI; ROGERS; VAKIL, 2020; GOVINDARAJAN; BAGLA, 2020; TURNER; AKINREMI, 2020) addressing the collapse of materials flow during the pandemic. However, the findings show that several opportunities naturally emerged due to the crisis, which had resulted in new projects. The literature (DONTHU; GUSTAFSSON, 2020) supports these results by affirming that organizations that develop medication are doing well in the pandemic.

The results reveal that the pandemic also damaged Gamma by stopping face-to-face meetings with customers and prospects. Nevertheless, the company and ecosystem remained operational. The literature contradicts these findings and shows that consultancies' organizations stopped their activities due to the pandemic (DONTHU; GUSTAFSSON, 2020). Therefore, Gamma appears to be an exception to this pattern.

Gamma also capitalized by publicizing the offer digitally, enhancing the digitization process, and developing new competencies. Works regarding resource redeployment (KAUR, 2020), the build of new competencies (BHATTACHARYYA; THAKRE, 2021), and the adoption

of digital solutions (KUCKERTZ *et al.*, 2020) to overcome the pandemic crisis support these findings.

Similar to Beta's case, Omega's findings reveal that the pandemic crisis boosted its business. Although having to anticipate the offering launch to the market, the startup could join a narrow market in which traditional companies struggled and failed to serve. In addition, organizations from the healthcare area, including telehealth, were also doing well in the COVID-19 pandemic (DONTHU; GUSTAFSSON, 2020; MOORE; HAWARDEN, 2020).

The findings show that only Beta's ecosystem did not have changes in network composition. Alpha and Gamma had to adopt measures to avoid losing participants and the dissolution of their respective ecosystems. In Omega's case, considering that the leader built the entire network for the market opportunity provided by digital healthcare, the ecosystem just needed to add new customers and suppliers due to the boom in demand. Therefore, the cases show that the ecosystems boosted by the pandemic did not have negative impacts on their compositions.

Alpha and Gamma's findings show the responsibility of keystones for keeping the networks running and overwhelm disruptions (IANSITI; LEVIEN, 2004). Further, ecosystems represent multiple actors progressing together (GOMES *et al.*, 2018; GRANSTRAND; HOLGERSSON, 2020; JACOBIDES; CENNAMO; GAWER, 2018). The success of leaders heavily depends on the success of the other participants (ADNER, 2006).

The results reveal that all approached ecosystems had modifications in the internal interaction process. Beta and Omega's cases show that their networks implemented intellectual platforms due to the health crisis. In Alpha and Gamma's cases, the pandemic just intensified their use. Moreover, the use of physical platforms stopped for a period in all cases. Nevertheless, the results show that this mandatory migration to a digital environment represented a sudden paradigm shift, resulting in a mix of positive and negative points.

On the one hand, all cases expose that the companies and ecosystems have not maintained the same efficiency level when increasing or adopting digital solutions. The activities still needed face-to-face interactions to deliver their value proposition. On the other hand, such migration allowed the studied ventures and ecosystem to keep running. In general, the pandemic forced companies of all sizes to increase the use of or adopt digital solutions (APEDO-AMAH *et al.*, 2020). Further, small ventures tend to adopt digital solutions to maximize their results using fewer resources (GREEVEN; YU, 2020; RASHID; RATTEN, 2021).

Except in Beta's case, the COVID-19 pandemic impacted the competitive-cooperative relationships within and against rival networks in different ways (as shown in Table 21). The decrease in competition within Alpha and Gamma's ecosystems should indicate a positive point that

does not prejudice the efforts to maintain these networks running. The increase in cooperation and decrease in competition against other networks also favors this point in Gamma's ecosystem. Further, these situations could also support Gamma's revamp process.

Concerning the increase in competition in Omega's case, it forces the ecosystem to deliver high-quality value to customers. However, consolidation within the marketplace becomes a struggling process. Although examples of a cooperative relationship development due to the COVID-19 outbreak (e.g., rival pharmaceutical companies co-creating a vaccine) (CRICK; CRICK, 2020), such a situation did not emerge in the approached cases. An increase in cooperative efforts within and with rival systems in Alpha and Omega's cases could benefit the respective ecosystems and their whole marketplace. Alpha's market requires such a relationship to warm up the business landscape, and Omega's, to help the development of this new market development.

### 5.3.2 Resilience

The findings of all cases also reveal that the studied enterprises and ecosystems were resilient. The results indicate that all cases had the following capabilities: agility, adaptability, cohesiveness, financial strength, market position, and organizational capability (RAMEZANI; CAMARINHA-MATOS, 2020). Each case had the necessary agility to respond to this health disturbance and showed adaptability by rearranging organizational routines. Further, they were cohesive to maintain the ventures and ecosystems operating, had sufficient monetary power to surpass cash flow fluctuations, and had market awareness by finding a place in the market for their value proposals. Finally, they had the necessary resource base, skills, and competencies to achieve resilience.

Beta's case also reveals a specific resilience capability: resistance (RAMEZANI; CAMARINHA-MATOS, 2020). The ecosystem maintained the same structure as before the pandemic disruption. The other networks had to evolve to adapt to the pandemic circumstances. Gamma's findings also expose the observability capability (RAMEZANI; CAMARINHA-MATOS, 2020) by alerting ecosystem participants regarding the cash flow fluctuations posed by the crisis. Additionally, Alpha's (through the elopement wedding) and Gamma's (by attending to customers online) results show enough flexibility (RAMEZANI; CAMARINHA-MATOS, 2020) to change the value delivery mode to customers.

These findings align with several works (BRUNET; MALAS; FLEURY, 2020; CASTRO; ZERMEÑO, 2020; KUCKERTZ *et al.*, 2020; PARKER; AMEEN, 2018; RAMEZANI; CAMARINHA-MATOS, 2020) that highlighted the importance of resilience to keep going forward and overcome the obstacles imposed by disruptions. Further, having an adequate resource base and

mobilizing it to respond to the COVID-19 crisis align with Barney's (1991) RBV assumptions and Teece's (2007) premises regarding adaptation to a changing ecosystem environment.

The results also reveal the importance of the entrepreneur figure (part of the human resources) to overcome the COVID-19 crisis. The entrepreneurs had unique abilities, backgrounds, and perceptions (e.g., financial advice concerning the cash flow fluctuation in Gamma's case) that enabled them to observe the market, prepare, and react to surpass the pandemic. Such findings meet the literature concerning entrepreneur resilience (CASTRO; ZERMEÑO, 2020), their importance for the sensing-seizing-reconfiguring DCV cycle (TEECE, 2007, 2012), and RBV (BARNEY, 1991).

## 6 CONCLUSION

The COVID-19 crisis unquestionably brought consequences for different businesses. Organizations and ecosystems have felt the pandemic effects at distinct levels, which led to different responses against the crisis. Hence, a question that emerged and motivated this research was: how have companies reshaped their competitive strategies and managed their innovation ecosystems in the context of the pandemic? The studied organizations rebuilt their strategies by mobilizing resources and readjusting competencies to remain competitive. However, to succeed, they managed to find opportunities within their ecosystems brought by the crisis and organize them to keep moving forward.

The following objectives had to be satisfied to answer this research question: defining the concepts related to innovation ecosystems; characterizing the concepts related to competitive strategy; identifying the current competitive strategy of the studied companies; describing the relationship of the studied firms with their innovation ecosystems; indicating changes in the studied organizations' competitive strategy and innovation ecosystems due to the COVID-19 pandemic. This research relied on exploratory and qualitative approaches and on multiple and holistic case study to do so. Further, data obtained mainly from interviews, documents, and visits enabled this work to reach the following conclusions.

The ventures and their respective ecosystems did not change the goals set before the pandemic. First, concerning the competitive strategy, the enterprises kept pursuing a focus strategy, but in different manners. They modified the means (i.e., activities and processes) to achieve such a competitive strategy to continue providing differentiation (in all cases), low prices (in Alpha's and Omega's cases), and reducing costs (in Gamma's case). Therefore, the organizations shifted their functional strategies.

Finally, regarding the innovation ecosystems, the ventures kept fostering the ecosystem establishment and balancing value co-creation (in all cases) and capture (in Beta's and Gamma's cases). Nevertheless, the means to achieve these objectives had changed at different levels. Beta's and Omega's cases reveal that they had mild modifications. The circumstances evolved in a way that the pandemic ended up boosting their business. On the contrary, Alpha's and Gamma's findings show that they demanded radical changes, especially the former. The reason is that their outputs demand high levels of face-to-face interactions, especially in Alpha's case. Consequently, the pandemic was detrimental to their business, notably for Alpha. Thus, the business context is a critical element that enhances the crisis's negative and positive impacts of the approached cases.

Besides being organizations and ecosystems from different industries and with different maturity levels, those most damaged by the pandemic (i.e., Alpha and Gamma) needed to develop



innovative solutions to respond to the pandemic effects. Such alternatives (i.e., elopement wedding in Alpha's case and online consultancies and systems maintenance in Gamma's) enabled them to keep running. Hence, these cases suggest that innovation is crucial to react against the crisis. Concerning those not so negatively affected by the pandemic (i.e., Beta and Omega), they could concentrate on finding opportunities to exploit and innovate brought by the disruption.

Due to the restrictions imposed to contain the virus spread, all enterprises had to go online to do business. The increased use of (in Alpha's and Gamma's cases) and adopting (in Beta's and Omega's cases) intellectual platforms allowed them to keep moving forward, although the problems related to this mandatory migration to the online environment. Therefore, the cases suggest that digital solutions are necessary to surpass the COVID-19 pandemic, although having negative impacts.

Those innovation ecosystems most affected by the COVID-19 disruption required efforts and solutions from the leadership to avoid more severe consequences (e.g., the ecosystem disappearance). Thus, ecosystem leadership guidance seems to be another essential factor for damaged ecosystems responding to the pandemic.

The results and discussion concerning the competitive and cooperative relationships show that the decrease in competition (in Alpha's and Gamma's cases), the increase in competition (in Omega's case), and the increase in cooperation (in Gamma's case) help surpassing the crisis. Nevertheless, the competitive and cooperative relationships remained the same in Beta's case. Thus, the cases show that the shift in these relations can be necessary against the COVID-19 pandemic. The business context seems to play an essential role in that situation.

Independently of the pandemic having severe impacts on the approached ventures and ecosystems or not, they were all resilient. Their resource base and competencies enabled them to develop the reported resilience capabilities. Then, they were able to adopt different crisis responses. Hence, the cases suggest that the resource base, competencies, and resilience are crucial factors in developing responses against the COVID-19 disruption.

Regardless of the pandemic context, the findings related to competitive strategy suggest an adherence between Porter's propositions and startups, a controversial topic. Moreover, the cases suggest a synergistic relationship between Porter's ideas, innovation, resource base, and internal and external organizational factors, supporting these enterprises' strategic management.

Concerning innovation ecosystems, the cases suggest that this concept still needs refinement in basic assumptions before reaching a solid theoretical basis. The findings of all cases indeed show innovation ecosystems. These networks have consolidation and establishment as a primary goal. Moreover, the studied ecosystems have the expected participants and use platforms for interaction

and network building. Nevertheless, it is worth noting that the intellectual platform providers did not actively participate within the studied ecosystems, contrary to the literature assumptions. Furthermore, Beta's and Gamma's results present a balance between capturing and creating value, contrary to the main difference between innovation and business ecosystems. Hence, Beta's and Gamma's cases suggest that emphasizing value creation or capture may not differentiate innovation ecosystems from business ecosystems.

The complex competitive-cooperative relationship exposed by the cases has a link with the literature. However, the described competitive relationship that Alpha and Omega have with rival systems occurs when the network becomes a business ecosystem and joins the expansion phase. Therefore, the market characteristics may accelerate the emergence of such a relationship in these cases. For example, considering that telehealth is operating in emergency circumstances, there is a high level of uncertainty regarding its continuity after the pandemic. Then, organizations may try to conquer as much market share as possible quickly.

It is worth noting that the enterprises' diversity was a crucial factor that enabled this research to identify and draw heterogeneous results and conclusions. Therefore, the ventures' heterogeneity makes this research relevant and with wealthy contributions.

## 6.1 CONTRIBUTIONS AND STUDY LIMITATIONS

This research has several theoretical contributions. First, the research provides findings related to competitive strategy and innovation ecosystems within the COVID-19 scenario that serves as a basis for future investigations. Second, the research identified several unanswered questions linked to innovation ecosystems and competitive strategy regardless of the pandemic context. Such gaps are mainly related to the lack of theoretical consolidation of the former. Additionally, this research provided an extensive discussion regarding the theoretical assumptions of innovation ecosystems and competitive strategy within and outside the pandemic context.

Concerning managerial contributions, this work revealed how the studied enterprises rebuilt their strategies and managed their ecosystems through a detailed description of the pandemic effects at the firm and ecosystem levels. Organizations need to look internally without ignoring the external environment if they wish to surpass the health crisis. Managers should reflect on the possessed resources and what is possible to do with them after analyzing the opportunities found in the marketplace. It is also crucial to dialog and cooperates with other network players to ensure business continuity.

This work has limitations that future studies should bypass. First, this study only considered small companies in an emerging economy, in which the reality could be different from developed

regions and larger organizations in both emerging and developed places. Therefore, although the study highlighted specific strategic and innovative features, the findings' generalization could be restricted. Second, the studied ecosystems considered only the keystone's perceptions. Hence, addressing other participants should expose elements not revealed by this work.

## 6.2 DIRECTIONS FOR FUTURE STUDIES

Further studies are necessary to understand the building blocks related to resilience and competitive strategy for companies and ecosystems to surpass the COVID-19 crisis and prepare for future disruptions. Studies should also focus on mitigating the side effects of the forced migration to the online environment. Future investigations should observe the government's role in supporting businesses and ecosystems to overcome the crisis, a topic not addressed by this research. Moreover, recognizing the need to understand the relationship between stakeholders within innovative networks (including government's support), addressing technology transfer processes in the COVID-19 context should present crucial contributions. Further research is also necessary to understand why companies like Gamma are an exception to the evidence found by prior works.

Directly related to the study limitations previously mentioned, further investigations should focus on medium and large-sized organizations in emerging and developed regions. Moreover, studies in small ventures should consider a developed economy. Both situations should extend this research by providing results comparable with the findings of this research. Furthermore, future studies should look forward and indicate how companies and ecosystems prepare for the recovery process from the crisis.

Concerning strictly the competitive strategy features, there is a necessity to investigate the adherence between Porter's strategies and startups' competitive strategies. Regarding innovation ecosystems, there are several opportunities for further investigations. Future studies should clarify if the difference between innovation and business ecosystems lies in value creation or capture emphasis.

Regarding the ecosystem structure, future studies should investigate prominent roles in the ecosystem self-renewal stage. That could provide an excellent background for a comparative study verifying the role and importance of each actor in birth and self-renewal stages of the life cycle. Furthermore, investigations are also necessary to develop a framework providing sub-stages within each phase of the ecosystem life cycle. Such a framework would improve a comparative analysis between different ecosystems, especially those in the same life cycle phase. Additionally, it is necessary to revisit the competitive and cooperative assumptions of each stage of the co-evolutionary life cycle to assess how the market characteristics and dynamism may change these

patterns. It is worth noting that the ecosystem life cycle premises consider relatively stable market conditions.

Future investigations should also observe in which circumstances participants play multiple roles in ecosystems. These studies could present new viewpoints for building the ecosystem theory, changing the perception concerning ecosystems' dynamism, including the value proposal logic and all features concerning the creation (birth phase) or revamp (self-renewal stage) of the network.

Finally, future studies should explain when it is more advantageous for companies and ecosystems to adhere to generic ICT platforms than establishing their own. The outcomes should also clarify if the platform responsibility still belongs solely to keystones.

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**APPENDIX A – INITIAL INTERVIEW SCRIPT****1.1) Identification of the interviewee and the company**

<b>Interviewee information</b>	
<b>Name</b>	
<b>Position in the company</b>	
<b>Working time in the company</b>	
<b>Contact phone</b>	
<b>E-mail</b>	

<b>General information about the organization</b>	
<b>Name</b>	
<b>Number of employees</b>	<input type="checkbox"/> Up to 20 <input type="checkbox"/> Between 21 and 99 <input type="checkbox"/> Between 100 and 500 <input type="checkbox"/> Above 500
<b>Company lifetime</b>	
<b>Origin of controlling capital</b>	<input type="checkbox"/> National <input type="checkbox"/> Foreigner <input type="checkbox"/> Mixed
<b>Is the company part of any financial group?</b>	<input type="checkbox"/> No <input type="checkbox"/> Yes. Name of the group:
<b>Is the company a headquarter or branch?</b>	<input type="checkbox"/> Headquarters <input type="checkbox"/> Branch. What is the location of headquarters?
<b>Does the company have other units?</b>	<input type="checkbox"/> No <input type="checkbox"/> Yes. How many in Brazil? If so, how many abroad?
<b>Number of employees in the study unit</b>	<input type="checkbox"/> Up to 20 <input type="checkbox"/> Between 21 and 99 <input type="checkbox"/> Between 100 and 500 <input type="checkbox"/> Above 500
<b>Unit lifetime</b>	

## 1.2) Questions

<b>A) General inquiries about innovation</b>
1) Considering the company's current business, could you explain how innovation occurs in your company?
2) Does your company practice more product or process innovation?
3) Does the company innovate more incrementally, or has it already carried out any radical innovation? Could you talk about this?
4) Is innovation present in the organization's mission and corporate strategy? If so, how?

<b>B) General inquiries about competitive strategy</b>
1) How would you describe the company's competitive strategy? Is this strategy differs depending on the business? Could you talk about this?
2) What are the company's principal internal aspects that influence the adoption of the current competitive strategy?
3) And what are the organization's external aspects that influence the competitive strategy adopted?

<b>C) Pandemic and strategy</b>
1) Did the pandemic impact the organization's strategy? If so, how?
2) What has changed internally with the pandemic?
3) How do you perceive the impacts of the current crisis on the company?

<b>D) Components of the innovation ecosystem</b>
1) How does the company relate to its suppliers to put innovation into practice?
2) Who are these suppliers?
3) What about the company's customers? How does this relationship work?
4) Who are these customers?
5) Based on what you presented, could you identify a network formation for the development of this innovation?
6) Still based on this innovation, on the identified network, and on what would be an ecosystem, how is the relationship with your customers' other suppliers?

- |   |
|---|
| <b>7) Would it be possible to identify these other suppliers?</b>   |
| <b>8) Does your company also establish a direct relationship with your suppliers' suppliers to develop such innovation?</b> |
| <b>9) Would it be possible to identify the suppliers of your suppliers?</b>   |
| <b>10) Can you identify the presence and influence of any regulator, the media, etc., in this network?</b>                  |
| <b>11) Still considering this great network, can you indicate, among all appointed, who is the key actor?</b>               |

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|--|
| <b>E) Maturity of the innovation ecosystem</b>   |
| <b>1) What would be the focus of the current network? Emphasis on aspects related to the introduction of innovations in the market or the search for returns and benefits with developed ones?</b> |
| <b>2) Does the current network still seek to consolidate, or is it already consolidated in the market?</b>   |
| <b>3) What are the challenges faced by the network in this search for consolidation and/or renewal?</b>  |
| <b>4) How is your company dealing with the challenges mentioned earlier?</b>   |

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|--|
| <b>F) Interaction within the innovation ecosystem</b>  |
| <b>1) How does the interaction between your company and the other members of the ecosystem work?</b>           |
| <b>2) Is there an interface that helps in this interaction?</b>  |
| <b>3) Which member of the network is responsible for providing and maintaining this operational interface?</b> |
| <b>4) Could you point out the advantages and disadvantages regarding the use of this interface?</b>            |

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|--|
| <b>G) Competition, cooperation, coopetition, and the innovation ecosystem</b>  |
| <b>1) Considering the network addressed, how do you perceive the competition between your company and the other members?</b> |
| <b>2) What about the cooperation between your company and the other members of the</b>                                       |

network?

3) Has there been a relationship of competition and simultaneous cooperation in the network? If so, would it be possible to detail?

4) Based on your ecosystem, can you perceive a competitive relationship with other networks that have similar structures?

5) What about cooperation? Is there a relationship between your network and the others?

6) What about simultaneous competition and cooperation between your network and the rest?

#### H) Pandemic and the innovation ecosystem

1) When compared to the network before the pandemic, is there any innovation change in the current network?

2) Are there any changes concerning the members of the current network when compared to the pre-pandemic network?

3) Comparing the current interaction and its interface with the one before the pandemic, what would be the difference between them?

4) Are these perceptions related to cooperation, competition, and simultaneous competition and cooperation within the network different from the pre-pandemic period?

5) Are these perceptions related to cooperation, competition, and simultaneous competition and cooperation between networks different from the pre-pandemic period?

#### I) Relationship between the strategy and the ecosystem

1) How does this network impact the organization's strategy? Does this key actor influence the company's strategy?

2) Do you believe that the network and all this existing relationship between members influence the development of resources and skills unique to your company? If so, could you talk in detail about it?

**J) Other inquiries****1) Would you like to add any more information that you think is relevant?**

## APPENDIX B – INITIAL INTERVIEW SCRIPT IN PORTUGUESE

### 1.1) Identificação do(a) entrevistado(a) e da empresa

Informações do(a) entrevistado(a)	
Nome	
Cargo na companhia	
Tempo de trabalho na empresa	
Telefone para contato	
E-mail	

Informação geral sobre a organização	
Nome	
Número de funcionários	<input type="checkbox"/> Até 20 <input type="checkbox"/> Entre 21 e 99 <input type="checkbox"/> Entre 100 e 500 <input type="checkbox"/> Acima de 500
Tempo de existência da companhia	
Origem do capital controlador	<input type="checkbox"/> Nacional <input type="checkbox"/> Estrangeiro <input type="checkbox"/> Misto
A companhia faz parte de algum grupo financeiro?	<input type="checkbox"/> Não <input type="checkbox"/> Sim. Nome do grupo:
A companhia é matriz ou filial?	<input type="checkbox"/> Matriz <input type="checkbox"/> Filial. Qual é a localização da matriz?
A empresa tem outras unidades?	<input type="checkbox"/> Não <input type="checkbox"/> Sim. Quantas no Brasil? Caso tenha, quantas no exterior?
Número de empregados da unidade de estudo	<input type="checkbox"/> Até 20 <input type="checkbox"/> Entre 21 e 99 <input type="checkbox"/> Entre 100 e 500 <input type="checkbox"/> Acima de 500
Tempo de existência da unidade	



## 1.2) Perguntas

<b>A) Questões gerais sobre inovação</b>
1) Considerando o atual negócio da companhia, o(a) senhor(a) poderia explicar como que ocorre a inovação na sua empresa?
2) A sua empresa pratica mais inovação de produto ou de processo?
3) A companhia inova de maneira mais incremental ou já realizou alguma inovação radical? O(a) senhor(a) poderia falar um pouco sobre isso?
4) A inovação está presente na missão e na estratégia corporativa da organização? Se sim, de qual forma?

<b>B) Questões gerais sobre estratégia competitiva</b>
1) Como o(a) senhor(a) descreveria a estratégia competitiva da empresa? Essa estratégia é diferente dependendo do negócio? O(a) senhor(a) poderia falar um pouco sobre isso?
2) Quais os principais aspectos internos à empresa que influenciam na adoção da atual estratégia competitiva da organização?
3) E quais os aspectos externos à companhia que influenciam a estratégia competitiva adotada?

<b>C) Pandemia e estratégia</b>
1) A pandemia impactou a estratégia da organização? Se sim, de qual forma?
2) O que mudou internamente com a pandemia?
3) Como o(a) senhor(a) vê os impactos da atual crise na empresa?

<b>D) Componentes do ecossistema de inovação</b>
1) Como a empresa se relaciona com os seus fornecedores para colocar a inovação em prática?
2) Quem são esses fornecedores?
3) E quanto aos clientes da companhia? Como que funciona esse relacionamento?
4) Quem são esses clientes?
5) Com base no que foi apresentado, o(a) senhor(a) consegue identificar a formação de

<b>uma rede para o desenvolvimento dessa inovação?</b>
<b>6) Ainda com base nessa inovação, na rede identificada e no que seria um ecossistema, como é o relacionamento com os outros fornecedores dos seus clientes?</b>
<b>7) Seria possível identificar esses outros fornecedores?</b>
<b>8) A sua companhia também estabelece algum relacionamento direto com os fornecedores dos seus fornecedores para desenvolver tal inovação?</b>
<b>9) Seria possível identificar os fornecedores dos seus fornecedores?</b>
<b>10) O(a) senhor(a) consegue identificar a presença e a influência de algum órgão regulador, da mídia, dentre outros, nessa rede?</b>
<b>11) Ainda levando em consideração essa grande rede, o(a) senhor(a) pode indicar quem é o ator chave dentre todos que foram apontados?</b>

<b>E) Maturidade do ecossistema de inovação</b>
<b>1) Qual seria o foco da rede atual? Ênfase em aspectos ligados à introdução de inovações no mercado ou à busca por retornos e benefícios com o que já foi desenvolvido?</b>
<b>2) A atual rede ainda busca se consolidar ou já se encontra consolidada no mercado?</b>
<b>3) Quais são os desafios enfrentados pela rede nessa busca por consolidação e/ou renovação?</b>
<b>4) Como a sua empresa está lidando com os desafios apontados anteriormente?</b>

<b>F) Interação no ecossistema de inovação</b>
<b>1) Como funciona a interação entre a sua empresa e os demais membros da rede?</b>
<b>2) Existe alguma interface que auxilie nessa interação?</b>
<b>3) Qual membro da rede é o responsável por prover e manter essa interface operacional?</b>
<b>4) O(a) senhor(a) poderia apontar as vantagens e desvantagens quanto ao uso dessa interface?</b>

<b>G) Competição, cooperação, coopetição e ecossistema de inovação</b>
<b>1) Ainda levando em consideração a rede abordada, como o(a) senhor(a) percebe a questão da competição entre a sua empresa e os demais membros?</b>

2) E quanto a questão da cooperação entre a sua empresa e os outros membros da rede?

3) Já ocorreu alguma relação de competição e cooperação simultânea na rede? Se sim, seria possível detalhar?

4) Com base na estrutura da sua rede, o(a) senhor(a) consegue perceber uma relação de competição com outras redes que possuem estruturas similares?

5) E quanto à cooperação? Existe essa relação entre a sua rede e as demais?

6) E em relação à competição e cooperação simultânea entre a sua rede e as demais?

#### **H) Pandemia e ecossistema de inovação**

1) Na atual rede, há alguma mudança em termos de inovação quando comparada à rede anterior à pandemia?

2) Há alguma mudança em relação aos membros da atual rede quando comparada à rede pré-pandemia?

3) Comparando a interação atual e a sua interface com a anterior à pandemia, qual seria a diferença entre elas?

4) Essas percepções relacionadas à cooperação, à competição e à competição e cooperação simultânea dentro da rede são diferentes em relação ao período pré-pandemia?

5) Essas percepções relacionadas à cooperação, competição e competição e cooperação simultânea entre redes são diferentes em relação ao período pré-pandemia?

#### **I) Relação entre estratégia e ecossistema**

1) Como essa rede impacta na estratégia da organização? Esse ator chave influencia na estratégia da companhia?

2) O(a) senhor(a) acredita que a composição da rede e todo esse relacionamento existente entre os membros influenciam no desenvolvimento de recursos e competências que sejam únicos por parte de sua companhia? Se sim, poderia falar com detalhes sobre isso?

**J) Outras perguntas**

**1) O(a) senhor(a) gostaria de acrescentar mais alguma informação que julga ser relevante?**

## APPENDIX C – INTERVIEW SCRIPT UPGRADE

Questions removed or modified in the initial script	Corresponding questions in the updated script	Comments
Question 3 from board C	-	Unnecessary question because the answer emerged in other queries.
Questions 1 and 2 from board D	Question 1 from board D	These questions became single for simplicity and practical purposes. The answer for the second emerged in the first inquiry.
Questions 3 and 4 from board D	Question 2 from board D	These questions became single for the same reason explained above.
Question 6 from board D	Question 4 from board D	This question had a subtle modification to ease the respondents' understanding.
Questions 8 and 9 from board D	-	It is hard to identify every member of an ecosystem through interviews. Moreover, It is very arduous for interviewees to remember every stakeholder that belongs to the ecosystem or even get to know all of them, alike if their company is the leader of the network.
Question 10 from board D	Question 5 from board D	This question also had a subtle change to facilitate the interviewees' understanding.
Question 1 from board E	Question 1 from board E	This question also had a subtle change due to the same reason explained above.
Questions 3 and 4 from board E	Question 3 from board E	These questions became single due to the same motives as questions 1 and 2 from board D of the initial script.
Questions 1, 2, and 3 from board F	Question 1 from board F	These questions became single due to the same motives

		described above.
Questions 1, 2, and 3 from board G	Question 1 from board G	Again, these questions became single due to the same reasons as questions 3 and 4 from board E of the initial script.
Questions 4, 5, and 6 from board G	Question 2 from board G	These questions became single also for the same reason described above.

## **APPENDIX D – CASE STUDY PROTOCOL**

### **1) Preparation for research**

#### **1.1) Research background**

##### **A) COVID-19 pandemic**

The pandemic caused by COVID-19 represents the context that serves as a basis for the research. The evidence suggests that due to the particularities of the COVID-19 crisis, it is not possible to compare it with any other. The current pandemic is making companies rethink and modify their strategies to keep their ecosystems operational.

##### **B) Innovation ecosystems**

The innovation ecosystem is an interdependent and interconnected network formed by the focal firm, its suppliers, customers, and complementors. This network focus on creating value than capturing it, and yet, the ecosystem may have other stakeholders such as regulators, universities, entrepreneurs, and the media.

The ecosystem approach challenges traditional strategy rules since companies from different industries belong to the same network in which they compete and cooperate. Further, they compete with rival ecosystems. The ecosystem seems to provide competitive edges in times of crisis. Organizations that adopt this approach can meet customer requirements through constant adaptations and improvement in the product or service offered.

##### **C) Competitive strategy**

The competitive strategy defines the way business units will deliver value to the market in which they operate. Consequently, it determines how they will obtain competitive advantages. This strategy is a set of measures and actions taken by the strategists of companies, based on the guidelines provided by the corporate strategy, on internal competencies, and firms' external environment. Therefore, companies can achieve superior performance and gain competitive edges.

Given the devastating consequences of the current health situation, customer needs have changed dramatically, forcing organizations to change their approaches to survive. Corporations within ecosystems appear to have adequate flexibility to readapt quickly to respond to such changes, unlike what occurs in, for example, supply chains. The evidence advises that the ecosystem model can complement the traditional strategy literature, including the competitive strategy.

## **1.2) Research question and objectives**

### **A) Research question**

How have companies reshaped their competitive strategies and managed their innovation ecosystems in the context of the pandemic?

### **B) Main objective**

Identify how firms have reshaped their competitive strategies and managed their innovation ecosystems in the pandemic situation.

### **C) Specific objectives**

- Defining the concepts related to innovation ecosystems.
- Characterizing the concepts related to competitive strategy.
- Identifying the current competitive strategy of the studied companies.
- Understanding the relationship of the studied firms with their innovation ecosystems.
- Indicating changes in the studied organizations' competitive strategy and innovation ecosystems due to the COVID-19 pandemic.

## **1.3) Case selection criteria**

Every company is a potential case study, regardless of its size and geographic location. However, the main criteria considered organizations' availability to participate in the research due to the pandemic crisis impacts.

## **1.4) Execution of the research**

### **A) Interview**

If possible, the interview will occur with at least two respondents from each corporation. These respondents need to be able to cover all the topics approached during the interview. Due to the current circumstances, there is a priority to guide online interviews. However, if not possible to conduct online, interviews can be face-to-face. Furthermore, if it is not possible to complete the interviews within a certain period, they can be rescheduled for further progress. One company will be the pre-test of the research to verify if the questions asked are adequate for the interviewees' understanding. Moreover, the pre-test will show if it is possible to achieve the research objective with the script.

### **B) Multiple sources of evidence**

The information from interviews, documentation, and if possible, from visits, will allow obtaining data triangulation. This documentation can be e-mails, archives, and business plans. It is essential to highlight that probable visits will respect the health protocols.



### C) Data analysis

All responses will be fully transcribed. Subsequently, the answers of the interviews from the same case will be compared with each and with information from documents to find similar and divergent points. Further, it is necessary to comprehend why the results occurred to establish the standards found in each case. Then, all cases will be compared to verify similarities and differences between them. The results will be correlated with theory to find support or contrasting points.

### D) Protection of company and interviewee information

The conduction and recording of interviews will occur only with the interviewee's prior authorization. It is crucial to assure the preservation of all respondents' personal information and companies' confidential data.

## 2) Interview script

### 2.1) Identification of the interviewee and the company

Interviewee information	
Name	
Position in the company	
Working time in the company	
Contact phone	
E-mail	

General information about the organization	
Name	
Number of employees	<input type="checkbox"/> Up to 20 <input type="checkbox"/> Between 21 and 99 <input type="checkbox"/> Between 100 and 500 <input type="checkbox"/> Above 500
Company lifetime	
Origin of controlling capital	<input type="checkbox"/> National <input type="checkbox"/> Foreigner <input type="checkbox"/> Mixed
Is the company part of any	<input type="checkbox"/> No

<b>financial group?</b>	<input type="checkbox"/> Yes. Name of the group:
<b>Is the company a headquarter or branch?</b>	<input type="checkbox"/> Headquarters <input type="checkbox"/> Branch. What is the location of headquarters?
<b>Does the company have other units?</b>	<input type="checkbox"/> No <input type="checkbox"/> Yes. How many in Brazil? If so, how many abroad?
<b>Number of employees in the study unit</b>	<input type="checkbox"/> Up to 20 <input type="checkbox"/> Between 21 and 99 <input type="checkbox"/> Between 100 and 500 <input type="checkbox"/> Above 500
<b>Unit lifetime</b>	

## 2.2) Questions

<b>A) General inquiries about innovation</b>
<b>1) Considering the company's current business, could you explain how innovation occurs in your company?</b>
<b>2) Does your company practice more product or process innovation?</b>
<b>3) Does the company innovate more incrementally, or has it already carried out any radical innovation? Could you talk about this?</b>
<b>4) Is innovation present in the organization's mission and corporate strategy? If so, how?</b>

<b>B) General inquiries about competitive strategy</b>
<b>1) How would you describe the company's competitive strategy? Is this strategy differs depending on the business? Could you talk about this?</b>
<b>2) What are the company's principal internal aspects that influence the adoption of the current competitive strategy?</b>
<b>3) And what are the organization's external aspects that influence the competitive strategy adopted?</b>

<b>C) Pandemic and strategy</b>
<b>1) Did the pandemic impact the organization's strategy? If so, how?</b>
<b>2) What has changed internally with the pandemic?</b>

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**D) Components of the innovation ecosystem**

1) How does the company relate to its suppliers to put innovation into practice? Who are these suppliers?

2) What about the company's customers? How does this relationship work? Who are these customers?

3) Based on what you presented, could you identify a network formation for the development of this innovation?

4) Based on the proposed innovation, on the identified network, and on what would be an ecosystem, how is the relationship with your customers' other suppliers? Who are these components?

5) Can you identify the presence and influence of any regulator, the media, universities, entities that support companies' growth, etc., in this network?

6) Still considering this great network, can you indicate, among all appointed, who is the key actor?

**E) Maturity of the innovation ecosystem**

1) What would be the focus of the current network? Introduce innovations in the market or seek returns and benefits from the developed ones?

2) Does the current network still seek to consolidate, or is it already consolidated in the market?

3) What are the challenges faced by the network in this search for consolidation and/or renewal? How is your company dealing with them?

**F) Interaction within the innovation ecosystem**

1) How does the interaction between your company and the other members of the ecosystem work? Is there an interface that helps in this interaction? Which company is responsible for providing and maintaining this operational interface?

2) Could you point out the advantages and disadvantages regarding the use of this interface?

### **G) Competition, cooperation, coopetition, and the innovation ecosystem**

**1) Considering the network addressed, how do you perceive the competition between your company and the other members? What about cooperation? Do these situations of competition and cooperation occur concurrently?**

**2) Can you perceive a competition with other networks? What about cooperation? Do these situations of competition and cooperation occur concurrently?**

### **H) Pandemic and the innovation ecosystem**

**1) When compared to the network before the pandemic, is there any innovation change in the current network?**

**2) Are there any changes concerning the members of the current network when compared to the pre-pandemic network?**

**3) Comparing the current interaction and its interface with the one before the pandemic, what would be the difference between them?**

**4) Are these perceptions related to cooperation, competition, and simultaneous competition and cooperation within the network different from the pre-pandemic period?**

**5) Are these perceptions related to cooperation, competition, and simultaneous competition and cooperation between networks different from the pre-pandemic period?**

### **I) Relationship between the strategy and the ecosystem**

**1) How does this network impact the organization's strategy? Does this key actor influence the company's strategy?**

**2) Do you believe that the network and all this existing relationship between members influence the development of resources and skills unique to your company? If so, could you talk in detail about it?**

### **J) Other inquiries**

**1) Would you like to add any more information that you think is relevant?**

## APPENDIX E – CASE STUDY PROTOCOL IN PORTUGUESE

### 1) Preparação para a pesquisa

#### 1.1) *Background* da pesquisa

##### A) **Pandemia do COVID-19**

A pandemia causada pelo COVID-19 representa o contexto que serve de base para a pesquisa. As evidências sugerem que devido às particularidades apresentadas por essa crise, não é possível compará-la com nenhuma outra. A atual crise está fazendo com que as empresas repensem e modifiquem suas estratégias para lidar com as novas necessidades do ecossistema.

##### B) **Ecossistemas de inovação**

Os ecossistemas de inovação são uma rede interdependente e interconectada formada pela empresa focal, por seus fornecedores e clientes e também, por complementadores. Tal rede está mais focada em criar valor do que capturar e ainda, pode ter outros atores como órgãos reguladores, universidades, empreendedores e a mídia.

A abordagem ecossistêmica desafia as tradicionais regras da estratégia porque companhias de indústrias diferentes pertencem à mesma rede, na qual cooperam e competem entre si e também, competem com ecossistemas rivais. O ecossistema parece prover vantagens competitivas em tempos de crise, pois as empresas que adotam tal abordagem possuem capacidade de atender aos requisitos dos clientes através de constantes mudanças e adaptações no que está sendo ofertado.

##### C) **Estratégia competitiva**

A estratégia competitiva define a maneira como as unidades de negócios vão entregar valor ao mercado em que operam e por consequência, como vão obter vantagens competitivas. Essa estratégia pode ser percebida como um conjunto de medidas e ações tomadas pelos estrategistas das empresas, baseado nas diretrizes fornecidas pela estratégia corporativa e pelos ambientes interno e externo das firmas. Isso é feito para que um desempenho superior seja alcançado e que, por consequência, vantagens competitivas sejam obtidas.

Considerando as consequências devastadoras da pandemia, as necessidades dos clientes mudaram severamente, obrigando as organizações a readequarem suas estratégias para sobreviverem. As empresas dentro do ecossistema parecem ter níveis adequados de flexibilidade para se readaptarem de maneira mais rápida para responder a tais mudanças, diferente do que ocorre, por exemplo, nas cadeias de suprimento. Existem evidências sugerindo que o modelo ecossistêmico pode complementar a literatura tradicional de estratégia, incluindo o conceito de estratégia competitiva.

## 1.2) Questão de pesquisa e objetivos

### A) Questão de pesquisa

Como as empresas têm moldado suas estratégias competitivas e gerenciado seus ecossistemas de inovação no contexto da pandemia?

### B) Objetivo geral

Identificar como as empresas têm moldado suas estratégias competitivas e gerenciado os ecossistemas de inovação a que pertencem na conjuntura da pandemia do coronavírus.

### C) Objetivos específicos

- Definir os conceitos relacionados aos ecossistemas de inovação.
- Caracterizar os conceitos relacionados à estratégia competitiva.
- Identificar a atual estratégia competitiva de quatro companhias.
- Compreender o relacionamento das empresas estudadas com os respectivos ecossistemas.
- Indicar as mudanças estratégicas nas estratégias competitivas e nas relações das companhias com os seus ecossistemas devido à pandemia.

## 1.3) Critérios de seleção de casos

Cada companhia é um estudo de caso potencial, independente do seu tamanho e localização geográfica. Contudo, os principais critérios de escolha consideraram a disponibilidade das empresas em participar da pesquisa, muito devido aos impactos da crise da COVID-19.

## 1.4) Condução do estudo

### A) Entrevista

Se possível, serão selecionados em cada companhia no mínimo dois entrevistados que estejam aptos a cobrir todos os tópicos abordados durante a entrevista. Devido as atuais circunstâncias, optou-se por priorizar as entrevistas por videoconferência. No entanto, elas poderão ocorrer presencialmente caso não seja possível realizá-las online. Caso não seja possível concluir as entrevistas em um determinado período de tempo, elas serão remarcadas para posterior prosseguimento. Um pré-teste será realizado com uma das empresas selecionadas para verificar se as perguntas elaboradas estão adequadas para o entendimento dos entrevistados e se de fato, é possível atingir o objetivo proposto com o roteiro.

### B) Múltiplas fontes de evidência

Para obter a triangulação dos dados, além das entrevistas, as informações também serão obtidas através de documentação a ser disponibilizada pelas empresas e de visitas, caso seja

possível. Essas documentações podem ser e-mails, arquivos e planos de negócios. É importante frisar que as visitas que forem realizadas respeitarão os protocolos de saúde.

### **C) Análise dos dados obtidos**

Todas as respostas serão transcritas na íntegra, de acordo com as respectivas perguntas. Posteriormente, as respostas dos entrevistados da mesma companhia serão comparadas entre si e também, com as informações oriundas da documentação a fim de verificar os pontos similares e divergentes. Ademais, é preciso entender o porquê da ocorrência dos resultados para estabelecer os padrões encontrados em cada caso. Depois, todos os casos serão comparados entre si para também serem verificadas as semelhanças e diferenças obtidas entre eles. Os achados também serão confrontados com a teoria para entender o porquê dessas ocorrências e se há ou não suporte para os resultados obtidos.

### **D) Proteção das informações das empresas e dos entrevistados**

As entrevistas serão conduzidas e gravadas somente com autorização prévia do entrevistado. Todas as informações pessoais dos entrevistados e os dados confidenciais das empresas serão preservados.

## **2) Roteiro de entrevista**

### **2.1) Identificação do(a) entrevistado(a) e da empresa**

<b>Informações do(a) entrevistado(a)</b>	
<b>Nome</b>	
<b>Cargo na companhia</b>	
<b>Tempo de trabalho na empresa</b>	
<b>Telefone para contato</b>	
<b>E-mail</b>	

<b>Informação geral sobre a organização</b>	
<b>Nome</b>	
<b>Número de funcionários</b>	<input type="checkbox"/> Até 20 <input type="checkbox"/> Entre 21 e 99 <input type="checkbox"/> Entre 100 e 500 <input type="checkbox"/> Acima de 500
<b>Tempo de existência da</b>	

<b>companhia</b>	
<b>Origem do capital controlador</b>	<input type="checkbox"/> Nacional <input type="checkbox"/> Estrangeiro <input type="checkbox"/> Misto
<b>A companhia faz parte de algum grupo financeiro?</b>	<input type="checkbox"/> Não <input type="checkbox"/> Sim. Nome do grupo:
<b>A companhia é matriz ou filial?</b>	<input type="checkbox"/> Matriz <input type="checkbox"/> Filial. Qual é a localização da matriz?
<b>A empresa tem outras unidades?</b>	<input type="checkbox"/> Não <input type="checkbox"/> Sim. Quantas no Brasil? Caso tenha, quantas no exterior?
<b>Número de empregados da unidade de estudo</b>	<input type="checkbox"/> Até 20 <input type="checkbox"/> Entre 21 e 99 <input type="checkbox"/> Entre 100 e 500 <input type="checkbox"/> Acima de 500
<b>Tempo de existência da unidade</b>	

## 2.2) Perguntas

<b>A) Questões gerais sobre inovação</b>
1) Considerando o atual negócio da companhia, o(a) senhor(a) poderia explicar como que ocorre a inovação na sua empresa?
2) A sua empresa pratica mais inovação de produto ou de processo?
3) A companhia inova de maneira mais incremental ou já realizou alguma inovação radical? O(a) senhor(a) poderia falar um pouco sobre isso?
4) A inovação está presente na missão e na estratégia corporativa da organização? Se sim, de qual forma?

<b>B) Questões gerais sobre estratégia competitiva</b>
1) Como o(a) senhor(a) descreveria a estratégia competitiva da empresa? Essa estratégia é diferente dependendo do negócio? O(a) senhor(a) poderia falar um pouco sobre isso?
2) Quais os principais aspectos internos à empresa que influenciam na adoção da atual



**estratégia competitiva da organização?**

**3) E quais os aspectos externos à companhia que influenciam a estratégia competitiva adotada?**

**C) Pandemia e estratégia**

**1) A pandemia impactou na estratégia da organização? Se sim, de qual forma?**

**2) O que mudou internamente com a pandemia?**

**D) Componentes do ecossistema de inovação**

**1) Como a empresa se relaciona com seus fornecedores para colocar a inovação em prática? Quem são esses fornecedores?**

**2) E quanto aos clientes da companhia? Como que funciona esse relacionamento? Quem são esses clientes?**

**3) Com base no que foi apresentado, o(a) senhor(a) consegue identificar a formação de uma rede para o desenvolvimento dessa inovação?**

**4) Ainda com base nessa inovação, na rede identificada e no que seria um ecossistema, como é o relacionamento com os outros fornecedores dos seus clientes? Quem são esses componentes?**

**5) O(a) senhor(a) consegue identificar a presença e a influência de algum órgão regulador, da mídia, de universidades, de entidades que fomentam o crescimento de empresas, dentre outros, nessa rede?**

**6) Ainda levando em consideração essa grande rede, o(a) senhor(a) pode indicar quem é o ator chave dentre todos que foram apontados?**

**E) Maturidade do ecossistema de inovação**

**1) Qual seria o foco da rede atual? Introduzir inovações no mercado ou buscar retornos e benefícios com o que já foi desenvolvido?**

**2) A atual rede ainda busca se consolidar ou já se encontra consolidada no mercado?**

**3) Quais são os desafios enfrentados pela rede nessa busca por consolidação e/ou renovação? Como a sua empresa está lidando com eles?**

<b>F) Interação no ecossistema de inovação</b>
<b>1) Como funciona a interação entre a sua empresa e os demais integrantes da rede? Existe alguma interface que auxilie nessa interação? Qual empresa é a responsável por prover e manter essa interface operacional?</b>
<b>2) O(a) senhor(a) poderia apontar as vantagens e desvantagens quanto ao uso dessa interface?</b>

<b>G) Competição, cooperação, cooptação e ecossistema de inovação</b>
<b>1) Ainda levando em consideração a rede abordada, como o(a) senhor(a) percebe a questão da competição entre a sua empresa e os demais integrantes? E quanto à cooperação? Essas situações de competição e cooperação ocorrem simultaneamente?</b>
<b>2) O(a) senhor(a) consegue perceber uma competição com outras redes? E quanto à cooperação? Essas situações de competição e cooperação ocorrem simultaneamente?</b>

<b>H) Pandemia e ecossistema de inovação</b>
<b>1) Na atual rede, há alguma mudança em termos de inovação quando comparada à rede anterior à pandemia?</b>
<b>2) Há alguma mudança em relação aos integrantes da atual rede quando comparada à rede pré-pandemia?</b>
<b>3) Comparando a interação atual e a sua interface com a anterior à pandemia, qual seria a diferença entre elas?</b>
<b>4) Essas percepções relacionadas à cooperação, à competição e à competição e cooperação simultânea dentro da rede são diferentes em relação ao período pré-pandemia?</b>
<b>5) Essas percepções relacionadas à cooperação, competição e competição e cooperação simultânea entre redes são diferentes em relação ao período pré-pandemia?</b>

<b>I) Relação entre estratégia e ecossistemas</b>
<b>1) Como essa rede impacta na estratégia da organização? Esse ator chave influencia na estratégia da companhia?</b>
<b>2) O(a) senhor(a) acredita que a composição da rede e todo esse relacionamento existente entre os integrantes influenciam no desenvolvimento de recursos e</b>

**competências que sejam únicos para sua companhia? Se sim, poderia falar com detalhes sobre isso?**

**J) Outras perguntas**

**1) O(a) senhor(a) gostaria de acrescentar mais alguma informação que julga ser relevante?**