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MARIA CECILIA CAVALCANTI JUCÁ

HOW STARTUPS AND CORPORATIONS ENGAGE IN OPEN INNOVATION INITIATIVES? An Exploratory Study

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HOW STARTUPS AND CORPORATIONS ENGAGE IN OPEN INNOVATION INITIATIVES? An Exploratory Study

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Área de Concentração: Engenharia de Softwre e Linguagens de Programação.

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ABSTRACT

In recent years, the increasing market pressure and constant emergence of new technologies have driven firms to undertake digital transformations to create value and deliver better products or services for customers. Corporations face several challenges when it comes to incorporating new technologies or accelerating and digitizing their well-established processes. By contrast, startups are recognized for their innovation capacity, willingness to take risks, scalable solutions, and agile processes. In the quest for speed and innovation, corporations are engaging with startups to achieve complementary goals. Corporations desire the creative potential of startups, while startups need resources that are plentiful in corporations. Therefore, we identified the increasing interest from corporations and startups to engage with one another through open innovation initiatives. This research explores how open innovation is performed from the perspective of startups and corporations. We identified an opportunity to explore startup-corporation relationships in Porto Digital, one of the most relevant innovation ecosystems in Brazil. In an exploratory study, we conducted semi-structured interviews at eight startups and five corporations to understand the dynamics of their relationships during open innovation initiatives. All eight startups are part of Porto Digital, and the corporations were selected due to their relationships with studied startups. Our results reveal the main drivers, benefits, and challenges involved in the engagement between startups and corporations. Finally, we present a set of recommendations to establish and foster startup-corporation relationships.

Keywords: open innovation; startup-corporation relationship; digital transformation; empirical study.

RESUMO

Nos últimos anos, a crescente pressão do mercado e o constante surgimento de novas tecnologias levaram as empresas a realizar transformações digitais para criar valor e entregar melhores produtos ou serviços para os clientes. As corporações enfrentam vários desafios quando se trata de incorporar novas tecnologias ou acelerar e digitalizar seus processos bem estabelecidos. Por outro lado, as startups são reconhecidas por sua capacidade de inovação, disposição para assumir riscos, soluções escaláveis e processos ágeis. Na busca por velocidade e inovação, as corporações estão se engajando com startups para atingir objetivos complementares. As corporações desejam o potencial criativo das startups, enquanto as startups precisam de recursos abundantes nas corporações. Portanto, identificamos o crescente interesse de corporações e startups em se envolverem por meio de iniciativas de inovação aberta. Esta pesquisa explora como a inovação aberta é realizada na perspectiva de startups e corporações. Identificamos uma oportunidade de explorar as relações startup-corporação no Porto Digital, um dos ecossistemas de inovação mais relevantes do Brasil. Em um estudo exploratório, realizamos entrevistas semiestruturadas em oito startups e cinco corporações para entender a dinâmica de seus relacionamentos durante iniciativas de inovação aberta. Todas as oito startups fazem parte do Porto Digital, e as corporações foram selecionadas devido ao relacionamento com as startups estudadas. Nossos resultados revelam os principais direcionadores, benefícios e desafios envolvidos no engajamento entre startups e corporações. Por fim, apresentamos um conjunto de recomendações para estabelecer e fomentar as relações startup-corporação.

Palavras-chave: inovação aberta; relacionamento startup-corporação; transformação digital; estudo empírico.

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1 INTRODUCTION

The increasing development of new technologies has a clear impact on market dynamics. Disruption, rapid changes, and global competition are examples of the new challenges corporations are facing in this scenario. Many corporations have already suffered, or even not survived, from not being able to keep up with the current pace of change (D. LITTLE *et. al*, 2016). The problem seems to be focusing efforts on strengthening existing lines of business, through resources and processes, which tend to overlook innovation opportunities (CHRISTENSEN & OVERDORF, 2000).

Big Tech companies such as Apple, Meta, and Google have occupied the first places in global rankings of market value (DULLFORCE, 2015). On the other hand, most corporations face opposite realities because of their non-technological core business. In spite of this scenery, many non-tech corporations try to find ways to stay competitive and relevant by different means in an age of digital transformation (JACKSON & STEIBER, 2019). They develop initiatives such as creating an research and development (R&D) department dedicated to new technologies, aligning incentives to adopt cutting-edge equipment, and tracking metrics relevant to digital transformation (FITZGERALD *et al*., 2013).

However, these internal initiatives are not enough to reach a satisfactory and relevant digital result that brings real value to organizations. This is due to the fact that organizations need capabilities to build products or services differently and rapidly to reach enough enhancements in a competitive environment. To overcome these challenges and in line with the open innovation paradigm of Chesbrough (2003), corporations are seeking different external opportunities to engage with in order to increase their innovative power.

According to Ries (2012), startups are organizations that have a great inventive skill set, as they build new products and services under uncertain conditions. Startups are well-known for exploring new markets, accessing and experimenting new technologies, and having an agile mindset. In this sense, startups were long considered a threat to corporations as they would get part of their markets or even disrupt completely their business. As an example, Blockbuster was disrupted by the creation of Netflix (ALUMNI, 2018; LEE MUCK, 2017). It is important to point out that, in this case, Netflix was not only using technology to grow, they were also innovating their business model.

In recent years, startups are no longer considered a threat. Instead, corporations identified a great opportunity to engage with startups, collaborating for mutual benefit. In the context of open innovation, these partnerships between corporations and startups have become

part of the strategic decisions (THIEME, 2017). The startup-corporation engagement can be very efficient by joining two, apparently, opposing forces. On the one hand, startups have the ability to create new ideas and test them quickly. On the other hand, corporations have vast experience and resources for large operations. This situation led several authors (Weiblen and Chesbrough, 2015; Steiber and Alange, 2018) to suggest that cooperation between large corporations and startups is a complementary match.

From a startups' perspective, this is also an interesting strategic avenue. According to Blank and Dorf (2012), startups are temporary organizations that seek a sustainable and repeatable business model. Engaging with large corporations could be a path to overcome their own challenges regarding business model validation, time pressure to develop software, or financial resources.

Although previous studies aimed to understand the open innovation paradigm in a broad way, very few studies have explored the engagement between startups and corporations formally to better understand their journey, from both perspectives. To address this research gap, this study aims to explore how startups and corporations engage, what are the key drivers, benefits, and challenges of these relationships. Furthermore, this study will present practical recommendations for both startups and corporations to foster these strategic relationships.

1.1 PROBLEM STATEMENT AND RESEARCH QUESTIONS

As presented in the previous section, corporations are increasingly investing in collaborations with startups (BONZOM & NETESSINE, 2016). Corporations aim to constantly perform their digital transformation, follow new trends, and use the most recent technologies. On the other hand, startups aim to grow and fulfill their maximum potential of their technology or disruptive business model. However, from an academic perspective, startup-corporation engagement is considered an immature field. Limited academic studies have investigated this specific area of open innovation (SPENDER *et al*, 2017). There is a wide variety of collaboration opportunities complementing the traditional equity-based models, therefore it is necessary to address the main characteristics of startup-corporation relationships.

The objective of this research is to contribute to understanding startup-corporation engagement models and proposing key recommendations to improve these relationships to startups and corporations. The complementary property of these relationships enables the exchange of knowledge in important fields, such as technology and business models, to foster businesses through digital transformation and growth. Therefore, we designed four research

questions that need to be answered to achieve our research objective. To provide some context, each question is accompanied by a short description of the type of information needed.

This dissertation aims to explore the problem: **How do startups engage with corporations?** To investigate this problem, we developed the following research questions:

RQ1) What are the key drivers involved in the relationships between startups and corporations?

This research question aims to start the investigation by understanding the key factors that kick off a startup-corporation relationship. First, we need to underline what can be understood as drivers in these relationships. The answer to the first research question results in two main drivers framed, which we identified as practical and intentional starting points to these relationships.

RQ2) What are the main challenges involved in the relationship between startups and corporations?

To help understand the dynamics of startup-corporate relationships, it makes sense to understand the main challenges faced by both actors, startups, and corporations. We intend to understand the pain points they have to overcome to make this collaborative relationship worth it. We aim that these results serve as a basis to improve or develop relationships between startups and corporations.

RQ3) What are the main benefits involved in the relationships between startups and corporations?

In the same sense of RQ2, RQ3 is important to frame the main benefits in these relationships for both startups and corporations. This research question is very important as it frames the value of that relationship for startups and corporations. Understanding the main benefits helps define the organization's strategy or decision-making about starting an open innovation initiative. Answering this question, we share important insights and a helpful understanding of what can be done and absorbed by startups and corporations when collaborating.

RQ4) What are the key recommendations to develop successful relationships between startups and corporations?

The answer to this research question is a practical list of recommendations for startups and corporations. We developed this list due to data collection and analysis of the semi-structured interviews. In this sense, this is the most practical contribution of this research. We collected recommendations from startups and corporations studied and passed them along to others interested in this matter. We considered only recommendations from startups to startups and from corporations to corporations.

In conclusion, this research will investigate the following gaps in theoretical knowledge: (i) Key drivers of the engagement between startup-corporations; (ii) Better understanding of the underdeveloped startup-corporation engagement construct; and (iii) Establish and recommend best practices for both startups and corporations during startup-corporation relationships.

1.2 THEORETICAL AND PRACTICAL CONTRIBUTIONS

Considering the lack of studies that investigate the engagement of startups with corporations, the first contribution of this dissertation is to further develop the understanding of engagement models, including the presentation of key drivers to engaging, the definition and classification of the engagement models identified, most important challenges and benefits identified and, insightful recommendations given by startups of Porto Digital and corporations that have experience in open innovation initiatives. We conducted exploratory interviews with startups and corporations to investigate the problem from an empirical perspective.

The main contribution of this research is the results identified on main characteristics of open innovation initiatives between startups and corporations, based on the case of Porto Digital, one of the most relevant innovation ecosystems in the national territory. Porto Digital was indicated by Rest of the World Blog (2021) as one of the six most promising innovation ecosystems, building the future of the technology industry, showing its relevance for the national and international scope. According to AD Diper (2020), Pernambuco's innovation ecosystem, Porto Digital, has just over 200 startups and technology companies in operation, in addition to 25 teaching, R&D centers.

The practical contribution of this research will also provide benefits to entrepreneurs and corporate innovators by having a complete view of different types of engagement models

identified, their main features, benefits, challenges and recommendations to improve these relationships. The results of the interviews provide a detailed look at the engagement practices of corporate startups. These results can provide a source of inspiration to start an open innovation initiative, can also serve as a potential wake-up call for bad practices during these relationships, or a simple guide to improve their current startup-corporation relationships.

Finally, an important contribution to the community of entrepreneurs and corporate innovators will also be mapping the main recommendations to improve startup-corporation relationships, which were identified throughout semi-structured interviews made by respondents. Startups made recommendations to startups and corporations made recommendations to corporations. Their practical experience will enable others interested in leveraging their innovation strategy through these recommendations on startup-corporation engagement.

1.3 DOCUMENT STRUCTURE

This work is divided into 5 chapters. The first brings the motivations, research questions, and contributions of the work. In Chapter 2, we present a theoretical background on the literature of Open Innovation, Startups, Corporations and Startup-Corporate Relationships. In Chapter 3, the methodology used to carry out the research is presented. Chapter 4 presents the results of the qualitative study performed with startups from Porto Digital and correlated corporations. Chapter 5 concludes the dissertation, answering research questions and presenting limitations and guidelines for future studies.

2 THEORETICAL BACKGROUND

This chapter presents the key concepts to understand the work. The chapter is divided into four sections: Innovation, startups, corporations and, startup-corporation relationships. We have Open Innovation as a main approach connecting all content presented. We discuss the most important concepts to understand the engagement between startups and corporations.

2.1 INNOVATION

In the contemporary world - where the only constant is change - keeping up with new discoveries and new technologies proves to be a very challenging task for all organizations. Organizations are in constant search for innovation and, according to Chesbrough (2003), companies that do not innovate die. Innovation is commonly related to new technologies. According to Schilling (2013), innovation is the act of introducing a new device, method, or material for commercial application or practical purposes. When we think about markets and how technology has affected different business models, it is possible to identify the fundamental role that innovation plays in the survival of organizations.

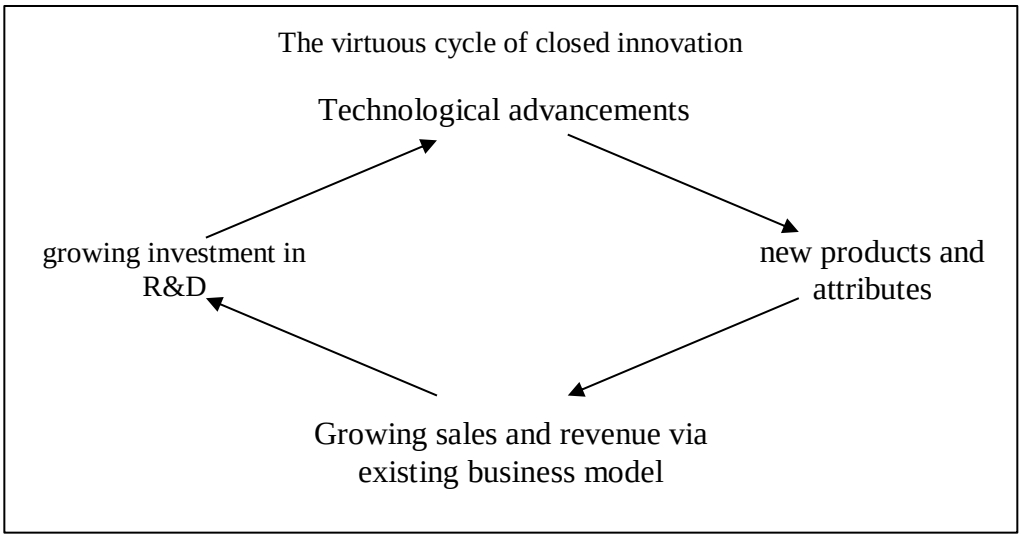
According to Teece (1986), the concept of innovation can be defined in terms of technical knowledge (partially tacit and codified) used to make things better than the existing state-of-the-art, so that this know-how can be commercialized in some market for which profits are generated. Afuah (1998) defines the term innovation as the use of new knowledge to offer a new product or service that customers want, involving its invention and commercialization. Thus, new knowledge is associated with technological factors (invention of products or services), marketing factors (marketing, distribution, customer experience, among others), or organizational and administrative factors (processes). Therefore, innovation can be in the creation of the product, in the process, in the business model, or in the service provided, which can represent the competitive advantage of that company.

The direct relationship of innovation with the technology market is more evident through the eyes of Christensen & Bower (1995) when they state that the most consistent pattern of business is the failure of leading companies to remain at the top of their industries when there are changes in technology or market, especially in the computing market. For many years, innovation was restricted to the internal environment of organizations with their areas of R&D, seeking to hire talent to acquire the ability to innovate internally, called by Chesbrough (2003) ***closed innovation***.

2.1.1 Closed Innovation

Closed innovation is a view that successful innovation requires control. Good ideas were generated, developed, built, tested, marketed and distributed by the company itself only internally to achieve success. Closed innovation created a virtuous cycle (Figure 1) where companies invested in internal R&D, which generated breakthrough discoveries. Consequently, new products and services were generated with the discoveries, making sales with higher margins, so that they could invest even more in internal R&D.

Figure 1 - The virtuous cycle



Source: Chesbrough, 2003.

During part of the 20th century, closed innovation worked very well, but with the acceleration of the technological market in recent decades, Chesbrough (2003) identified four erosion factors to break this paradigm: (i) the increasing availability and mobility of skilled workers; (ii) the venture capital market; (iii) external options for ideas sitting on the shelves; and (iv) the growing capacity of external suppliers. Thus, in situations where erosion factors have taken root, Closed Innovation is no longer sustainable and has opened space for the application of the approach called by Chesbrough (2003) of ***Open Innovation***.

2.1.2 Open Innovation

Open innovation is defined by Chesbrough (2003) as: “the use of intentional knowledge inputs and processes to accelerate internal innovation and expand markets for external use of innovation, respectively”.

Open innovation is a paradigm assuming that companies can and should use internal and external ideas to advance their technology, products or services. For Chesbrough *et al*. (2006), Bonzom & Netessine (2016), and Christensen (1997), Open Innovation is an alternative for companies to stay tuned to new market trends and protect themselves from disruptive innovation and loss of market share. Gassmann (2006) suggested that industries are more prone to engage in open innovation if they are characterized by technology intensity, technology fusion, new business models and knowledge leveraging.

Even though the term is relatively new, Open Innovation sets its conceptual roots that go far back in history (e.g., Christensen *et al*., 2005). Neither the concept of seeking outside inputs to improve internal innovation processes nor looking for external business opportunities for internal developments are new. The concepts of disruptive innovation (CHRISTENSEN, 1995), absorptive capacity (COHEN & LEVINTHAL, 1990), complementary assets (TEECE, 1986) and the explorations versus exploitation discussion (March, 1991) are considered to be related to the foundations of open innovation.

Although it was inspired by different sources, it is important to note that the Open Innovation concept has several differences from previous theories, constituting an original approach, which has become very popular. According to Chesbrough (2006), among the highlights of the uniqueness of this innovative approach, the following stand out:

- The emphasis on external knowledge flows
- The growth of intermediaries in the innovation process
- The business model becoming a central theme in the context of open innovation, in the conversion of R&D into added value in commercial terms

The closed innovation paradigm has been consumed by erosion in many industries, especially in the technology industry where technologies change and adapt at a very high speed. The logic of open innovation constitutes a scenario of abundant knowledge, which must be used promptly so that it is possible to extract value from new knowledge. In table 1, it is

possible to observe the contrast between closed and open innovation through some of the principles of this new paradigm, as proposed by (CHESBROUGH, 2003).

Table 1 - Contrast between closed and open innovation principles

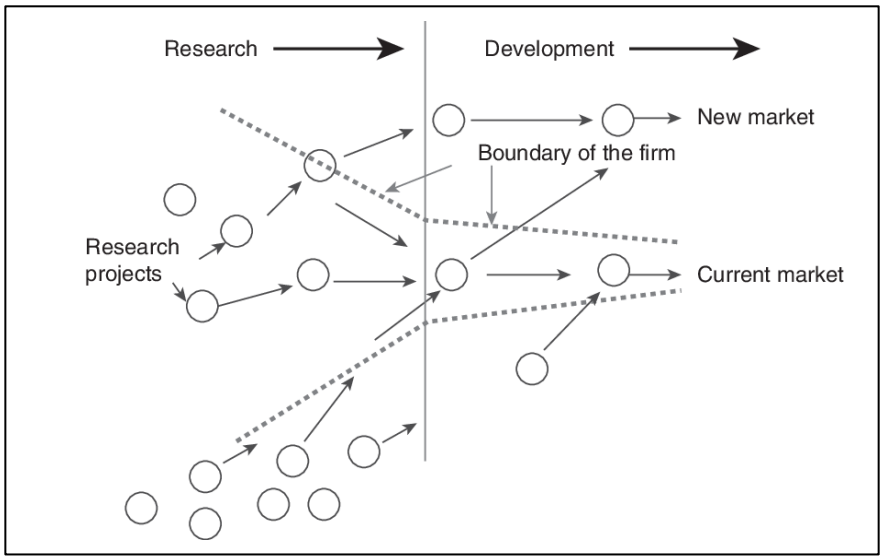
Closed Innovation Principles	Open Innovation Principles
The best in our fieldwork for us	Not all the best work with us. We need to have the best inside and outside our company
To profit from R&D, we need to discover, develop and deliver results ourselves	Outside R&D can create significant value; Internal R&D is required to capture a certain part of this value
When the discovery is ours, we will always bring it to the market first	We are not required to generate the survey in order to profit from it.
The company that first launches innovation in the market always takes that market.	Building a better business model is more useful than getting to market first
If we create the best and most numerous ideas in the industry, success is guaranteed.	If we make the best use of internal and external ideas, success is guaranteed.
We need to have control over our intellectual patents so that competitors do not benefit from our ideas.	We must generate revenue from the use of our patents by third parties and we must also purchase patents from third parties whenever this improves our business model.

Source: Chesbrough, 2003.

In the empirical context, several companies are adopting mixed practices, that is, merging traditional closed innovation practices with open action strategies to find the best way to innovate. Open innovation has at its core interaction, knowledge exchange, and collaboration, forming an innovation ecosystem (CHESBROUGH, 2007). Open innovation effectively relates the management and governance of a network of social actors, directly and indirectly, involved in the organization's innovation process.

For Dodgson, Gann and Salter (2006), the process of open innovation redefines the boundaries between organizations and the environment, making organizations more porous and creating a wide network of different actors, collectives, and individuals working to commercialize new knowledge. Figure 2 clearly reflects this porosity of an organizations' boundaries, opening access from the outside in and from the inside out.

Figure 2 - The open innovation paradigm in industrial R&D management



Source: Chesbrough, 2003.

By opening up this so-called porosity between organizations, it is possible to verify collaboration dynamics, partnerships, and exchanges in general between different actors that promote value creation through research results and the discovery of new knowledge. The main actors involved in these dynamics are corporations, medium-sized companies, startups, universities, consultants, and research centers. Due to this wide range of actors involved, innovation ecosystems are strategic in promoting these interactions, which is why building and managing innovation ecosystems is becoming increasingly important (CHESBROUGHT, 2017; VANHAVERBEKE & ROIJAKKERS, 2013).

2.2 STARTUP CONCEPT

The most popular definition of startup was coined by author Eric Ries (2012) where startups are defined as a human institution designed to create a new product or service under conditions of extreme uncertainty. This environment of uncertainty is created from technological innovations, for the most part, and on the culture of experimentation that is essential to innovate (THOMKE, 2020). On the other hand, Robehmed (2013) points out that startups do not have to be tech-based, although technology will provide more opportunities to scale. Also according to Robehmed (2013), considering the differences in revenue, profit, or the number of employees across companies and industries, there are no specific rules to define the startup.

Baldridge & Curry (2022) see startups as young companies founded to develop a unique product or service, bring it to market and make it irresistible and irreplaceable for customers. The same authors point out that startups are considered as innovation-based organizations, addressing the problems of existing products or creating entirely new categories of goods and services. To do so, they face many challenges. They face several challenges because they operate in highly uncertain markets and exploit cutting-edge technologies that have not been widely tested.

It is estimated that 50% of startups fail, with a foundation time of less than or equal to four years, according to Arruda *et al*. (2015). The most common causes of failure include the inability to find the product's market-fit alignment, the lack of experience of entrepreneurs and insufficient economic and financial funding to support the startup during the initial phases.

In Blank's (2010) view, a startup is a temporary organization designed to search for a repeatable and scalable business model. It's important to frame that startups differe themselves from small businesses, Blank makes it clear that the explorative nature of a startup is what sets them apart. The author also defines different types of startups, which differentiate themselves by mindset, characteristics and main objectives or paths defined when they're born, described in Table 2.

Table 2 - The six types of startups

Type of Startup	Description
Lifestyle Startups: Work to Live their Passion	Lifestyle entrepreneurs are living their preferred lives while working for no one, but themselves. In Silicon Valley, such professionals are freelance coders or web designers, who love their jobs, because of passion.
Small Business Startups: Feeding the Family	Small businesses are grocery stores, hairdressers, bakers, travel agents, carpenters, electricians, etc. They are those who runs his/her own business to feed the family. Small business entrepreneurship is not designed to scale.
Scalable Startups: Born to Be Big	Such startups hire the best and the brightest. They always search for a repeatable and scalable business model. When they find it, they start to look for more venture capital to boost their businesses. Often scalable startups group together in innovation clusters (Silicon Valley, Shanghai, New York, Boston, Israel, etc.).
Buyable Startups: Born to flip	During the last five years, startups that offer Web and mobile app solutions, are sold to larger companies. This tendency becomes more and more popular. Their goal is not to build a billion-dollar company, but to be sold to a larger company for pretty cash.
Large Company Startups: Innovate or Evaporate	Large companies have a finite life duration. Changes in customer preferences, new technologies, legislation issues, new competitors create pressure, forcing large companies to create new innovative products for new customers in new markets (for example – Google and Android).

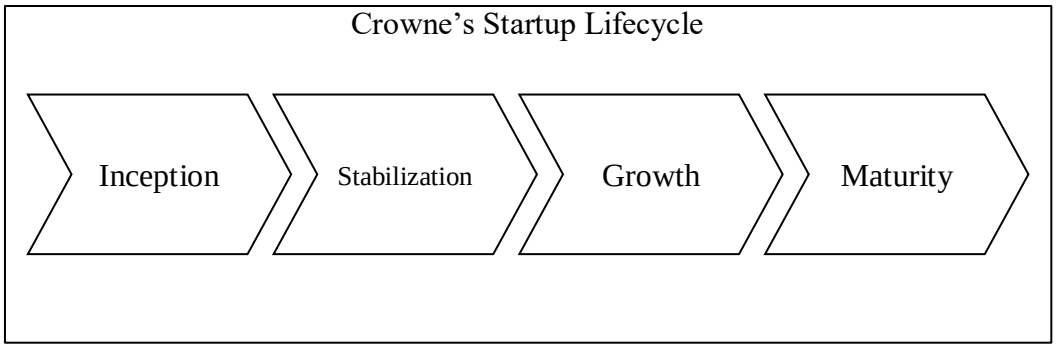
Social Startups: Driven to Make a Difference	They are passionate and driven to make an impact. However, unlike scalable startups, their mission is to make the world a better place, not for wealth's sake, but for an idea.

Source: Steve Blank, 2011.

2.2.1 Startups' Lifecycle Phases

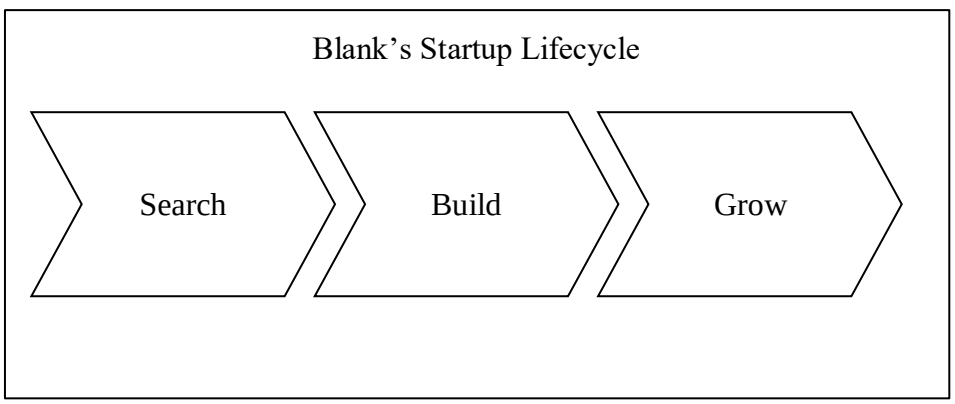
The startup lifecycle is defined based on product development, business model development and experimentation and validation cycles. Different authors adjust definitions based on their own experience or cases they've seen, but all startup phases definitions are very similar. According to Crowne (2002) the lifecycle of a startup is based on the development cycle of its product that goes through four phases: Inception, Stabilization, Growth and Maturity. As for Steve Blank (2015), startups go through 3 steps before becoming a big corporation: Search, Build and Grow (Figures 2.3 and 2.4.).

Figure 3 - Crowne's Startups' lifecycle



Source: Crowne's, 2002.

Figure 4 - Blank's Startups' lifecycle



Source: Blank, 2015.

In both first phases, Inception and Search, the startup's goal is to search for a repeatable and scalable business model, going through iterative processes and pivoting until they reach the product-market fit - the match between what is being built and who wants to buy it. Validation can be done through proof of purchase of the product by a customer. In general, this phase is based on identifying the opportunity and validating the idea. In this phase, understanding and communicating the needs of the target audience to define and develop a product scope are the foundations of software engineering practices. According to Blank (2015), most startups die in this first phase.

The next phases, Stabilization and Build, are aimed at when the main product is already stable enough to increase the customer base without generating overhead in product development. For Blank, this is also the phase of achieving positive cash flow and starting to create startups' own culture, training, processes and procedures for better organizing internal dynamics.

In the Grow/Growth phases, different concepts between Crowne's and Blank's definitions. For Crowne, this phase begins when the number of customers increases significantly without causing an overload on the team - which also grows and transfers its know-how. As for Blank, this is the moment of great growth, that is, a possible opening of an Initial Public Offering (IPO), it is already growing through repeatable and more structured processes, with defined Key Performance Indicators (KPIs), for example. Which is already perceived in the definition of Crowne's next phase, Maturity.

2.2.2 Lean Startup

The Lean Startup methodology was created by Eric Ries (2012) and brings together concepts from business and product development, such as customer development by Blank (2007) and design thinking. The concept was created to support companies in launching products and services that effectively serve their customers and achieve product-market fit. For Blank and Dorf (2012), a company achieves product/market fit when the product solves a real market need. When a group of people are willing to pay for your product and use it often.

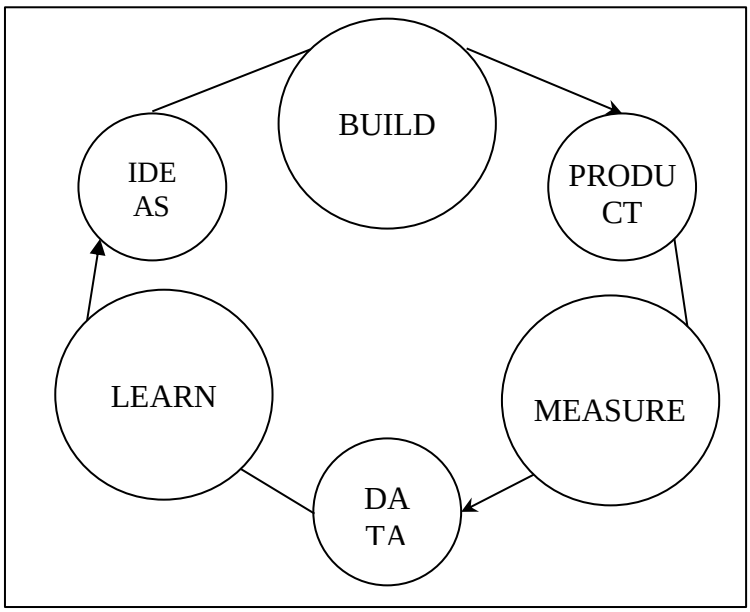
Ries (2012) highlights five basic principles of the lean startup methodology:

1) **Entrepreneurs are everywhere.** It considers that entrepreneurs can be anywhere: inside a startup or in a corporation;

2) **To undertake is to manage.** It deals with a management model built specifically for the context of product launch uncertainty;
3) **Validated learning.** Companies must learn to create a business that sustains itself. Tests and experiments are needed to validate the business model in the market;
4) **Build-measure-learn cycle.** The objective is to develop something that has value for people, measure how they deal with the product or service and assess whether it is worth keeping the initial idea or promoting course corrections;
5) **Accounting for innovation.** A new type of accounting that aims to define learning milestones and the prioritization of work, through the measurement of results, to monitor the progress of the product and enterprise.

Based on these principles, Ries (2012) understands that there is a path to be followed to transform an idea into a sustainable business. A central component of the Lean Startup approach is the build-measure-learn feedback loop (Figure 2.5). The first step is to figure out the problem that needs to be solved and then develop a Minimum Viable Product (MVP) to start the learning process as quickly as possible. Once the MVP is established, a startup can work on tuning the engine. This will involve measurement and learning and should include actionable metrics that can demonstrate cause and effect.

Figure 5 - Build-Measure-Learn feedback loop



Source: Ries, 2012.

2.3 CORPORATIONS CONCEPT

As this research frames relationships between startups and corporations in open innovation initiatives, it is equally important to define the concept of both terms: startup and corporation. Even though the "corporation" term is very popular and well-known, it's commonly used with different meanings depending on each context. Chandy and Tellis (2000) define an incumbent as an organization that commercializes products that were disrupted before the radical innovation took place. We would like to confront that definition because some markets did not get disrupted, some markets are only innovating incrementally.

Blank and Dorf (2012) define an incumbent firm as a "permanent organization", which directly correlates with their definition of a startup, where the concept comes from unstable reality. For Cambridge Dictionary (2022), an incumbent is "a person or business that holds a particular position in a company, market, industry, etc. at the present time", which can relate to Blank and Dorf's definition. Regarding their size by the number of staff, SEBRAE (2013) considers large companies when it has more than one hundred employees for services and commerce, or more than five hundred employees for industries.

In this research, we consider all concepts presented and we define a corporation as an established organization that executes a scalable and repeatable business model.

2.3.1 Corporate Innovation and Digital Transformation

Corporate innovation is the process through which large organizations identify innovative ideas, evaluate and develop them into new products, processes, or business models (WEIBLEN & CHESBROUGH, 2015). Corporate innovation relies on research in internal departments and formal collaboration with external actors (GOEL & NELSON, 2021). Analogously to the term Corporate Innovation, the concept of Corporate Entrepreneurship was coined in the field of strategy, as a way for companies to obtain more value from their current businesses by betting on innovation opportunities (SELIG *et al.*, 2018; SHANKAR & SHEPHERD, 2019).

Both terms are directly linked to the concept of digital transformation which, according to the Gartner Glossary, is defined as "Digital transformation can refer to anything from IT modernization (for example, cloud computing), to digital optimization, to the invention of new digital business models." According to Rogers (2016), digital transformation involves much more than technology; it is about a holistic change of strategy and an entirely new way of

thinking. In that sense, creating initiatives inside and outside of the corporation is a strategic move towards developing the corporations' digital capabilities and fostering constant digital transformation.

For Van Alstyne and Parker (2021), digital transformations are about changing both the business model and where value is created in an organization. There are two different paths of change for digital transformation: one is a direct conversion of processes from analog to digital, and the second one is changing how corporations work or what they do (business model). Based on that, the authors defined a new production model called "inverted firm" that seeks value from outside, through external partnerships. Combining two strategies to seek innovation and digital transformation is what O'Reilly and Tushman (2004) call ambidextrous organizations - the balancing act of exploring new opportunities to innovate while working towards better exploring its current capabilities. These "ambidextrous organizations" allow executives to experiment radical innovations while creating value through incremental gains.

For Davenport and Redman (2020), digital transformation requires talent in four key domains of knowledge: technology, data, process people, and organizational change capacity. CESAR School (2021) breaks down these key domain areas into seven phases into the digital transformation journey: People and Culture; Consumers; Business Models and Competition; Enabling technologies, Data and Regulatory Environment; Organizational Processes; Innovation and Leadership. Every domain of knowledge must be transformed or at least adapted to the challenges of today, and it is clear that the potentially complementary relationship between corporations and startups enables accelerating this process.

2.4 RELATIONSHIP BETWEEN STARTUPS AND CORPORATIONS

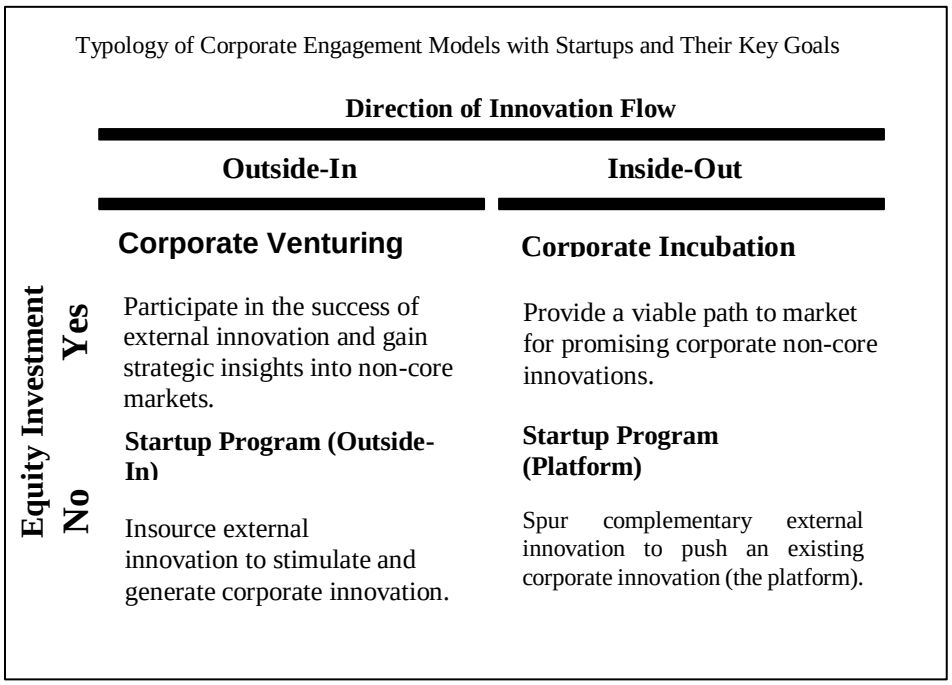
Today most industries are experiencing constant and accelerated transformational change; therefore, this reality increases the emphasis on the role of startups in corporate innovation. Innovating is a clear need for all corporations to survive and prosper. In many cases, a relationship between corporations and startups can be an effective and collaborative way to accelerate innovation for corporations and growth for startups (ALÄNGE & STEIBER, 2018). There are many different models for how corporate-startup relationships could be designed and executed (WEIBLEN & CHESBROUGH, 2015; BONZOM & NETESSINE, 2016; ALÄNGE & STEIBER, 2018).

The role of startups in corporate innovation gains strength given their ability to develop not only new products and process innovations rapidly, but also to develop entirely new

business models (ROGERS, 1995). Corporations and startups often show opposing areas of strength and weakness, which has led many authors to suggest that cooperation between these actors would be complementary (ROTHWELL & DOGSON, 1991; PRASHANTHAM & BIRKINSHAW, 2008).

Chesbrough and Weiblen (2015) developed a well-known study on how corporations can engage with startups to enhance corporate innovation. They suggest that corporate efforts to reach out to the startup ecosystem is increasing and they identified a variety of ways that corporations can engage with startups, complementing existing ones. On their analysis, based on open innovation initiatives, they classify the types of engagement based on two main criteria: direction of innovation flow (from the inside out or from the outside to the inside), and if it has equity investment (Figure 6).

Figure 6 - Typology of Corporate Engagement Models with Startups and Their Key Goals



Source: Weiblen and Chesbrough, 2015 - Exhibit 2.

The four types of engagement, corporate venturing, corporate incubation, and both startup programs, are considered and used throughout this research. As a result, Weiblen and Chesbrough (2015) suggest that there are many challenges when it comes to startups and corporations engaging, as they play opposite roles with distinguished characteristics. It also plays the role of indicating which engagement path to take depending on what are the main objectives of the corporation and identifies common implementation pitfalls.

Another important framework to consider is from Bonzom & Netessine (2016) alongside INSEAD and 500 Startups, both institutions are well-known and combine academic knowledge with real cases from the market. They identified eight main channels that corporations can access and engage with startups, called Swiss Army Knife of Corporate Startup Engagement, that is: Mergers & Acquisitions, Investments, Spin-Offs, Accelerators & Incubators, Events, Support Services, Startup Programs, and Co-working Space (Figure 7).

Figure 7 - The swiss army knife of corporate-startup engagement

Source: Bonzom & Netessine, 2016

Each channel must be used based on corporations' objectives that, according to Bonzom & Netessine (2016), vary between Innovation, Culture, New Markets, Platforms and Solving Problems. This framework is also used to better understand different perspectives of choice: from low to high involvement, the low cost versus high cost, risk-averse versus risk-seeking, and short term versus long term strategy. More than 50% of corporations around the world are engaging with startups (BONZOM & NETESSINE, 2016).

Finally, considering all of these concepts presented, the current study will define a startup-corporation relationship as: "A relationship established between corporations and startups, aiming for beneficial gains for both parties". We believe that a corporate-startup engagement is a clear mutually valuable relationship and it is an enabling way to foster digital transformation and growth for both actors.

3 CHAPTER SUMMARY

This chapter presented the necessary background to conduct and understand this research. Initially, concepts about innovation, especially open innovation, were presented. They are the focus of this research. Then the concepts of startup and corporations were presented. In addition to the basic concepts, methodologies and complementary elements were also presented that make the context of startups and corporations clear, such as digital transformation and lean startup. Finally, the dynamics of open innovation specific to the relationship between startups and corporations were presented, which in this case works as a mutual collaboration between actors - a central theme of this research.

3.1 RESEARCH METHODOLOGY

This chapter describes the research method used to investigate the research questions. According to Merriam (1998), conducting research is investigating something we don't know in a systematic way, in order to contribute to the knowledge base of some field.

3.2 TYPE OF RESEARCH

This research is an exploratory qualitative study. The choice of the methodology and design of the study corresponding to the research must be adequate to their research questions (MERRIAM, 1998). In this sense, this research started with a very broad problem “How do startups engage with corporations?”. This problem aims to investigate the main characteristics of this kind of relationship from both perspectives of startups and corporations. A qualitative approach allows us to have a comprehensive understanding of both actors, startups and corporations, on their relationships. Since our research questions concern a contemporary phenomenon, we conducted an qualitative study by means of semi-structured interviews with startups and corporations to understand their experiences of engagement.

We adopted steps proposed by Merrian (2016) to conduct qualitative studies. First, we approached contacts at accelerators and innovation institutes at the Porto Digital Ecosystem to identify startups that are currently engaging with corporations in joint projects. We interviewed CEOs and CTOs of 8 startups. During these interviews, we asked contacts of corporations they are collaborating with. We were able to interview managers and C-level staff at 5 large corporations.

The interviews were the main source of data of this research. We executed an exploratory qualitative study to collect-code-analyze data, aiming to investigate evidence on startup-corporate engagement. During the analysis phase, we were inspired by grounded theory (GLASER & STRAUSS, 1967), as it has a highly emergent nature and allows inductive reasoning (CRESWELL, 2009; VERSCHUREN *et al.*, 2010). In this sense, we used Creswell's (2009) data analysis methodology for qualitative research.

3.3 RESEARCH DESIGN

As described in Section 1.2., this research was guided by our problem statement, summarized in this exploratory problem: "**How do startups engage with corporations?**" which led us to elaborate four research questions:

RQ1) What are the key drivers involved in relationships between startups and corporations?

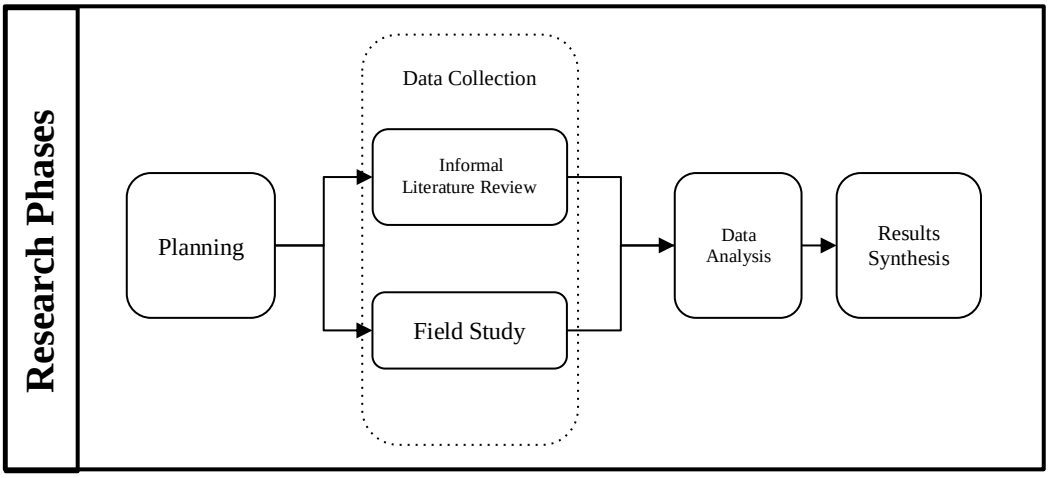
RQ2) What are the main challenges involved in the relationship between startups and corporations?

RQ3) What are the main benefits involved in the relationships between startups and corporations?

RQ4) What are the key recommendations to develop successful relationships between startups and corporations?

Our investigation process started with an informal literature review in the fields of: Open Innovation and Startup-Corporate Engagement. To answer the research questions, we conducted qualitative interviews with startups and corporations. The research was conducted in the following phases (Figure 8).

Figure 8 - Research Phases



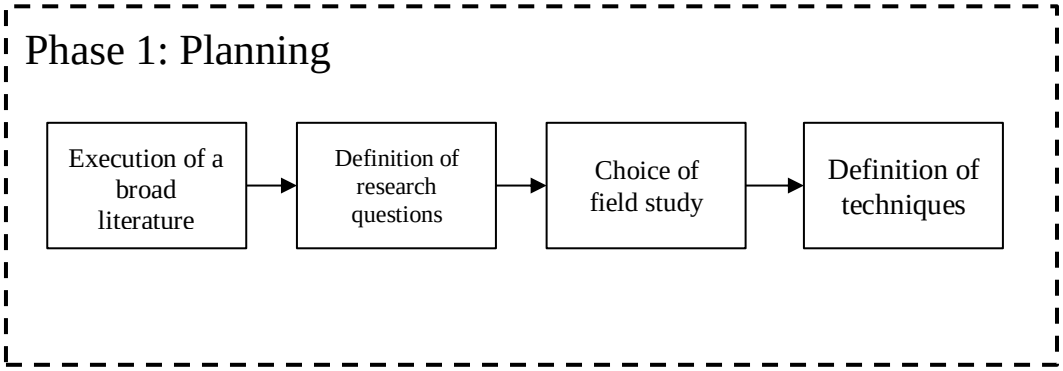
Source: The author, 2021.

In the planning phase, we defined our strategy for developing the research. Then, we entered the Data Collection Phase semi-structured interviews with Porto Digital actors (startup entrepreneurs and corporate innovators). After that, we conducted the Data Analysis Phase, where interview results were compared and all new findings were discussed and recorded. Finally, we wrote the research report by synthesizing our findings.

3.3.1 Phase 1: Planning

In this phase, our first steps into this research involved reading articles on the topic of Open Innovation to better underline research opportunities. While studying Open Innovation, we mapped gaps in the academic literature. As a practical theme, we also conducted exploratory research on informal literature, such as blogs and main innovation magazines to gather relevant practical information. After identifying gaps in the literature, we framed the problem statement. Given the research exploratory direction, it is essential to plan strategies to foster the collection of new facts that were not expected by researchers (GONÇALES, 2017).

Figure 9 - Detailed steps of Planning Phase



Source: The author, 2021.

Our research questions emerged from our problem statement: “how do startups engage with corporations?” which led us to four research questions. The first research question (RQ1) emerged while doing an informal literature review, understanding that there is a gap on that starting point. RQ2 and RQ3 also emerged focused on understanding the journey, as they are very broad and focused on exploring the theme. And finally, our forth and last research question (RQ4) emerged during interviews and first steps into data analysis (this phase will be described in more detail in the next section).

The Porto Digital ecosystem was chosen for our field study. The startups studied were all embedded in the Porto Digital ecosystem, considering the convenience of finding a diversity of startups gathered in a single space. In addition, Porto Digital is already well-known for open innovation programs and actions, validating our need of approaching the phenomenon of startup-corporate engagement from an industrial perspective.

Finally, we defined our data collection techniques to be a combined method using semi-structured interviews and online research to gather more information about the studied startups and corporations.

3.3.2 Phase 2: Data Collection

We collected data by combining semi-structured interviews and practical desk research about studied organizations. As it can be seen in Figure 8., this phase has two main data collection processes: secondary data research (or desk research) and interviews. Using multiple data enhances research validity (DENZIN & LINCOLNenzin, 2005) and exploring qualitative approaches, we can deliver contextualized and detailed descriptions of theoretical insights. In this section we explain the steps taken throughout this process.

Following Creswell (2009) guidelines, we started our readings based on our major research problem “how do startups engage with corporations?”, seeking to be aware of the latest informal literature on the topic. During this process we used a wide range of keywords to find relatable works, such as: open innovation, startup-corporate engagement, startup relationship, innovation program, startup, large firms, corporations, innovation ecosystem, startup ecosystem, Porto Digital. Different sources help to minimize bias and become valuable complements to each other in searching for literature on an emerging subject (THIEME, 2017). The recent and practical nature of the topic studied led us to include publications of renowned innovation, business and consulting firms or articles in high-quality magazines in organizational science (e.g. Forbes) or governmental papers.

Myers (1997) points to interviews as one of many techniques for collecting empirical data and it was used in this research because it matches our exploratory approach and the objective of getting both startups and corporations perspective on engagement relationships. In that sense, we conducted interviews with startup entrepreneurs from Porto Digital and the corporate innovators indicated by the startups’ entrepreneurs.

According to Seaman (1999), interviews can be structured when the interview already has a closed set of questions that should be addressed by the interviewee and they should be unstructured when the interviewer does not have many topics about talk with the interviewee. In this case, we stand in between: we used a semi-structured interview protocol, which has a prior set of questions but it is flexible to include other questions during the interview. So the protocol works as a guide not a script.

We developed a semi-structured interview protocol using exploratory guidelines from research questions (the full interview protocol is available in Appendix A). We strongly recommend reading the protocol to get a clear vision of what questions were made and how we could address the research questions. The protocol has 18 questions divided into four parts for both actors (startups and corporations): (i) Context and general vision, (ii) Mapping startup-corporate engagement experiences, (iii) Identifying main characteristics of relationships, (iv) Recommendations. The interviewees were contacted through telephone or e-mail invitation.

We conducted 15 interviews in total, which 8 were with startup entrepreneurs and 7 interviews with corporation representatives (representing 5 different corporations), as we present in Table 3.

Table 3 - Interviews' overview

ID	Type of Actor	Function	Date of Interview	Transcript Pages	Duration (min)
S1	startup	CEO	27/03/2020	8	38
S2	startup	CEO	07/04/2020	9	41
S3	startup	CEO	09/04/2020	6	51
S4	startup	CEO	29/09/2020	9	42
S5	startup	CEO and CTO	05/10/2020	6	42
S6	startup	CEO	08/04/2020	6	25
S7	startup	CTO	17/04/2020	7	23
S8	startup	CEO	30/09/2020	7	35
C1	corporation	Commercial Director	10/08/2020	6	28
C2	corporation	Project Manager	11/08/2020	7	43
		Finance Manager			
C3	corporation	CTO	15/04/2020	9	53
C4	corporation	Marketing Coordinator	09/11/2020	9	39
		Innovation & Startup Engagement Manager			
C5	corporation	Supply Chain Coordinator	24/11/2020	7	38

Source: The author, 2021.

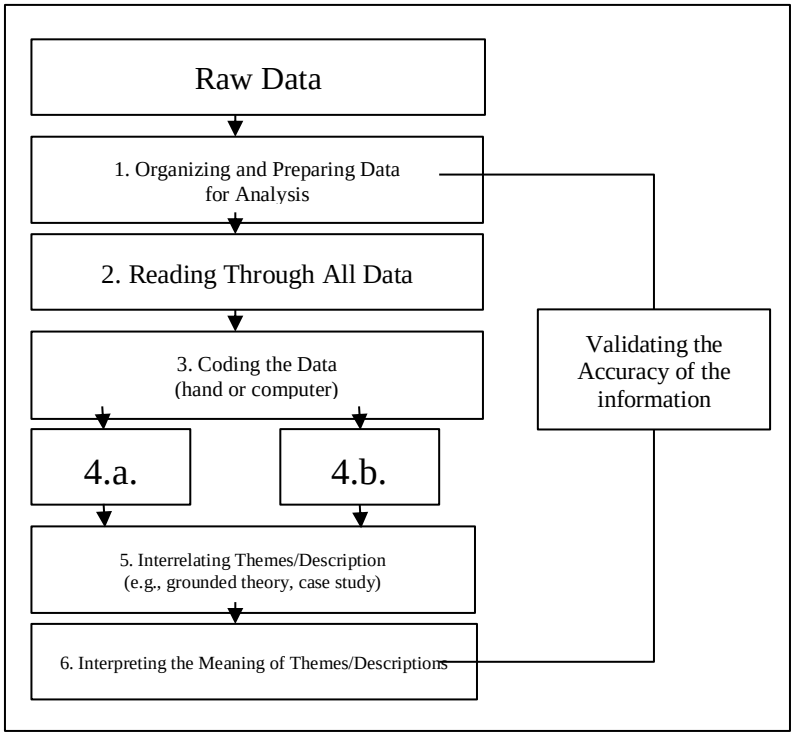
The interviews were conducted via videoconference between March and November of 2020. All interviews were recorded and later transcribed. The interviews lasted on average 38 minutes and the transcripts were consolidated in Google Docs to enable collaborative data analysis of the authors.

As an exploratory qualitative research, it matches the semi-structured interview method because it enables the interviewee to share more details freely. On the other hand, it also restrains the unnecessary discussions on off-topic subjects, making the interview too long or lacking essential information. Finally, we used data available on startup and corporations' websites, communication channel websites and official profiles in social media (such as Linkedin) to complement the interviews' perspective.

3.3.3 Phase 3: Data Analysis

For the analysis of data collected in the interviews, we adopted a procedure based on Crewell's (2009), which the step-by-step is presented in Figure 10. It's important to note that the author considers an interactive approach, in which the various stages are interrelated and not always visited in the order presented (CRESWELL, 2009).

Figure 10 - Data analysis in qualitative research



Source: Creswell, 2009.

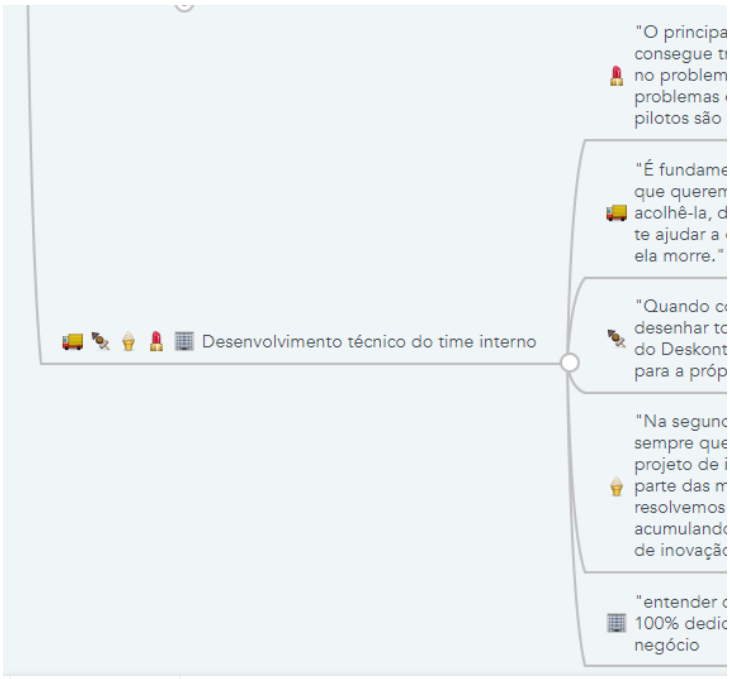
The first phase starts with the raw data, **organizing and preparing data for analysis.** We produced 15 documents with an average of 7 pages of transcript interviews. Startups' and corporations' websites and official social media pages were also analyzed to optimize the process. In this phase, we must have all interviews transcribed, visually scan all material and interview notes typed up. In order to better organize all documents to analyze them, we created a header in all transcripts containing the startup or corporation that was interviewed, their function, interview date, and a slot to fill with the most important insight of that interview. Alongside the transcripts, we created a spreadsheet to gather the most important quotes per interview.

Following the designed process, the second step is **reading through all data** available. All interview transcripts were read to get an amplified view of notable results and

characteristics of the described relationships. According to Creswell (2009), in this phase, it is important to get a sense of the information and to reflect its overall meaning. These transcripts were re-read along the way, in other phases of the process.

Entering the third step, **coding the data**, we begin to organize the material into chunks or segments of text before bringing meaning to it (ROSSMAN & RALLIS, 1998). First, we started out highlighting the most important quotes in the transcripts and passing them to the quotes spreadsheet. At the end of reading each transcript, we write short summaries of the main findings of each interview. Following that, we started the open coding process, which was conducted by one researcher, manually. According to Corbin and Strauss (2007), open coding is the process of decomposing the data into distinct parts, examining closely, and comparing them for similarities and differences. We synthesize quotes into sentences and assign a code to them, which can be equivalent to Creswell's (2009) construction of **themes** and **descriptions**, in the fourth step. Therefore, we clustered similar codes, creating categories. This codification was validated by the supervisor during orientation sessions with the researcher and there were no important discrepancies on the data. In order to help with data visualization, we used a mindmap to organize the coded data and used emojis as footprints to which quote belonged to which startup/corporation, represented by their operating market (Figure 2). We used MindMeister as a mindmap tool to support the research on this step.

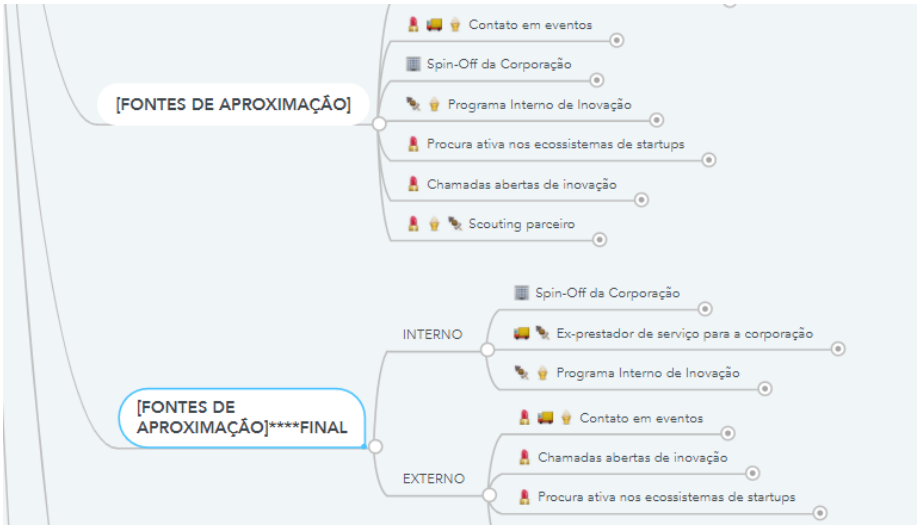
Figure 11 - Mind map during opne coding



Source: The author, 2021.

Moving on to the fifth step, axial coding (or **interrelating themes/descriptions**), where an intense analysis around the defined categories is performed, in order to find correlations, making connections between a category and its subcategories or other categories (CORBIN & STRAUSS, 2007; CRESWELL, 2009). We grouped the codes according to similarities and focused on exploring the relationship journey between startups and corporations. It was also considered that the volume of respondents in the same category or subcategory indicated the level of importance of that topic in that context. The identified relations were revised, in an iterative process, in order to verify if there was an overlap or lack of any relevant content (Figure 3).

Figure 12 - Revising results iteratively



Source: The author, 2021.

Finally, in step 6 **interpreting the meaning of themes/descriptions**, we analyzed the results, ensuring the appropriate interpretation or meaning of the data. As this study has an explorative nature, the results were a set of characteristics organized in fluxes, tables and lists to present practical answers to our research questions (presented in detail in chapter 4).

3.3.4 Phase 4: Results Synthesis

Through data collection, analysis and synthesis combined with practical desk research, it was possible to frame the most important characteristics of relationships between startups and corporations. By that means, we answered all research questions using these methods. As

a result, it was possible to provide a combination of theoretical and practical insights to startups and corporations.

All research questions (RQ1, RQ2, RQ3, and RQ4) were answered from the data collected in the interviews. The material resulted in five main findings: (i) Approximation Sources, (ii) Goals, (iii) Challenges, (iv) Benefits, and (v) Recommendations. The results of Approximation Sources were documented through a flow of direction between startups and corporations. Goals, Challenges, and Benefits findings were presented in tables with macro and micro categories. This taxonomy was derived from the open, axial and selective coding, conducted in the data analysis process. Finally, Recommendations were presented as a list because of their practical and orientational approach.

3.4 CHAPTER SUMMARY

This chapter covered the research methodology adopted to answer research questions. At first, the nature of the research was presented. Afterwards, the research methods and methodological inspirations were presented. The research phases and how each one was conducted were also exposed. Finally, results synthesis was presented.

4 RESULTS

This chapter describes the main findings discovered through semi-structured interviews that we carried out with startups and corporations that had relationships with them. The focus of this work is exploratory discoveries, therefore its main source of data was from semi-structured interviews with main actors of engagement relations. In this chapter, we present the profile of selected startups and corporations. Then, we present the main drivers identified about startup-corporate relationships.

The main benefits and challenges observed by both actors are presented. Finally, we present key recommendations based on lessons learned discussed by the studied startups and corporations in order to develop or improve startup-corporation engagement relationships.

4.1. CONTEXT OVERSIEW

According to Granstrand and Holgersson (2020), an innovation ecosystem is defined as the evolving set of actors, activities, and artifacts, and the institutions and relations that are important for the innovative performance of an actor or a population of actors. This definition is suitable to describe Porto Digital's reality.

Porto Digital ecosystem was created in 2000 with the main objective of retaining IT professionals in Recife (Brazil), where it is located. It also helped the local government to revitalize a degraded urban area. Nowadays, Porto Digital operates in the axes of production of Information and Communication Technology (ICT) software and services, creative economy, in addition to focusing on the future of cities through prototyping based on digital fabrication and the Internet of Things (IoT).

Its relevance is notorious. In 2020, the turnover of companies embarked at Porto Digital reached BRL 2.86 billion - an amount 21.7% higher than that recorded in the previous year, of BRL 2.35 billion, and 50.8% more than that in the year 2018 (PORTO, 2022). Currently, in 2021, the ecosystem has more than 300 companies of different sizes, of which more than 200 are startups. Porto Digital has 5 research institutes, 7 investment institutions, and 5 accelerators. It also has strong partnerships with 4 universities, which opens opportunities to promote open innovation with many different organizations, such as corporations. In the following sections, we present an overview of studied startups and corporations.

4.1.1 Studied Startups

In Table 2 we present an overview of the 8 software-based startups from the Porto Digital innovation ecosystem selected for this study. These startups were chosen because of their technological background and notable partnerships with corporations. Information such as market, type of consumers, business model, number of staff, year of foundation, and role of respondents are presented. We also defined an ID code for each startup, so we can refer to it without having to identify them.

Table 4 - Profile of startups interviewed for this research

ID	Market/Domain	Type of Consumers	Business Model	Number of staff	Year of creation	Interviewee role in the startup
S1	Construction	B2B and B2B2C	SaaS	2-10	2018	CEO
S2	Fintech	B2B	SaaS	2-10	2016	CEO
S3	Sales and Communication	B2B	SaaS	2-10	2016	CEO
S4	Social Impact	B2B2C	SaaS	2-10	2016	CEO
S5	Human Resources	B2B	SaaS	2-10	2017	CEO and CTO
S6	Logistics	B2B and B2B2C	SaaS	21-200	2006	CEO
S7	Analytics and Big Data	B2B	SaaS	11-50	2007	CTO
S8	E-commerce	B2B	SaaS	2-10	2016	CEO

Source: The author, 2021.

All startups have been in business for over 3 years. The oldest organization S6 is 15 years old and still explores different business models, within a context of uncertainty. The number of staff information was gathered through the companies' official LinkedIn profile. The majority of startups have very small teams, with up to 10 employees, the exception is S6 which already has approximately 60 employees and s7 with approximately 40 employees. In terms of market performance, all startups operate in different markets, bringing a wealth of diversity to the research. What remains the same among them all is that they are software-based startups.

Regarding the types of consumers, 7 out of 8 startups are focused on a business client, in other words, they adopt the “B2B” business to business model. The only variation in this sense is S4, which focuses on the “B2B2C” business to business to consumer. It still operates through the business-to-business model, the difference is that it focuses on the end customer as well. Regarding the revenue model, all 8 startups use the “SaaS” model - *software as a service*. All respondents were part of the startup's "C-level", meaning that they were directors or founders of the startup, which greatly benefited this study, as these people know the entire history and strategy of innovation and growth of their startups.

These startups were selected by convenience because they are representative cases of different lifecycle stages of startups from the Porto Digital ecosystem. In Blank’s (2010) startup typology, we have 6 out of 8 startups classified as Scalable Startups, 1 startup classified as Large Company Startup and 1 startup classified as Social Startup. It’s important to note that the mindset of all startups involved in this study was to scale their business fitting the mindset of Scalable Startups definition (BLANK, 2010).

When we interviewed startups S1, S2, S3, S4 and S5, participants mentioned their startups maintained relationships with corporations C1, C2, C3, C4 and C5, respectively. We were able to interview staff from these corporations. In summary, 5 out of 8 startups were portrayed with the corresponding corporations. These startups answered questions focused both on the engagement model developed with the corresponding corporation, as well as on other relationships they had already experienced. On the other hand, startups S6, S7 and S8 do not have corresponding corporations in our study due to lack of access to the corporations indicated by them. Therefore, these startups answered all questions in a broad scope about all corporations they had relationships with. However, we were not able to confirm the findings with the corporations.

4.1.2 Studied Corporations

In Table 3 we present corporations’ profiles, they were all selected based on their relationship with the interviewed startups. Their size and relevance to the market were also considered to fit into the corporation construct. We collected information about their market domain, type of consumers, number of staff, year of creation, and Interviewee role in the corporation.

We also defined an ID for each corporation, so we can refer to it without having to identify them. The ID defined for each corporation is the same to the respective startup they engaged with.

Table 5 - Profile of corporations interviewed for this research

ID	Market/Specialty	Type of Consumers	Number of staff	Year of creation	Interviewee role in the corporation
C1	Construction	B2B and B2C	51-200	1995	Commercial Director
C2	Logistics and Supply Chain	B2B	501-1.000	1991	C2.1 Project Manager C2.2 Finance Manager
C3	Wholesaler, Retailer, Distribution and Logistics	B2C and B2B	700-900	1978	CTO
C4	Cosmetics	B2C and B2B	5.000-10.000	1969	C4.1 Marketing Coordinator C4.2 Innovation & Startup Liaison Manager
C5	Consumer Goods	B2B2C	10.001+	1872	Supply Chain Coordinator

Source: The author, 2021.

4.1.3 Engagement models adopted by startups with corporations

To understand the context of relationships between startups and corporations, it is important to analyze the engagement models used by them. We adopted two frameworks from Chesbrough and Weiblen (2015) and Bonzom & Netessine (2016) as guidelines to characterize the engagement models. The models presented in Table 6 were indicated by the participants during the interviews.

Table 6 - Engagement Models Adopted by Startups with Corporations

Engagement Models Adopted by Corporations with Startups		
Direction of Innovation Flow	**Engagement Model**	**ID**
Outside-in	Proof of Concept	(S2 + C2), S3, (S4 + C4), (S5 + C5), S6
	Direct Services and Co-creation	S2, (S3 + C3), S6, S7
	Mergers & Acquisitions	S8
Inside-out	Spin-Offs	(S1 + C1)
	Startup Acceleration Programs	S2, S7

Source: The author, 2021.

We classified the engagement models considering the direction of innovation flow according to (CHESBROUGH & WEIBLEN, 2015). Using this initial categorization, we identified the following engagement models of outside-in innovation flow that studied startups adopt: Proof of Concept, Direct and Co-created Services, Startup programs, Mergers and Acquisitions.

The ***Proof of Concept model*** is very popular among the startup community. It consists of a contract (paid or free) to validate the technical capacity and value of the startup solution. It is literally a proof of concept for corporations. It is generally used in contexts of early relationships between organizations, has a short duration (on average 3 months), and focuses on building MVPs for a clear validation of the value proposition of the proposed solution. We observed that five of the studied startups adopt this model. For example, S4 described that their relation with C4 started with this model, experimenting and validating hypotheses of the product, so they ran a 3-month proof of concept to validate the idea before investing.

On the other hand, ***Direct Services and Co-creation*** is a model where the provision of services takes place in a more traditional way. Startups S6 and S7 provide their standard service and get paid a regular fee, while startups S2 and S3 engage in co-creation initiatives with corporations. We observed these startups develop an adapted service provision, by means of working with corporations as a joint team, trying some adaptation of the regular service to better fit the corporation's context and expectations. This model worked very well between S2+C2 and S3+C3.

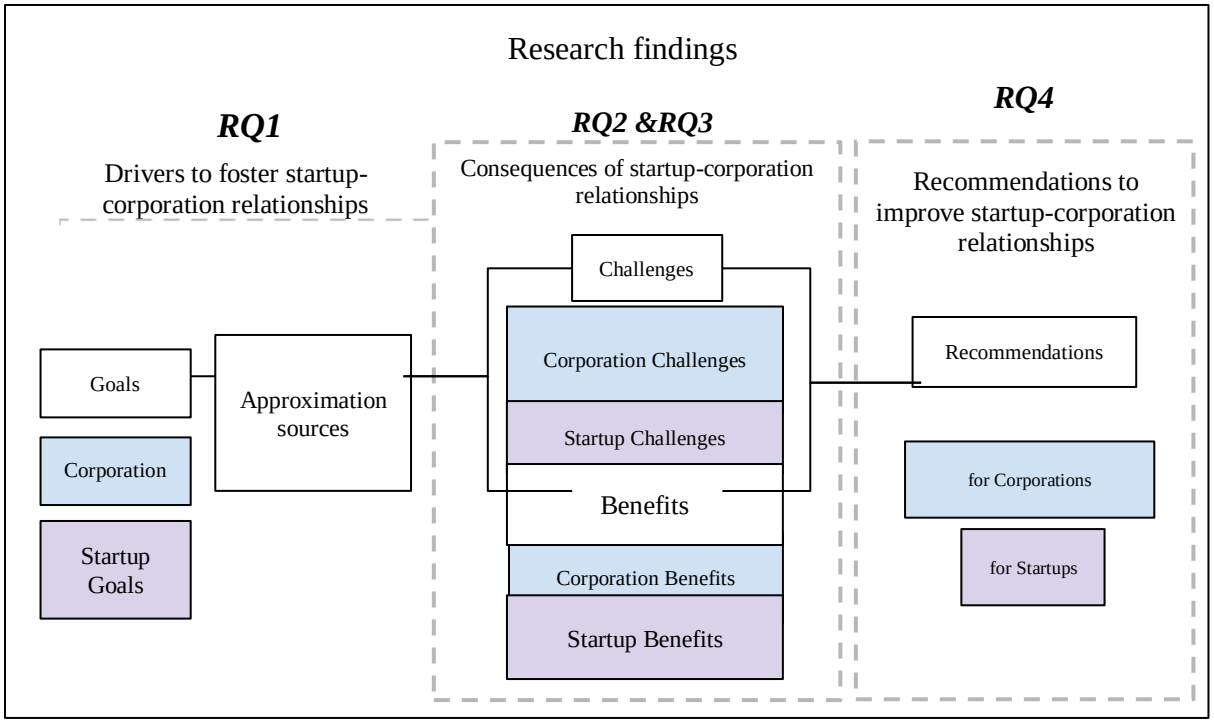
Finally, the last outside-in engagement model identified is ***Merge & Acquisitions***. As the name suggests, this is the model where corporations go after market startups, which can represent an interesting partner or a brutal competitor, making the purchase or acquisition a strategic path for the corporation. For startups, it is an interesting model when their goals change along the entrepreneurial journey, when they no longer see the possibility of growth or when the proposal is financially very attractive. Startup S8 was acquired by a big publicly traded corporation, where the sale proved to be a very strategic model for the S8 entrepreneur: "For us it was a very good, life-changing opportunity. The Corporation that acquired us had the objective of capturing us, the startup's talents. Therefore, today we are part of the company, with good positions and good career projections".

In the inside-out innovation flow, we identified two engagement models adopted by startups: Spin-offs and Startup Acceleration Programs. ***Spin-offs (or Corporate Ventures)*** are a well-known model where startups are created within corporations, but by gaining meanings,

markets, and even different strategies, startups can leave within corporations to become autonomous outside the corporations (spin-off). This is the case we found at startup S1, which was created by the founders of corporation C1. Initially, startup S1 stayed within corporation C1, with the aim of expanding services and operating in markets that complement C1. Until today the founders of C1 have a direct relationship with startup S1 and C1 provides resources to help S1 grow. C1 comments: "startup S1 was founded by the founders of corporation c1, today they act as founding partners, almost like a board of directors. We work very closely, almost daily, as a planning and strategy board, but we have our own team running our operation.".

Figure 4 presents an overview of findings obtained from the perspective of startups and corporations. First, we explore the drivers to foster relationships between startups and corporations. Then, we discuss the consequences of the relationships in terms of benefits and challenges. Finally, we provide practical recommendations to improve corporate-startup relationships. These results were all extracted from the collected data, considering multiple respondents to the same matter, its frequency and relevance of the theme.

Figure 13 - Research findings overview



Source: The author, 2021.

4.2 KEY DRIVERS INVOLVED IN STARTUPS AND CORPORATIONS RELATIONSHIPS

This section aims to understand what are the key drivers of startup-corporation engagement as stated by *RQ1: What are the key drivers involved in relationships between startups and corporations?*. Considering that driver according to Collins Dictionary is *a part that transmits force or motion*. In other words, we consider drivers as triggers or engines to create startup-corporation relationships. In this context, the following categories of drivers emerged from the semi-structured interviews: (i) ***goals***, and (ii) ***approximation sources***.

In the following sections, we discuss the findings from the perspective of both studied actors: corporations and startups.

4.2.1 Startups' Goals

The goals identified from the qualitative interviews represent the initial desires and expectations that the actors - startups and corporations - had when starting their relationships. From the perspective of the studied startups, our study revealed 3 macro goals and 7 specific goals they have when approaching corporations, as presented in Table 7

Table 7 - Startups' goals for engaging with corporations

Startup Goals		
Macro Goals	**Specific Goals**	**ID**
PRODUCT/SERVICE DEVELOPMENT	[TECHNOLOGY] Maturation of the startup's technical capacity	S2, S4, S6, S6
	[NEW PRODUCT OPPORTUNITIES] Identification of problems to be solved seeking to develop new products	S1, S2, S6
	[PRODUCT-MARKET FIT] Validate the fit of the solution with the market	S1, S4, S5, S7
BUSINESS SUSTAINABILITY	[DIRECT SALE] Accomplish a direct sale	S2, S3, S4, S5, S6, S7, S8
	[BUSINESS MODEL] Find the best revenue streams and partnership models	S4, S5
ORGANIZATIONAL GROWTH	[TEAM EXPERIENCE] Professional evolvement of the startup team to gain experience with the corporation	S1, S4, S6, S7
	[MARKETING] Gain credibility through brand association with the corporation	S1, S2, S3, S5, S6, S8

Source: The author, 2021.

We classified the startups' goals into 3 different macro-goals: (i) ***Product/service development***; (ii) ***business sustainability***; and (iii) ***organizational growth***. Within the ***product/service development*** category, it was possible to identify the startups' goal to improve and further develop their products using corporate resources. The business's focus on sustainability was clearly the goal of maintaining the startup's financial health, since a very common situation faced by startups is the lack of financial resources. Finally, we identified the need for ***organizational growth***, either due to the startups' short life in the market or because of the young age and limited maturity of the team members. We also observed that several startups aim to gain credibility from associating themselves with the brand of the corporations.

Among the most popular goals, our analysis revealed that accomplishing direct sales, with a clear focus to ensure e financial growth, is of great importance for 7 of the 8 startups interviewed. It emphasizes the startups' high level of concern about the financial sustainability of their business. Finally, the relevance of this goal is confirmed by the interviewee of startup S4: "I had a clear focus on large corporations to make bigger sales, if not, I would take a long time to reach my breakeven (financial breakeven point)".

Another very common goal that 6 out of 8 startups mentioned is to gain credibility through brand association with the corporation which reveals the need and importance of marketing and brand strength. It is a seemingly common problem for companies in general, but it is an even more latent pain for startups as they are considered “immature” and “unprofessional” by many corporations and other business players. S3 confirms this when they point out that, when they began operating, they didn’t use to identify themselves as a startup when talking to big corporations, they’d prefer just using the word organization or similar, because they knew that could improve their credibility in more conservative markets.

This scenario has been improving with the popularization and even romanticization of the term “startup”, especially in Brazil, as it is not an English-speaker country. We can identify this shift in trending words to use and how the market sees it now by S3 confirming: “I believe I had more difficulty before because the startup was still seen a lot as an “amateur” organization here in Brazil, but now it's fashionable to say we are a startup.”

Although the term startup is in the hype and their credibility has increased, it is still of great interest for startups to associate their names with the big names of the corporate market. S2 states that having a relevant name in its portfolio opens doors for new hires and business expansion.

4.2.2 Corporations' Goals

From the perspective of corporations, their goals are closely linked to the company's digital improvements and advancements. We identified 3 macro goals subdivided into 8 specific goals, as described in Table 8.

Table 8 - Corporations' goals for engaging with startups

Corporation Goals		
Macro Goals	**Specific Goals**	**ID**
DIGITAL TRANSFORMATION ACCELERATION	[INNOVATIVE SOLUTIONS] Problem solving through the creation of tech-based and innovative solutions	C1, C2, C3, C4, C5
	[STARTUP MINDSET] Learn new methodologies and approaches used by startups (lean startup, design processes, agile methodologies)	C2, C3, C4
	[TECH CAPABILITIES] Improve the team's tech and innovation capabilities	C2, C3, C4
RESOURCE OPTIMIZATION	[OUTSOURCING] Optimize processes by contracting outsourced services	C2, C3, C4
	[SERVICE ACQUISITION] Obtain cost-effective services	C1, C2, C3
DESIRE TO BE AT THE FOREFRONT OF INDUSTRY	[ATTRACT NEW TALENT] Hire young and talented personnel	C3, C4, C5
	[INNOVATION ECOSYSTEMS] Presence in the startup and innovation ecosystems	C1, C4, C5
	[STRATEGIC PARTNERSHIPS] Conquer or accelerate new markets through new partnerships	C1, C3

Source: The author, 2021.

The first macro goal of corporations that we identified is the clear focus on ***digital transformation acceleration***. Corporations aim to learn the methodologies and mindset of startups to emulate their digital culture. Such methodologies include: agile methodologies, lean startup, design thinking, among others chosen for rapid prototyping and validation. Within this context, another specific objective of corporations is to evolve their problem-solving capacity through the discovery and development of technology-based and innovative solutions. In other words, including as many digital solutions as possible to increase productivity and even break paradigms in consumer markets. The last specific objective, in the category of digital transformation, is to evolve the technical capacity of the team in cutting-edge technologies,

often skillfully mastered by startups. This specific objective is even more evident in corporations that are immersed in traditional markets, with little use of digital solutions. C3 evidences the value of startups on their digital transformation path: “We value the relation with startups that helps us to identify and create new solutions to old problems, as well as accelerating our full digital transformation”.

Resource optimization is a macro goal that is well known among corporations. Large corporations focus on process improvement as part of their robust structure, given the large number of resources and, due to its great product scale, every optimization performed brings great benefits to the corporation. Thus, the hiring of startups' services, as they have a clear cost-benefit ratio, also stands out as a way of optimizing resources. In addition, the solutions created in partnership with startups are frequently focused on cost reduction, scale increase or optimization of other resources.

Finally, a clear macro goal of corporations is to become a reference in their industry, ***desire to be at the forefront of industry***. This macro goal has specific objectives: attracting new talent, conquering or accelerating the entry into new markets and having a presence in the innovation and startup ecosystems.

The goal of attracting new talent is a challenge for many corporations, given that competition, especially from the younger workforce, is highly disputed with the startups themselves. By actively engaging with a startup, the corporation uses this partnership to attract new talent interested in the startup but seeking the stability of a large corporation. C5 comments “through hackathons to create startups or partnerships with existing startups, we were able to map talents and attract people looking to innovate and work in our team”.

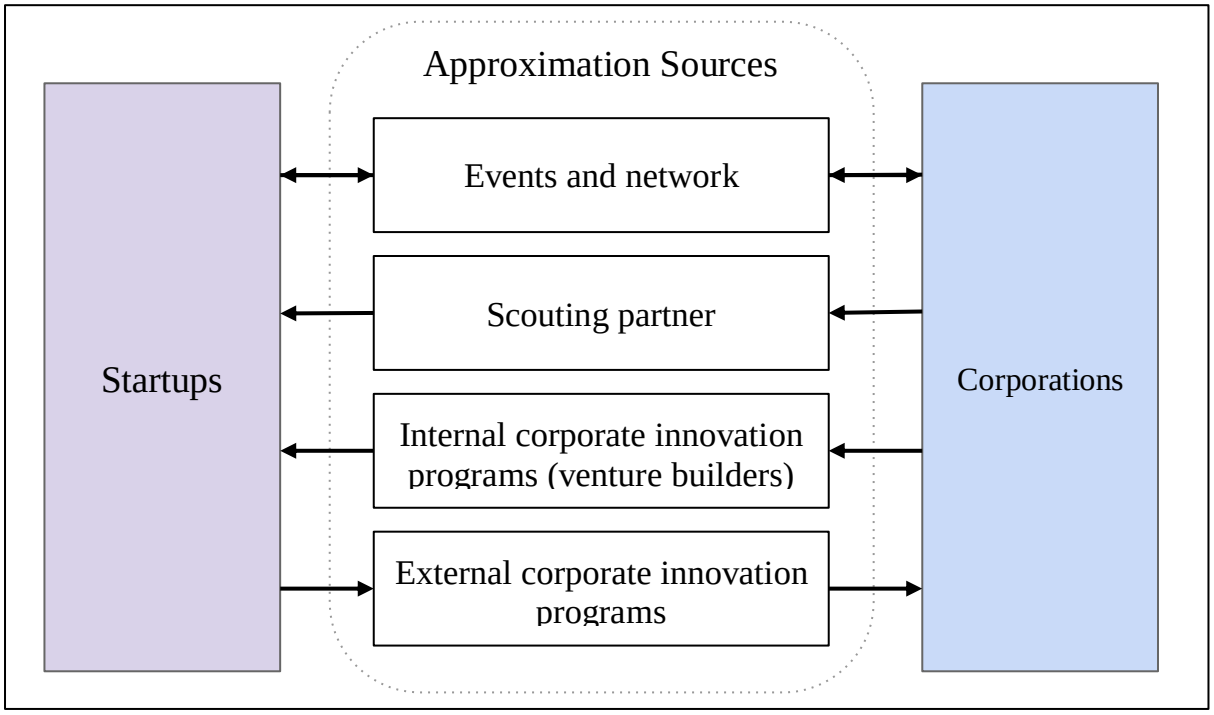
Still connected with this sense of external image to the public, the presence of the corporation in startups and innovation ecosystems is also one of the specific objectives aimed by studied corporations. C4 also points to direct exchange with entrepreneurs and the ecosystem: "With collective intelligence, we work in a network, in an uncomplicated and coordinated way, in an equitable relationship with the ecosystem and the entrepreneurs.".

Lastly, the specific goal of conquering and accelerating entry into new markets is common for two of the five corporations interviewed. The opportunity to open up new ways of acting and diversify the corporation through collaboration with startups is identified as a relevant objective. Opening new paths for corporations through startups is a strategy that also correlates with the corporate image, which often does not risk entering other markets alone due to high competitiveness or fear of failure. By doing this through startups, there is the possibility of safeguarding the risk of failure, while strengthening the image of being bold.

4.2.3 Approximation sources

The sources of approximation are the meeting points, whether physical, such as events, or social, such as by networking, where startups and corporations meet each other. In Figure 5, we present the 4 sources of approximation between startups and corporations and how the interaction flow works: if the interaction comes from the corporation to the startup, the inverse, or both ways.

Figure 14 - Approximation sources flow between startups and corporations



Source: The author, 2021.

The most common source of approximation is through ***events and networks***. Startups and corporations value attending strategic events of Porto Digital's ecosystem, that is, events that promote the exchange of ideas between startups and corporations. There is always an interest in meeting new people who can promote business connections. Startup S2 points out how strategic it is to build strong networking and use its participation in events wisely: "My strategy was to build a strong network of contacts. For that, I attended many events, knocked on many people's doors, and received many no's, but always with focus, given that this source of approximation is very important."

Partner Scouting is a service that innovation consultancies and open innovation facilitators promote to actively identify and seek out startups in communities that are fit with the corporation's interest. This service is hired by the corporation in search of solutions that already exist on the market and works analogously to a startup "headhunting". In this interaction, the flow of contact happens from the corporation to the startup, which is passive in this case.

Finally, ***corporate innovation programs*** were frequently cited both by startups and corporations as mechanisms to find potential partners. We consider external programs, those that the corporation opens its problem to the market so that startups come after the corporation with proposed solutions. It is a very popular format and the operational flow only happens with proposals or subscriptions from participating startups. Internal programs, on the other hand, are those in which corporations create the environment for experimentation and innovation for their own teams, which may lead to the creation of an internal startup. Eventually, the startup may leave the corporation as a spin-off. In this case, the flow is from corporations going towards the creation of startups.

Table 4.6 synthesizes the approximation sources to engage with each other adopted by the studied startups and corporations.

Table 9 - Approximation sources identified

Startups	Approximation Source	Corporations
S2, S3, S4, S5, S6, S7, S8	Through events and networking	C1, C2, C3, C4, C5
S2, S3, S4, S5, S7	Scouting partner	C3, C4, C5
S2, S3, S4, S7	Corporate acceleration external programs	C4, C5
S1	Internal innovation programs	C1, C3, C5

Source: The author, 2021.

4.3 CHALLENGES INVOLVED IN STARTUP CORPORATION RELATIONSHIPS

In this section, we investigate *RQ2: What are the main challenges involved in the relationship between startups and corporations?*

4.3.1 Challenges for Startups

The macro challenges described by studied startups when they engage with corporations are: (i) ***cultural differences***, (ii) ***complexity of corporate processes*** and (iii) ***business model obstacles***. We identified 8 specific challenges within these 3 categories of macro challenges as shown in Table 10.

Table 10 - Startups' challenges during relationships with corporations

Challenges for Startups		
Macro Challenges	**Specific Challenges**	**ID**
CULTURAL DIFFERENCES	[SKEPTICISM ON DELIVERY CAPACITY] Dealing with discredit on the startup's capacity of delivery	S1, S3
	[UNWILLINGNESS TO EXPERIMENT] Corporations' misunderstanding the experimentation process	S1, S5, S7
	[FEAR OF CHANGING] Dealing with change aversion of corporations	S1, S2, S3, S5, S7
COMPLEXITY OF CORPORATE PROCESSES	[SLOW PROCESSES] Slow decision-making involving heterogeneous and sillowed areas of corporations	S1, S2, S3, S4, S5, S6, S7, S8
	[LOW PRIORITY FOR INNOVATION] De-prioritization of innovation projects by corporations	S2, S5
	[BUREAUCRACY] Facing great bureaucracy imposed by corporations	S2, S3, S4, S5, S6, S8
BUSINESS MODEL OBSTACLES	[LACK OF RESOURCES] Lack of initial resources impacting the startup's performance	S2, S4
	[POWER INEQUALITY] Difficulties to bargain in negotiations with large players	S3, S6, S8

Source: The author, 2021.

The ***cultural differences*** between startups and large corporations is stark. From the perspective of startups, dealing with the lack of credibility and confidence in their deliveries is a great challenge, since they have great difficulty in transmitting self-confidence and convincing untrusting corporations. It is necessary to break the barrier of disbelief through the delivery of projects that generate clear value for partners, as S1 states: "we must break this barrier that exists, often due to age prejudice or lack of professionalism, through our delivery of value".

The basis for startups to deliver value are the innovative methodologies used in the experimentation process. An important point of friction is the understanding of this process by corporations and the need to align their expectations. Corporations often expect a ready-made

product, where in reality the startup is still developing it, sometimes even in the form of a MVP. S5 and S7 point out this challenge :

S5 - “If the startup is very nascent, it may be that the solution is not ready for consumption, so the company needs to be willing to understand that it is a process - it is part of our methodology. If she wants a ready-made product, go to the market".

S7 - “Corporations expect to buy a finished product most of the time, they rarely expect to build a product. It is a great difficulty for us to manage this misalignment of expectations”.

This cultural mismatch also creates challenges due to the risk aversion mindset that corporations have. By not accepting to take risks, corporations also hinder the experimentation process, which is premised on the great possibility of going wrong, that is, invalidating the idea or solution. Differently, startups, by their definition (RIES, 2012), are institutions that live in an environment of uncertainty. When dealing with corporations that do not embrace the risk of innovation, a lot of friction may be generated between the actors of engagement, as described by the startups:

S1 - “The question of mindset! It is the main, if not the only, difficulty in this relationship with them. We were never barred from doing anything, but we have the initial difficulty of being able to do something different."

S2 - "Another challenge is because they are too rigid to change, to believe in innovation since the processes implemented there are already so consolidated."

S2 also points out, from their own experience, that in order to break this paradigm, it is necessary to seek support from the corporation's senior management for the project.

The complexity of the corporations' internal processes is a matter of regulatory laws for that type and size of company. In addition to the legislation itself, the process of organizing a large company is naturally more complex due to the volume of people, data, and investment in that organization. Therefore, the main friction factor between startups and corporations is speed, this challenge was mentioned by all interviewed startups.

The processes often require several approvals and extended deadlines. In startups, the founders are also the ones who are in the operation, facilitating and accelerating approvals so it becomes a great challenge to startups to deal with delayed processes, as S4 explains: “The delay in closing the contract, payment or other processes is very long. Which is generally very different from the process of a startup, a smaller company, which is less process and fewer people to approve”.

Even within this same context of processes, bureaucracy gains great attention from startups when several documents and internal assessments are needed. The imposition of terms

in negotiations, internal processes, and decision change also leaves startups without much power to react and they need to face such impositions. S5 comments: “There are many projects happening simultaneously and just one “swipe”, that is, a decision by the top management to change and everything else changes as well”.

The imposition of top management is also connected with the challenge of de-prioritizing innovation projects. If the project with startups does not directly reflect on the corporate core business, it is common to see it deprioritized, with a smaller team or no corporate person fully dedicated to it. For startups, it becomes a major obstacle to access key information for the project, in addition to slowing down the entire startup process.

Finally, there are business obstacles such as lacking initial resources impacting startups’ performance and facing power inequality in negotiations between startups and corporations. S4 makes it clear that it is very risky for startups to start a new project without any investment: “In some cases, startups lack resources for adapting to the process of corporations (...) . In our case, we were “lucky” to have our own money to invest at that point, otherwise, we wouldn’t be able to run the project… Or we would have to go after others’ investments. This vulnerability can generate a bad image towards the corporation, or a misunderstanding that we would not have the capacity to operate the project”.

Lastly, it is very clear and well-known that corporations have strong market power and a great ability to negotiate. Therefore, startups struggle with negotiations so they can equalize their needs and prove their capabilities when partnering with corporations. S8 points out that while negotiating with corporations, startups need to keep in mind that they have value and something to offer corporations, otherwise, they wouldn’t be in that position. In another perspective, S6 understands that to convince corporations of the startups’ capabilities during negotiations is the main challenge to conquer a partnership.

4.3.2 Challenges for Corporations

Our study revealed 3 macro challenges and 7 specific challenges faced by corporations when engaging with startups This result is presented in Table 11.

Table 11 - Corporations' challenges during relationships with startups

Challenges for Corporations		
Macro Challenges	**Specific Challenges**	**ID**

CULTURAL DIFFERENCES	[UNCERTAIN RESULTS] Difficulties of dealing with uncertain results of innovative projects	C1, C3, C4
	[FAILURE TOLERANCE] Corporations' frustration towards failure	C3, C4
	[STARTUPS' IMMATURITY] Difficulties dealing with startup immaturity	C1, C3, C4, C5
OPERATIONAL MANAGEMENT	[MANAGEMENT PRIORITY] DIfficulties to find internal senior sponsors of innovation projects with startups	C1, C2, C4
	[BUREAUCRATIC PROCESSES] Mismatch between internal bureaucratic processes with startups context	C1, C4
PARTNERSHIP RISKS	[ROI RISK] Risk in the return of financial investment from the projects with startups	C1, C2, C3
	[BRAND REPUTATION] Fear of damaging the corporation's brand reputation	C1, C2

Source: The author, 2021.

Startups embrace uncertainty. Corporations go the opposite way, they praise control, data, and predictability. Given this context, one of the main challenges for corporations is **cultural and behavioral differences**. In particular, corporations are not comfortable with uncertain results. Corporations C1, C3, and C4 mention how the lack of predictability on the results of the partnership with startups generate anxiety and bring frustration for the corporation's team.

In the same context, low failure tolerance is also a major challenge for corporations. Startups are willing to take risks on experimentation and understand that errors are part of the process of identifying innovative solutions. On the other hand, corporations are more concerned about the damage of failing projects. C3 comments: "The biggest challenge I see today is to be aware, throughout the company, that tolerance to error is necessary, tolerance to a low level of quality of delivery or performance, in order to innovate".

Another aspect related to cultural differences, corporations challenge themselves to deal with entrepreneurs and startups that are often just starting out. In other words, dealing with the immaturity of business and management inerent of startups. C4 points out: "Many startups that we interacted with are very focused on the technical solution and often forget to evolve their management and preparation in other business issues. It is a challenge for us to deal with this lack of preparation.".

Framing operational challenges, corporations are already creating an awareness that the challenge is internal. Studied corporations pointed out that it is challenging to propose

innovative projects with startups and prioritize them with corporate senior management. C5 mentioned the difficulties to find sponsors of projects with startups. In addition, corporations already understand the need to reduce bureaucracy in their processes to meet the latent needs of startups, such as quick payment or rapid approvals for starting of the project.

Finally, the macro challenge of partnership risks was often mentioned by the studied corporations. We identified that it is problematic to obtain an internal budget for investment in innovation projects since it is quite complex to measure the ROI (Return On Investment) of initiatives with startups. The return is often obtained by employees' training on innovative approaches, publicity to be engaging with the startup ecosystem , and other indirect factors that are more difficult to measure. The situation is especially challenging on projects where the construction of the solution fails and, through experimentation, it is proven that it is better to pivot (i.e. changing the direction of the solution). In these cases, the investment risk becomes even more critical. C1 points out that one of the main concerns when partnering with S1: “Reputation risk, if it didn't work out, with the association of brands, as they are dealing with a base of customers and partners in the same sector”.

4.4 MOST RELEVANT BENEFITS OF STARTUP CORPORATION RELATIONSHIPS

This section explores RQ3: What are the main benefits involved in the relationships between startups and corporations?. We observed that fundamental differences between startups and corporations generate complementary strengths and benefits during their relationships.

4.4.1 Benefits for Startups

The benefits for startups identified in this study followed the same analysis pattern as discussed in the previous sections, we have macro benefits and specific benefits presented in Table 12.

Table 12 - Benefits for startups in corporation-startup relationships

Benefits for Startups		
Macro Benefits	**Specific Benefits**	**ID**
DOOR OPENER TO NEW OPPORTUNITIES	[NETWORKING] Grow networking and referral to other organizations	S3, S4, S5
	[BRAND REPUTATION] Increase brand credibility	S1, S2, S3, S5, S6, S8
ACCELERATE PRODUCT GROWTH	[PRODUCT DEVELOPMENT] Obtain resources and infrastructure to foster product development	S1, S2, S3, S6
	[NEW CONSUMER POOLS] Get new accesses to consumers in corporations' channels	S1, S3, S4
	[PRODUCT VALIDATION] Obtain real data to validate startup's products	S1, S2, S3, S5, S6, S7
BUSINESS DEVELOPMENT	[MARKET EXPERIENCE] Gain market new perspective and knowledge	S1, S2, S3, S7, S8
	[FINANCIAL STABILITY] Establishing financial stability through corporations' investments	S2, S3, S6, S8
	[BUSINESS MATURITY] Improve business model and team maturity	S1, S2, S4, S5, S7

Source: The author, 2021.

For startups that live in an environment of uncertainty, opening doors to new opportunities is essential for their survival. Especially for startups in the validation phase, it is extremely important to gain the trust of future customers. The majority of startups understand the clear benefit obtained by the credibility of brand association with a reputable corporation. Increasing the startup reputation by partnering with a corporation is an initial goal to be accomplished.

S2 and S3 agree on the direct relation that having respectable corporations in their portfolio brings positive financial returns. S1 provides another viewpoint of the same benefit. S1 states that C1's great reputation among other players helped break down prejudice barriers, as a young entrepreneur or inexperienced professional, among potential clients, especially in a more traditional market.

In addition to brand association, startups also acquire a strong network with corporate executives and professionals during this relationship. This networking works as a lever for recommendations to other corporations, mostly from other markets, as a form of collaboration.

S5 also brings a new perspective on the networking opportunity, which is through professionals directly:

S5: “It is impressive how powerful people's networks can be. Many corporation workers propagate our startups to their own network... almost like pollination among other companies. In other cases, people leave that particular corporation and move to another corporation, they still recommend our startup”.

Another macro benefit for startups is accelerating their product growth. Lack of resources in early-stage startups is quite common. Therefore, access to large-volume databases, and especially real business data, is essential for startups to test and validate the value delivery of their products. Another important access is to new experimentation channels, such as the corporations’ app or official communication channel, as they aim to scale their business. Corporations provide this benefit by sharing their different channels. Engaging with corporations enables this access and accelerates the maturity of the solution. This benefit is perceived by startups S1, S2, S3, and S6.

Startup business development benefits from the extensive knowledge of corporations in the markets they operate. This vast knowledge of the market helps startups to get to know their end customer better if they operate in the same market. Startups also evolve and validate their business models through the experience of having as customers corporations with many demands and high expectations of quality.

The bureaucratic processes of corporations are very challenging for startups, as discussed in section 4.3.1. On the other hand, the same bureaucratic processes can be beneficial when startups identify the need to learn how mature corporations operate, as they aim to become one in the future. S2 confirms the benefit of learning: "the processes, legal issues... all the bureaucracy in this relationship prepares us for the growth of our own business".

4.4.2 Benefits for Corporations

The benefits for corporations are closely related to innovation, expansion, and growth. 3 macro benefits and 9 specific benefits were identified, they were reported by the studied corporations as shown in Table 13.

Table 13 - Benefits for corporations in corporation-startup relationships

Benefits for Corporations		
Macro Benefits	**Specific Benefits**	**ID**
NEW SOLUTIONS AND POSSIBILITY TO EXPAND MARKETS	[FAST VALIDATION] Rapid validation and delivery processes	C2, C3, C4, C5
	[FLEXIBLE PARTNER] Flexibility of startups for customization and co-creation	C3, C4
	[INNOVATIVE SOLUTIONS] Get fresh and innovative solution ideas for corporation problems	C3, C4, C5
DEVELOPMENT OF INNOVATION CULTURE	[AGILITY] Incorporate agility into internal teams	C2, C3, C4, C5
	[BRAND REPUTATION] Brand rejuvenation through keeping updated with new market trends	C1, C3, C4
	[STARTUP MINDSET] Learn startup's novel methodologies and processes	C3, C4, C5
INCREASE OPTIMIZATION AND EFFICIENCY	[TECH IMPROVEMENT] Creating or using tech-based solutions improving old processes	C1, C2
	[EFFICIENCY] Great cost-effective services provided by startups	C2, C4, C5
	[CUSTOMER EXPERIENCE] Improve customer experience through startup’s know-how	C2, C3, C4

Source: The author, 2021.

The first macro benefit is that startups can bring **new solutions to corporations** and consequently, open the opportunity to expand their market performance. In this scenario, 4 out of 5 corporations reported the speed of delivery as a great benefit of engaging with startups. C2 points out that the speed to start a pilot project with startups is quite high, and differentiated from partnerships with other organizations, increasing the productivity and delivery speed of its own team.

Additionally, during the corporation-startup interaction, startups present gains for corporations by being flexible and working with ease in the customization of their products and solutions. C4 exposes this benefit and this delivery of value from startups: "The main benefit is having the flexibility to build together a customized and specialized solution specific to our corporation's demand".

Another point that was very important in the relationship is the solution of traditional corporate problems through a fresh and innovative look provided by startups. Corporations find it difficult to clearly identify these problems within a traditional and routine-driven context.

With this in mind, startups are able to contribute by proposing new solutions without internal biases and with a culture of innovation already at their core business. C3 reports that “there will always be a different pain or need, which we still don't know today. There are several that we already know, and I also know that many of them we can't solve by ourselves”.

Another macro benefit perceived by corporations is the experimentation and **implementation of an innovation culture.** This search is closely linked to digital transformation. It is enhanced from the rapid technological advancements, making the innovation mentality a necessary characteristic to keep the business alive. Within this perspective, the relationship with startups provides the specific benefit of rejuvenating the brand of the large corporation, which is often considered obsolete or too traditional.

Learning through the exchange of experiences is evidenced by C3: “There is an intangible gain here, which is the development of the employees involved, we learn methodologies and ways of working to generate innovation.” This interaction promotes the transfer of knowledge, especially methodologies such as lean startup and agile methodologies, through the practice presented by startups to the corporation's internal teams. This benefit is evidenced by 4 of the 5 corporations interviewed, confirming its great relevance.

Finally, the last macro benefit mapped is the optimization of resources and increased efficiency. Startups are seen as service providers too, when they are in an initial phase of life, or in a phase of validation of their business models, they usually tend to charge a very affordable price for large corporations. Therefore, relationships with startups are considered cost-effective projects. C4 confirms this view: “solving problems that were not solvable before, especially at very affordable prices, it is fantastic”.

In addition, resource optimization is also presented when processes that were previously done manually or by obsolete systems are updated or implemented by startups' tech-based solutions. The digitizing process of analog routines is quite common and is a core part of the digital transformation of organizations. Confirming this finding, C2 states: “The digitization of our old processes increases our power of scaling that also contributes to our operation, cash flow effect, reducing possible staff in the future”.

Lastly, it is very clear to all corporations that the services provided by startups are directly related to increasing customer experience and satisfaction. Startups' expertise in user experience design benefits corporations’ projects built during the partnership initiatives. C3 highlights how the differentiated experience through faster and more digital services of S3 increased its customers' satisfaction.

4.5 KEY RECOMMENDATIONS TO DEVELOP SUCCESSFUL RELATIONSHIPS BETWEEN STARTUPS AND CORPORATIONS

In this section, we answer RQ4. During the collaboration in open innovation initiatives, startups and corporations may acquire new capabilities and obtain valuable resources that are internally scarce. In order to contribute with other startups and corporations to achieve successful open innovation projects and build win-win relationships, we summarize key recommendations provided by studied startups and corporations to foster this kind of relationship. These recommendations and lessons learned were asked during the semi-structured interviews to startups and corporations. Every startup was asked to give recommendations to other startups and corporations were asked to give recommendations to other corporations. Then, we've selected the most relevant recommendations and encapsulated the lessons learned by the participants of the study based on their own experiences and viewpoints.

4.5.1 Recommendations for Startups

We identified **5 key recommendations for startups** to better interact with corporations:

1) **Do not neglect formalities and regulations**

At first, formalities and regulations seem obstacles for corporations, but we identify with startups that it is necessary to comply with these issues. First, it is necessary to be aware of the principles and premises for the relationship and legal regulations. In addition, formalities help corporations to maintain their organizational structure and smooth complex processes. Finally, startups should learn such formal rules to enable their growth process.

2) **Be aware of negotiation and pricing strategy**

If the relationship with corporations includes negotiation, reaching reasonable agreements is often challenging for startups. We identified that it is necessary for startups to pay careful attention to their trading strategies. It is important to keep a strategic and attractive price. On the one hand, charging too high prices can get corporations off the table. On the other hand, if startups charge very low prices, corporations tend to think the startup won't be able to

get the job done. Furthermore, startups should present their services in a trustful manner and clearly demonstrate the value it will deliver to corporations. .

3) **Build a strong network with corporations**

Strategic alliances can support the entrepreneurial journey of startups through valuable connections, opening doors for referrals and project support. Strengthening networks with respectable corporations is a powerful guiding process for startups, enabling the connection with key actors with decision-making power and expanding their operation.

4) **Build an adequate delivery strategy**

Satisfying the high expectations of corporations is a critical success factor. In this way, startups should build good planning and manage delivery and deadlines. This practice will help to align expectations and agreement between corporations and startups. In addition it generates more confidence about the project's predictability for corporations. Carefully balancing the level of promises is also a great practice to be implemented, given that the boldness of startups as a surprise factor is much more alluring than promising deliveries that won't be executed.

5) **Focus on customer satisfaction**

Expectations are also directly linked to customer satisfaction of partnering corporations. Understanding the needs, studying the market and adapting, whenever possible, its solution to better serve corporations, are essential practices to ensure satisfaction and a good relationship. The adaptation of startups regarding the structure and availability of the team must also be considered.

4.5.2 Recommendations for Corporations

The lessons learned by studied corporations during the different types of engagement identified: events, POCs, services provision, M&A, among others, were derived into recommendations for other corporations that wish to build a win-win relationship with startups. We identified **7 key recommendations for corporations**:

1) **Seek strategic alignment and involve decision-making leaders**

It is necessary to structure the vision, direction, tactics, partnerships, and indicators that will be used. Choose initiatives aligned with the corporation’s goals and its operational reality.

This decision will determine which type of relationship is ideal for the goals the corporation seeks. Corporations should involve key leaders in the decision-making processes, from C-level to management, so they can analyze if the innovation initiative with startups fits the corporate strategy.

2) Align expectations with startups

As we have already discussed, the cultural difference between startups and corporations generates a conflict regarding the level of delivery expected by each party. Therefore, to increase the success of this relationship it is important to seek, from the start, the alignment of delivery expectations with the startup. In addition to the alignment itself, it is recommended to keep the instability of the innovation process in the mind of involved participants of the project from the corporation. It can be done by frequent alignments between teams involved and presentation of innovation and product discovery methods, for example.

3) Identify a relevant problem and seek to solve it with startups

We observed that corporations often struggle to identify relevant problems by themselves. Corporations are very immersed in their routines, which makes it very challenging to capture what could be the root problem they are dealing with. Problem framing is a premise to innovate when interacting with startups. If corporations do not clarify the problems they aim to solve, the relationship may lead to a loss of resources and not generate any results or impact. A good practice is to incorporate the design process to identify problems and use the partnership with startups to support the validation of them.

4) Adapt bureaucratic processes to fit startup's need to speed

Corporations should simplify whenever possible bureaucratic routines to help the startups accelerate their processes. When the bureaucratic matter is coming from a legal need, corporations must keep it. The recommendation is for cases when the bureaucratic process is imposed by organizational culture only. In these cases, we recommend developing new processes or making exceptions that can help to speed up the engagement process. It is important to have the basic infrastructure adapted as soon as possible at the beginning of the relationship. Otherwise, because of the uncertain environment that startups operate in, they run the risk of not surviving waiting for corporations' approvals.

5) Provide financial, technical, and, especially, human resources

Strongly connected with the previous recommendation, it is important to provide resources to support internal bureaucratic processes adaptation. Corporations need to be willing to invest financially, make systems and technologies available. We also recommend paying special attention to internal teams' engagement to embrace the innovation project and the changes that may come with it. Having pre-designated interlocutors who lead and accompany the adaptation process is one way to facilitate it.

6) Understand and embrace risk and accept the possibility of failure

The mindset of corporations needs to be prepared to participate in the entire innovation process, starting with the problem framing, and in an iterative manner, going through several experiments to validate the problem and, later, the solution. This dynamic requires a tolerance to risk, also identified as a challenge for corporations, which has become a determining factor for success and for the construction of good relationships with startups.

7) Learn how to identify and measure innovation project results

Finally, it is essential to know how to measure and show the results of innovation projects carried out with startups. Defining return on investment of an innovation project is not simple, as there are often intangible returns and unpredictable results at the beginning of the journey. This measurement must be directly connected with the goals initially defined. We recommend sharing the lessons learned from the journey both within the team involved in the project as well as with the corporation's staff so that it spreads an innovation culture to different sectors of the corporation.

4.6 CHAPTER SYNTHESIS

In this chapter, two categories of drivers for fostering relationships between startups and corporations were identified: approximation sources and goals.

Four sources of approximation to drive the corporation-startup relationship were identified through the interviews. Three macro-objectives of the corporations were also

identified, which are subdivided into eight specific objectives. As for startups, three macro goals and seven specific goals were identified.

In addition to this discovery, it was also possible to identify the main benefits and challenges for both actors studied. Finally, we synthesized recommendations given by the studied actors to improve the relationships between startups and corporations.

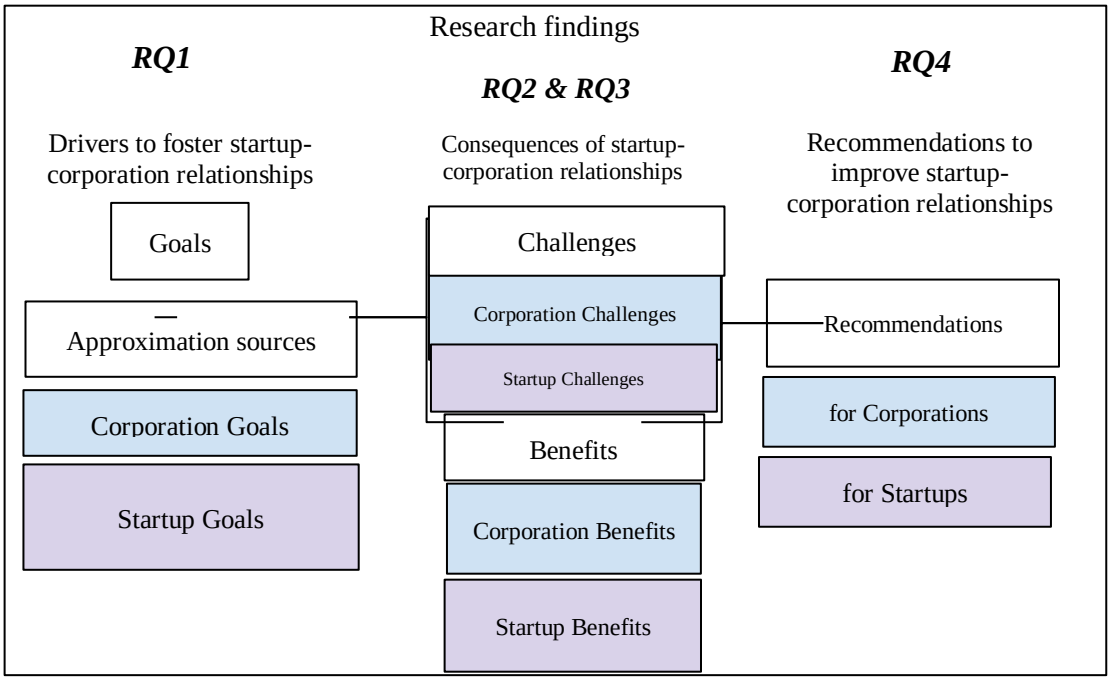
5 CONCLUSIONS

This chapter presents the most relevant contributions of this study to academy and industry, discusses threats to validity, and presents future work.

5.1 ACADEMIC AND INDUSTRIAL CONTRIBUTIONS

The main contribution of this dissertation is a better understanding on how the relationships between corporations and startups are established during open innovation initiatives. We aimed to explore how startups engage with corporations, their main goals, benefits, and challenges. An important practical contribution of this study is the set of the recommendations provided by studied startups and corporations to create and foster relationships between startups and corporations. In this section we will consider figure 15., so we can revisit the main results found in this field study.

Figura 15 - Research results



Source: The author, 2021.

When we observe startups' goals and corporations' goals, the opposition of objectives between the two actors is clear. On the one hand, we have startups, which focus on growing and maturing their business, which shows us the willingness of startups to become big corporations one day. There is a lot of debate about the trend of being a startup, or the

romanticization of the term, where in fact, to become an established corporation is the ultimate goal of these smaller organizations.

On the other hand, we have corporations' objectives focused on accelerating digital transformation. This is clearly reflected not only in the interviews with corporations, but also in the natural market movement seen in recent years. This can relate to the usage of new tech solutions and the development of capabilities in corporations in all markets. The COVID-19 pandemic also made it possible to accelerate the use of digital resources by a large part of the population, making this purpose even more relevant.

The use and integration of technology in people's daily lives are expanding widely, so companies looking to grow must be aware of their customers' needs combined with technology. It is already possible to see that the common desire target between startups and corporations is these two factors: usage of technology and finding (and solving) customers' needs. Both also can relate to the macro objective of growth (increase in revenue, prosperity, brand reputation), accelerating possibilities, and adapting to the current global scenario.

Great differences between startups and corporations generate friction during their relationships. When corporations' challenges and startups' challenges are compared, we can identify a similar result. They both identified as macro challenges: cultural differences, operational and processes obstacles, and market challenges. In other words, it's possible to directly relate these challenges from two perspectives. That is mainly because corporations have already started to recognize their own mistakes in the innovation processes, especially when we are framing digital transformation and startup methodologies.

The mutual benefits that these relationships give both startups and corporations make clear that it's a great opportunity for both actors. One of the benefits that are pointed out on both sides is about brand reputation. For startups, partnering with a corporation's already well-established brand is a door opener. On the other hand, for corporations, brand association with startups can rejuvenate their "traditional" brand and thus attract more young talents.

The dynamics of open innovation, where startups and corporations help each other, has already proven to be a relationship of *coopetition*, where competition and cooperation coexist. This study proposed the presentation of a new consolidated view on engagement between startups and corporations in Brazil, identifying the main drivers, benefits, and challenges, by comparing theory with market practice. As a relevant contribution, these results can serve as a reference for academia and for the professional market that are involved with this type of initiative.

Finally, the lessons learned discussed by the participants of the interviews were derived into recommendations for startups and corporations aiming to build win-win relationships. The practical contributions of this dissertation can be valuable for entrepreneurs and corporate innovators to obtain a complementary view of different types of engagement models. The results of the study may provide a source of inspiration, practical orientation, and actionable insights on how to establish and nurture startup-corporation relationships.

5.5.1 Comparison with Related Works

This study proposed the presentation of a new consolidated view on engagement between startups and corporations in Brazil, identifying the main drivers, benefits, challenges and recommendations, by comparing theory with market practice. As a relevant contribution, these results can serve as a reference for academia and for the professional market that are involved with this type of initiative.

Different from contributions from Weiblen and Chesbrough (2015), this study considers corporations from different industries relating with software-based startups - while the authors only studied corporations from the tech industry. In this sense, we can identify that corporations in this research were seeking tech innovation and their digital transformation throughout the relationships.

Thieme (2017) studies how relations between corporations and startups can be related to corporations' strategies, focusing on the drivers of this relationship for the corporations. Our study differs from Thieme's contribution because it secures the exploration of both perspectives: startups' and corporations'. Thieme's study focuses on Netherlands' corporations and startups, as for this dissertation focus on Brazilian startups and brazilian/multinational corporations. Another important difference is that in this field study, we've mapped three phases of the relationship: before engagement, during engagement and after engagement. In this sense, this study explored a broad view of the relationships as a whole, answering research questions.

In addition to the practical differences from other works, the present study is original for investigating startups in the Brazilian ecosystem of Porto Digital. It is relevant for the academic community to be more aware of the importance of this ecosystem for Brazil, which serves both as a reference for innovation. Finally, the starting point of this study are the startups and not the corporations, as many contributions are made (WEIBLEN & CHESBROUGH

2015; THIEME, 2017). This brings an emphasis on the entrepreneurial journey and growth of startups, and its great contributions on open innovation initiatives.

5.2 THREATS TO VALIDITY

Throughout the research, we were careful to ensure the validity of the research and map possible threats. The following limitations were identified during the design and execution of this research. Since we use interviews as the main data collection technique, our results are centered on the personal opinions of respondents and may suffer from their own prejudices.

Following Creswell (2009), it is also important to account for the personal bias that the researcher brings to the study. During interviews, no techniques were used to mitigate the researcher's bias or confirm the data reading. We were not able to use techniques to explore the credibility of the results, such as Member Checking.

The interviews were conducted, transcribed, and analyzed by a single researcher, there may be a bias of the same in each of these phases. In two of the 16 interviews we had more than one interviewee, so most of the interviews were conducted with only one member of the startup or corporation, which can lead to a bias for the personal opinion of these individuals. We tried to mitigate this bias by presenting interviewees' quotes, to expose the spoken form in full, opening the interpretation for readers of this research. Nevertheless, the results are specific to this particular context and, therefore, we cannot guarantee the generalizability of our findings.

It is important to point out that we were not able to conduct interviews with corporations that engaged with three of the studied startups (S6, S7, S8). We went after contacts from these corporations, but we couldn’t reach them. Therefore, we could not confirm the views of these startups with respective partnering corporations.

Another important factor of potential bias is that the researcher has professional experiences in volving open innovation dynamics. She is also an active professional at the Porto Digital ecosystem, which can lead to introducing background knowledge on this study. We tried to use only the data collected from the interviews to obtain the study's insights. In this sense, the study was conducted from a very practical understanding of the area. Nevertheless, she does not have professional or personal relationships with any studied case that may cause a conflict of interest.

5.3 FUTURE WORK

In future works, we would like to carry out longitudinal studies to follow the relationships of startups and corporations through case studies to take a closer and longer follow-up of their relationships. The objective would be to investigate further and monitor the results generated, the impact of the relationship on organizations, and evaluate performance factors. In this way, it would be possible to have a more medium-term view, with a wealth of details and the possibility of identifying the dynamics of relationships.

Another possibility for future work is to deepen the relationship between the different phases of startups and the relationship with corporations. We would like to further study the context of startups, identify similarities and differences, especially between the startup life stages. In the current study, we did not have enough data to understand this phenomenon in such depth to make a correlation between the life stage of startups and the maturity of their relationships with corporations. In the future proposal, we would aim to assess the degree of dependence, characteristics, different benefits, and challenges depending on the stage of each startup.

Finally, we would also like to further study the eventual influence that the innovation ecosystem, Porto Digital, may have to foster the growth and improve the relationships between embedded startups and corporations. The main objective would be to understand if the presence in Porto Digital would be a benefit for startups in relation to engagement with corporations and how this benefit would be manifested. We could also extend the research to other ecosystems to verify the differences between the relationships between corporations and embedded startups and make a comparison with the findings on the Porto Digital ecosystem.

REFERENCES

AAKER, D. Innovation: Brand It or Lose It. **California Management Review**, v. 50, n. 1, p.8-24, 2007.

ADNER, R. Match Your Innovation Strategy to Your Innovation Ecosystem. Harvard Business Review, 2006. **Harvard Business School** Publishing Corporation, april, 2006.

AD DIPER. **Mapeamento do ecossistema de inovação**: startups, empresas e iniciativas, 2020. Accessed in February 2021 https://bit.ly/Mapeamento_Ecossitema_PE.

AFUAH, A. Models of innovation. *In:* AFUAH, A. **Innovation management:** strategies, implementation and profit. New York: Orford University Press, 1998. p. 13-46.

ALÄNGE, S. &STEIBER, A. Three Operational Models for Ambidexterity in Large Corporations. **Triple Helix**, v. 5, n. 1, 2018.

ARRUDA, C., *et al*. Causa da mortalidade de startups brasileiras: o que fazer para aumentas as chances de sobrevivência no mercado?. Nova Lima, **DOM**, v.9, n. 25, p. 26-33, fev. 2015.

BLANK, S. **The Four Steps to the Epiphany**: Successfull Strategies for Products that Win. [s.l]: K&S Ranch., 2007.

BALDRIDGE, R. & CURRY, B. What is a startup?. **Forbes advisor**, feb. 4, 2022. Available at: https://www.forbes.com/advisor/investing/what-is-a-startup/. Accessed in January of 2022

BLANK, S. & DORF, B. **The Startup Owner's Manual**: The Step-by-step Guide for Building a Great Company. K&S Ranch, Incorporated, 2012.

BLANK, S. Why Governments Don't Get Startups. **Steve Blank**, sept. 1, 2011. Available at: https://steveblank.com/2011/09/01/why-governments-don%E2%80%99t-get-startups/. Accessed in January of 2022

BLANK, S. What is a startup? First Principles. **Steve Blank**, jan. 25, 2010. Available at: https://steveblank.com/2010/01/25/whats-a-startup-first-principles/. Accessed in January of 2022

BLANK, S. Why the Lean Start-Up Changes Everything. **Harvard Business Review Magazine**, 2013. Harvard Business School Publishing Corporation.

BONZOM, A. & NETESSINE, S. (2016). **How do the World's Biggest Companies Deal with the Startup Revolution?**. [s.l:] 500 Startups and INSEAD Report, [s.d].

PEIXOTO, E. **Transformação digital uma jornada possível**. São Paulo. Jandaíra, 2021.

CHANDY, R. K. & TELLIS, G. J. The Incumbent's Curse? Incumbency, Size, and Radical Product Innovation. **Sage Journals**, v.64, n.3, 2000.

CHESBROUGH, H. **Open innovation**: The new imperative for creating and profiting from technology. Boston: Harvard Business Press, 2003.

CHESBROUGH, H., VANHAVERBEKE, W., & WEST, J. **Open Innovation**: Researching a New Paradigm. USA: Oxford University Press, 2006.

CHRISTENSEN, C. M. **The Innovator's Dilemma**. Boston, MA: Harvard Business School Press, 1997.

CHRISTENSEN, C. & OVERDORF, M. Meeting the challenge of disruptive change, **Harvard Business Review**, v. 78, n. 2, p. 66-76, 2000.

CHRISTENSEN, C. & BOWER, J. Disruptive Technologies: Catching the Wave. **Harvard Business Review**, january-february 1995.

CLARKE, M. The digital revolution, *In:* CAMPBELL, R. **Academic and Professional Publishing**, [sl.:] Chandos Publishing, 2012, p. 79-98.

COHEN, W.; LEVINTHAL, D. Absorptive capacity: a new perspective on learning and innovation. **Administrative Science Quarterly**, v.35, n. 1, p. 128-152, 1990.

CORBIN, J. & STRAUSS, A. **Basics of qualitative research**: techniques and procedures for developing grounded theory. Thousand Oaks, CA: Sage, 2007.

CRESWELL, J. W. **Research design:** Qualitative, quantitative, and mixed methods approaches. [s.l:] Sage publications. Creswell, 3. ed, 2009.

CROWNE, M. Why software product startups fail and what to do about it. Evolution of software product development in startup companies, **IEEE International Engineering Management Conference**, p. 338-343, 2002.

D LITTLE, A. Telecommunication Industry Report. **ToFane**, 2016. Available at: https://tofaneglobal.com/arthur-d-littles-2016-telecommunication-industry-report-major-strategic-choices-ahead-telcos-reconfiguring-value/. Access on February, 2021

DAVENPORT, T. H. & REDMAN, T. C. Digital Transformation Comes Down to Talent in 4 Key Areas. **Harvard Business Review**, 2020. Available at: https://hbr.org/2020/05/digital-transformation-comes-down-to-talent-in-4-key-areas.

DENZIN, N. K., & LINCOLN, Y. S. Introduction: The discipline and practice of qualitative research. *In:* N. K. DENZIN & Y. S. LINCOLN (Eds.). **Handbook of Qualitative Research**. 3. ed. Thousand Oaks: Sage, 2005, p. 1–32

DODGSON, M., GANN, D. & SALTER, A. **The role of technology in the shift towards open innovation:** the case of Procter & Gamble. Wiley Online Library, 2006.

DULLFORCE, A. FT 500 2015 Report. **Financial Times**, jun, 19, 2015. Available at: https://www.ft.com/ft500 Accessed in February 2021

FITZGERALD, M., *et al*. "Embracing digital technology: a new strategic imperative", MIT Sloan Management Review, **Research Report**, with Capgemini Consulting, 2013.

LEE MUCK, Anna. From Blockbuster To Netflix: The History Of Disruption, **Forbes**, jun 5, 2017. Available at: https://www.forbes.com/sites/delltechnologies/2017/06/05/from-blockbuster-to-netflix-the-history-of-disruption-in-entertainment/?sh=20405e704678, accessed in March 26th, 2022.

GALHA, C., *et al*. The Evolution of Requirements Practices in Software Startups. In Proceedings of ICSE '18: 40th **International Conference on Software** Engineering, Gothenburg, Sweden, May 27-June 3, 2018 (ICSE'18).

GASSMANN, O. Opening up the innovation process: towards an agenda. **R&D, Management**, v. 36, n. 3, 2006, p.223–229.

GLASER, B. & STRAUSS, A. **The discovery of grounded theory**: strategies for qualitative research. Aldine Pub. Co, Chicago, 1967, 21.

\GOEL, R. & NELSON, M. A. How do firms use innovations to hedge against economic and political uncertainty? Evidence from a large sample of nations. **The Journal of Technology Transfer**, 46(C), 2021.

GONÇALVES, J. A. M. **Engenharia de Requisitos em Startups de Software**: uma investigação qualitativa. 90 f. Dissertação (Mestrado) - Instituto de Matemática e Estatística, Universidade de São Paulo, São Paulo, 2017.

GRANSTRAND, O. & HOLGERSSON, M. Innovation ecosystems: A conceptual review and a new definition. Elsevier **Technovation**, p. 90–91, fev/mar., 2020.

ALUMNI, G. The Origin of Netflix's Success. **Digital Innovation and Transformation**, mar 26, 2018. Available at https://digital.hbs.edu/platform-digit/submission/the-origin-of-netflixs-success/. Accessed in March 26th, 2022.

HILL, C. W. & ROTHAERMEL, F. T. The performance of incumbent firms in the face of radical technological innovation. **Academy of Management Review**, v. 28, n. 2, p. 257–274, 2003.

JACKSON, N. & STEIBER, A. New economies' governance in the age of digital transformation: the sociological orientation's effect on a nation's digital transformation, Working Paper, AOM **Responsible Leadership Conference**, October 2019.

PORTO Digital cresce em faturamento e mão de obra, mas ainda enfrenta o desafio de formar capital humano. **JC Online**, feb., 23, 2022. Available at https://jc.ne10.uol.com.br/economia/2022/02/14951406-porto-digital-cresce-em-faturamento-e-mao-de-obra-mas-ainda-enfrenta-o-desafio-de-formar-capital-humano.html. Accessed in February, 2022.

MARCH, J. G. Exploration and exploitation in organizational learning. **Organization science**, v. 2, n. 1, p. 71–87, 1991.

MERRIAM, S. B**. Qualitative research and case study applications in education**. San Francisco, CA: Jossey-Bass, 1998.

MERRIAM, S. B. **Qualitative Research**: A Guide to Design and Implementation, 3d Edition, Jossey-Bass, 2016.

MYERS, M.D. Qualitative Research in Information Systems. **MIS Quarterly**, v.21, n.2, p.241-242, jun.1997.

O'REILLY, C. & TUSHMAN, M. The ambidextrous organization. **Harvard Business Review Magazine**, apr. 2004.

PEIXOTO, E. Um Olhar sobre a Transformação Digital nas Empresas Filiadas ao LIDE Pernambuco. Como empresas pernambucanas reagiram ao recente contexto desafiador que impulsionou a aceleração da transformação digital no Estado. **Cesar Reports**, Recife, 2021.

PENA, R. F. A. Economia do Nordeste; **Brasil Escola**, 2021. Available at: https://brasilescola.uol.com.br/brasil/economia-nordeste.htm. Accessed in February, 13, 2022.

PRASHANTHAM, S. & BIRKINSHAW, J. Dancing with the gorillas: how small companies can partner effectively with MNCs. **California Management Review**, v. 51 n.1, p. 6-23, 2008.

PRASHANTHAM, S., & KUMAR, K. Engaging with startups: MNC perspectives. **IIMB Management Review**, v.31, n.3, dec.2019, p.407-417.

RIES, Eric. A Startup Enxuta: **Como os empreendedores atuais utilizam inovação contínua para criar empresas extremamente bem-sucedidas**. São Paulo: Leya Editora, 2012.

ROBEHMED, N. What Is A Startup? **Forbes**, 2013. Available at: https://www.forbes.com/sites/natalierobehmed/2013/12/16/what-is-astartup/#38b44c604044. Accessed in January 30, 2019.

ROGERS, D. The Digital Transformation Playbook: Rethink Your Business for the Digital Age. **Columbia Business School Publishing**, 2016.

ROGERS, E. M. **Diffusion of Innovations**. New York: The Free Press, 1995.

ROSSMAN, B.G. & RALLIS, S.F. **Learning in the Field**: An Introduction to Qualitative Research. Sage, London, 1998.

ROTHWELL, R. & DODGSON, M. External linkages and innovation in small and medium-sized enterprises, **R&D Management**, v. 21, n. 2, p. 125-137, 1991.

SCHILLING, M. **Strategic Management of Technological Innovation**. McGraw Hill, 4 ed., 2013.

SEAMAN, C.B. Qualitative methods in empirical studies of software engineering. **IEEE Transactions on Software Engineering**, v., 25, n.4, ´p.557-572, 1999.

SERVIÇO BRASILEIRO DE APOIO ÀS MICRO E PEQUENAS EMPRESAS (SEBRAE). **Anuário do trabalho na micro e pequena empresa**. Brasília, DF: Departamento Intersindical de Estatística e Estudos Socioeconômicos - DIEESE, 2013. Available at: www.sebrae.com.br/Sebrae/Portal%20Sebrae/Anexos/Anuario%20do%20Trabalho%20Na%20Micro%20e%20Pequena%20Empresa_2013. Access: fev.2022.

SELIG, C.J., GASSER, T. & BALTES, G.H. How corporate accelerators foster organizational transformation: an internal perspective. Stuttgart, Germany: **IEEE International Conference on Engineering, Technology and Innovatio**n (ICE/ITMC), p.17-20 June 2018

SHANKAR, R. K. & SHEPHERD, D. A. Accelerating strategic fit or venture emergence: Different paths adopted by corporate accelerators. **Journal of Business Venturing**. Elsevier, 2019.

SIMON, F., HARMS, R. & SCHIELE, H. Managing corporate-startup relationships: what matters for entrepreneurs?. **Int. J. Entrepreneurial Venturing**, v. 11, n. 2, p.164–186, 2019.

SLACK, N., CHAMBERS, S., JOHNSTON, R. **Administração da Produção**. 3d. São Paulo, Atlas. 2002.

SPENDER, J. C., CORVELLO, V., GRIMALDI, M. and RIPPA, P. Startups and open innovation: A review of the literature. European Journal of Innovation Management, v. 20, n.1, p. 4-30, 2017.

STOL, K., RALPH, P. & FITZGERALD, B. Grounded theory in software engineering research: A critical review and guidelines. **Proceedings of the 38th International Conference on Software Engineering**, ICSE ’16, p.120–131, New York, NY, USA, 2016. ACM.

STRAUSS, A. L. & CORBIN, J.M. **Basic of qualitative research**:
Techniques and procedures for developing Grounded Theory. Sage Publications, 1998.

TEECE, J.D. **Profiting from technological innovation**: implications for integration, collaboration, licensing and public policy. Research Policy, v.15, p.285-305, 1986.

TEECE, D. J. **Economic Performance and the Theory of the Firm**. Edward Elgar Publishing, 1998.

THIEME, K. **The Strategic Use Of Corporate-Startup Engagement**. Delft University of Technology, 2017.

THOMKE, S. **Building a culture of experimentation**. Harvard Business Review, v. 98, n.2, p. 40-47, 2020.

TRIPATHI, N., SEPPANEN, G., BOOMINATHAN, G., OIVO, M. & LIUKKUNEN, K. Insights into startup ecosystems through exploration of multi-vocal literature. **Information and Software Technology**, 105, p. 56-77, 2019.

URBANIEC, M. & AGNIESZKA, Z. Business model innovation in corporate entrepreneurship: exploratory insights from corporate accelerators, **International Entrepreneurship and Management Journal**, v.17, p. 865–888, 2021.

VAN ALSTYNE, M. & PARKER, G. Digital Transformation Changes How Companies Create Value. **Harvard Business Review**, 2021. Available at: https://hbr.org/2021/12/digital-transformation-changes-how-companies-create-value.

VANHAVERBEKE, W. & ROIJAKKERS, N. Enriching open innovation theory and practice by strengthening the relationship with strategic thinking. **Strategy and Communication for Innovation**, p. 15–25. Springer, 2013.

VERSCHUREN, P., DOOREWAARD, H., POPER, R. & MELLION, M. (2010). **Designing a research project**, v.2 Eleven International Publishing The Hague, 2010.

WEIBLEN, T. and CHESBROUGH, H. Engaging with Startups to Enhance Corporate Innovation. **California Management Review**, v.57, n. 2, p. 66–90, 2015.

YU, D. & HANG, C. A. Reflective review of disruptive innovation theory. **International Journal of Management Reviews**. v.12, p. 435-452, 2010. https://doi.org/10.1111/j.1468-2370.2009.00272.x

INCUMBENT. In: **Cambridge Dictionary**. [s.l], 2022. In: https://dictionary.cambridge.org/us/dictionary/english/incumbent. Access on February, 2021

APPENDIX A – INTERVIEW PROTOCOL

Form Introduction

This form aims to raise awareness among respondents about the use of data in a safe and private way, only for academic purposes of the Master's in Computer Science by student Maria Cecilia Jucá at the UFPE's Informatics Center.

Informed Consent Form

You are being invited to participate in the research "HOW STARTUPS AND CORPORATES ENGAGE: A MULTIPLE CASE STUDY IN PORTO DIGITAL", under the responsibility of master's student Maria Cecilia Cavalcanti Jucá from UFPE, with professor Carina Alves as an advisor.

The objective of this research is to understand the different relationship models between large corporations, startups, and third-party agents, and the motivational aspects of this approach between entities. Therefore, I would like to ask you about your interest and willingness to cooperate with the survey.

You will receive all the necessary clarifications before, during, and after the research is completed, and I assure you that your name will not be divulged, and the strictest confidentiality will be maintained by omitting information that allows you to be identified. Data from your participation in the research, such as recording of the interview and documents provided, will be kept by the researcher responsible for the research.

Data collection will be carried out through interviews. It is for this procedure that you are being invited to participate. Your participation in the survey does not entail any risk.

It is expected that this research can contribute to a better understanding of digital transformation initiatives of mature and growth companies by startups, expanding knowledge about open innovation and the phenomenon of coopetition between the entities involved (mature companies, startups and, in some cases, third-party agents).

Your participation is voluntary and free of any remuneration or benefit. You are free to refuse to participate, withdraw your consent or discontinue your participation at any time. Refusal to participate will not entail any penalty or loss of benefits.

If you have any questions regarding the survey, you can contact me by phone (81) 996760706 or email: mccj@cin.ufpe.br

The research team ensures that study results will be returned to participants who request access to the results. The results will be delivered electronically (applicant's email) and may be published later in the scientific community.

Startups' Interview Protocol

	Context and general vision of the startup
Q1	What is the core business (main product or service) of [STARTUP]?
Q2	Does [STARTUP] already have paying customers?
Q3	When was [STARTUP] founded?
Q4	What is your role in the [STARTUP]?
	Mapping startup-corporate engagement experiences
Q5	Did your startup already have any experience in engaging with corporations?
Q6	Can you name the most relevant engagement experiences?
Q7	How did the approach to [RELEVANT CASE CORPORATION] occur and who led it?
Q8	How did the interest in [STARTUP] arise for this type of engagement to happen?
Q9	What were the objectives of [STARTUP] in making this approach?
Q10	What was the engagement model adopted? Can you tell us a little about this relationship?
	Identifying main characteristics of relationships
Q11	What are the main benefits that [STARTUP] found when interacting with corporations?

Q12	What are the main challenges that [STARTUP] encountered while interacting with corporations?
Q13	What were the main risks involved in this model?
Q14	How was the internal engagement with this project? How did the management of this operation happen?
Q15	What are the main lessons that your startup found during the interaction with corporations?
Q16	Have there been changes in START UP NAME's business model, products or services during or after the relationship with corporations? If yes, which ones?
Q17	Is there interest in pursuing new relationships with other corporations? Why?
	Recommendations
Q18	What are the good practices and recommendations that a startup should follow to have good results in these engagement relationships?

Corporations' Interview Protocol

	Context and general vision of the corporation
Q1	What is the core business (main product or service) of [CORPORATION]?
Q4	What is your role in the [CORPORATION]?
	Mapping startup-corporate engagement experiences
Q5	Did [CORPORATION] already have any experiences of engaging with startups?
Q6	Can you name the most relevant engagement experiences?
Q7	How did the approach to startups occur and who led it?
Q8	How did the internal interest arise in engaging with startups?
Q9	What were the objectives of [CORPORATION] in making this approach?
Q10	What was the engagement model adopted? Can you tell us a little about this relationship?
	Identifying main characteristics of engagement models
Q11	What are the main benefits that your corporation found when interacting with startups?
Q12	What are the main challenges that your corporation encountered while interacting with startups?

Q13	What were the main risks involved in this model?
Q14	How was the internal engagement with this project? How did the management of this operation happen?
Q15	What are the main lessons that your corporation found during the interaction with startups?
Q16	Have there been changes in your corporation's business model, products or services during or after the relationship with startups? If yes, which ones?
Q17	Is there interest in pursuing new relationships with other startups? Why?
	Recommendations
Q18	What are the good practices and recommendations that a corporation should follow to have good results in these engagement relationships?