INSTITUTO
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CONTRIBUTION OF OPEN INNOVATION TO ENTREPRENEURSHIP

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Master of Science in Business Administration

Supervisor:

Professor Leandro Pereira, ISCTE Business School, Department of Marketing, Operations and General Management

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Resumo

Neste estudo é analisada e posta em causa a prática do modelo de inovação aberta, uma prática dentro da área de inovação que tem vindo a ganhar muita popularidade e reconhecimento, sendo já considerada e utilizada por muitas empresas a nível mundial. Têm vindo a ser relatados excelentes resultados da prática de inovação aberta em várias empresas e um aumento generalizado de interesse na sua prática tem vindo a verificar-se. No entanto, segundo vários autores, ainda é um conceito que está em estudo e em desenvolvimento, e que carece de uma definição exata do conceito, sendo um conceito complexo que pode ser abordado de diversas formas e em diferentes áreas. Neste trabalho pretende-se estudar os contributos da utilização de uma abordagem de inovação aberta no empreendedorismo, mais concretamente analisar as suas vantagens, desvantagens, o seu potencial e capacidades da sua prática no mundo empresarial.

Classificação JEL:
M15 IT Management
O36 Open Innovation

Palavras-chave: Inovação aberta, empreendedorismo, desenvolvimento de negócio, vantagem competitiva

Abstract

This study analyses and questions the practice of the open innovation model, a practice within the area of innovation that has gained much popularity and recognition, being already considered and used by many companies worldwide. Excellent results of the practice of open innovation have been reported in several companies and a generalized increase of interest in its practice has been verified. However, according to several authors, it is still a concept that is under study and development, and lacks an exact definition of the concept, being a complex concept that can be approached in several ways and in different areas. In this work it is intended to study the contributions of the use of an open innovation approach in entrepreneurship, more specifically to analyse its advantages, disadvantages, its potential and capabilities of its practice in the business world.

JEL Classification:

M15 IT Management

O36 Open Innovation

Keywords: Open innovation, entrepreneurship, business development, competitive advantage

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List of abbreviations

ABB - Asea Brown Boveri

AI - Artificial Intelligence

CEO - Chief executive officer

IBM - International Business Machines Corporation

IoT - Internet of things

JIT - Just in time

KWIC - Keyword in context analysis

NPD - New product development

POS - Part of speech

R&D - Research and development

P&G - Procter & Gamble Company

1. Introduction

1.1 Contextualization

With globalization and the rapidly changing markets, there are more competing businesses than ever before, making it harder for a company be well succeeded. The many challenges and pressures that companies are facing, create a necessity to be more productive and efficient, in a way to generate more added value and be ahead of competitors.

In this context, the topic of innovation could have a crucial role in enterprise growth and success, allowing companies to make a difference and produce more added value for customers. Innovation can create an impact on businesses and it is capable to influence positively all activities of a company's value chain as the example of the research and development areas. However, in order to apply it well, the right strategy needs to be implemented, and sometimes, it can be a real challenge to achieve better results (Chandler, N. & Krajcsák, Z., 2021).

Most of the innovations that are part of the organizations are derived from inside the organizations and not from outside. This close innovation method was very efficient in the past, but now, with the current globalization of research, technology, and innovation itself, some researchers have proven that this approach could bring limitations to entrepreneurial growth. This is explained by the fact that new forms of information and communication technology are available and accessible anywhere for everyone, and that has opened the world market to companies (Chesbrough, H., 2019).

As a result, the concept of Open Innovation has been promoted in particular by Henry Chesbrough, also known as the creator of this concept, where it is defended that organizations should not just rely on their own internal knowledge and resources for their innovation processes but also use multiple external sources to drive innovation in a more efficient and productive way (Bogers et al., 2018). By that, innovation no longer depends at all on research and development departments, and starts to be complemented by joint efforts of external initiatives being incorporated into the organization and a possible outsourcing, or combination of several inputs from the external environment, during the product design and development process (Chesbrough, H., 2019).

1.2 Research Problem

The research problem is focused on understanding and analyzing the impact of Open Innovation in entrepreneurship, how and when the two themes can be connected to achieve higher entrepreneurial results, considering Open Innovation as a competitive advantage tool. Today's competitive business environments make it difficult for companies to succeed, forcing companies to use more efficient and competitive approaches. Thus, considering the importance of innovation for the success of a company's performance, the relevance of this study is highlighted. Knowing that there are different structures and characteristics for each business area, the use of Open Innovation approach may produce different outputs for different business areas and that is considered in this study. There is still a gap in the academic context about the connection between the two themes, and it is expected that the results obtained in this research will consolidate and clarify the knowledge about the relationship and connections between Open Innovation and entrepreneurship, adding and complementing the current knowledge about the theme.

1.3 Research objectives

The aim of this study is to produce new information for the scientific community, through the research about the integration of Open Innovation to entrepreneurship, enriching and completing the current knowledge about this theme. To support the research, this study will answer three questions. Firstly, how important is the role of innovation in entrepreneurship? In order to understand better the impacts, the concept and the several approaches innovation processes. Secondly, can Open Innovation makes the difference and become a competitive advantage in entrepreneurship? Thirdly, what are the impacts open information and knowledge access can bring to companies? This research will analyze diferent perspectives from companies worldwide that are using Open Innovation approaches as a way to enrich the research.

1.4 Structure of the thesis

This research is organized into five chapters which are detailed below:

At the chapter I there is an introduction divided into contextualization, research issues, and research objectives.

The chapter II contains the literature review divided into two parts. The first part is focused on analyzing the relationship between innovation and entrepreneurship. The second part, has the overall objective of explaining the concept of Open Innovation and its connection to entrepreneurship.

The chapter III is dedicated to the methodologies applied to study the research problem and objectives.

The chapter IV presents the data analysis methods used with the sample characterization and data obtained.

The chapter V presents the analysis and results of the research obtained from the literature and methodologies applied.

Finally, at the chapter VI is presented the conclusion. The final considerations of the study are presented, as well as the contribution that the study had to entrepreneurship and to the concept of Open Innovation, and some suggestions for future investigations.

2. Literature Review

2.1 Innovation and entrepreneurship

The exact definition of an entrepreneur is a subject of much discussion and has changed throughout time. There are many definitions in the literature that defines what is an entrepreneur. As an example, some authors define it as a person who creates value by taking social, financial, and physical risks in exchange for monetary rewards and satisfaction (Chandler, N. & Krajcsák, Z., 2021). Other authors, define it as a person who habitually creates and innovates to build something of recognized value around perceived opportunities (Rexhepi, G., 2019). Some researchers claim the existence of a relationship between innovation and entrepreneurship, where the success of an entrepreneur may be compromised by innovation (Schachter, M., 2018).

2.1.1 The connection between innovation and entrepreneurship

The current business environments are very dynamic and competitive, and companies need to innovate in order to guarantee the business success. As an example, Nokia, a technology company that dominated the mobile phone market for more than one decade with innovative and unique products, failed to see smartphone technology as a disruptive innovation, by resisting to the change to this new technology. In the past, Nokia sold the division of mobile phones to Microsoft and began to focus more on its telecommunications infrastructure business (Rexhepi, G., 2019). This is an example that it is not enough to innovate at once, to keep the business running successfully. A constant concern to innovate and consideration of potential disruptive innovations may be necessary to ensure constant business success. The potential effects of innovation in entrepreneurship can vary in different industries, for example the banking industry has less effects and requirements of innovations than the electronics industry due to its characteristics (Schachter, M., 2018).

In this context, innovation can be categorized into four categories: product, process, marketing, and organizational innovation.

2.1.2 Product Innovation

Product innovation is the development and launch of a new product or service that is new to the market or an improved version of a previous product designed to create an impact on the market that is targeted for. It's the most popular innovation type and it is defined as a product made available to potential customers that is new or significantly changed with respect to its characteristics or intended uses (Schachter, M., 2018). Product innovation aims to provide more value to customers than the current products that are on the targeted market in a way to replace the current products and allow companies to increase the sales of their innovative products. Product innovation allows companies to increase their business performance, producing an important competitive advantage, helping companies to sell more and increase their revenue and business success. There are several factors that contribute to the growth of a company and product innovation is surely one of those factors that can make the difference (Na et al., 2019). This innovation process must be carried out continuously so that the product continues to be developed, improved, and

reach perfection. Not only it is important to develop an innovative product when a company wants to beat competitors or to increase sales, but also it is important to consider it and keep developing knowledge and technology to protect the company against innovative products of competitors, helping the company to be updated, allowing the company to defend itself from competitors (Christa & Kristinae, 2021).

Creating an innovative product could be a real challenge, not only because it requires significant investments in research and development but in the end, it needs to be well succeeded. Creating differentiated products or services with unique benefits and a compelling value proposition for the customer distinguishes new product winners from losers more often than any other factor. A thorough understanding of customers' needs and wants, economic environment, and the nature of the market, is an important consideration for the new product or service success. In general, about 40% of new products are estimated to fail at launch and out of 7 to 10 new product concepts, only one will be a commercial success, and only about 13% of companies report that their total new product efforts achieve their annual profit objectives (Cooper, R., 2018).

Recently it's verified some research trends about new product development (NPD) in relation to Open Innovation, Internet of Things (IoT), databases, analytics, and sustainability. Many companies are using some forms of Open Innovation to access outside knowledge, expertise, and technologies that facilitate NPD. In this respect, Open Innovation can be a strategic tool that can enhance efforts for NPD either by allowing them to source knowledge from external innovators or by allowing their ideas and technologies to be incorporated into other innovation processes (Schachter, M., 2018).

A common problem verified in companies is that a lot of projects suffer from a lack of financial and time commitment. This problem conducts in an increased rate of project failures and it is common when the profit and limited resources are verified. Also, many companies try to do too many projects for the resources available and don't abort early the ones that are going in unsuccessful directions (Cooper, R., 2018).

It has been noticed a close relationship between product and process innovation in the innovation literature. Some authors refer to the existence of a relationship between product and process innovation as mutual sources of innovation, where product innovation creates the need for process innovation and vice versa (Schachter, M., 2018).

2.1.3 Process Innovation

Process innovation is the introduction or application of a new technology or method for doing something that helps an organization to increase its competitiveness and meet customer demands to produce a product or service with the aim of achieving lower costs or higher product quality (Schachter, M., 2018). Process innovation is verified when a company solves an existing problem or performs an existing business process in a new and different way that generates something highly beneficial to those who perform the process. Currently, companies search for and try to use sophisticated information technology systems that allow companies to have more efficient, fast, and less expensive processes (Schmuck, R. & Benke, M., 2021).

Process innovation often involves both organizational and technological changes in companies' processes, such as the adoption of new management practices and the introduction of new equipment. Process innovation can vary widely in its scope and nature and it is impossible to define the ideal approach for all because for each organization there is a better process innovation to consider and use (Chirumalla, 2021). A growing worldwide phenomenon associated with improving process innovation in organizations is the emergence of lean and design thinking, which considers the use of new technologies and new work practices in coordination with human resources. Some industries have experienced a paradigm shift from standardized, large scale manufacturing to production that is more flexible and low volume and with a rapid adaptation to the market demand. In overall, lean manufacturing and manufacturing process innovation are new approaches that companies can adopt to innovate with limited resources in the context of fast technological development (Schachter, M., 2018).

As an example, the innovative process developed by Toyota called Just-in-Time (JIT) was a very successful process innovation for its manufacturing system that created a more competitive advantage and improved their system resulting in a more organized, efficient and less expensive system. Toyota not only considered the cope in inventories but also used it in operations strategies, human resources, management, and quality management making JIT a remarkable process innovation that was taken over by many other companies in the industry and also in other industries as well (Schmuck, R. & Benke, M., 2021).

2.1.4 Marketing Innovation

It is more common to see innovation as an orientation of the company to test ideas or perform creative processes that can lead to the development of new products or services. However, studies related to marketing innovations have showed very positive results with a significant impact in some business areas. Marketing efforts of companies are producing positive results, showing the importance of the role of consumers and its diffusion process associated. In this view, marketing innovation is an innovation to consolidate and strengthen the marketing practice. Furthermore, it is considered an innovation type to increase the competitive advantage and performance of a company by providing improvements and new solutions for marketing mix related to products or services, prices, promotions, and distribution (Na et al., 2019). Regarding the benefits of marketing innovation in companies, it reveals to produce a positive and greater effect when its complemented with product innovations than when implemented alone. As an example, the development and launch of new technologies that improve products or services might also require new marketing strategies to drive sales for the right direction, and marketing innovation can be a good solution for that. Marketing innovation can be used in several fields, its concept can be included in brand differentiation, product development capability, superior product quality, marketing communication, advertising differentiation, and the business ability of sales. It also can provide the ability to effectively manage, allocate and implement the resources and capabilities for the market conditions (D'Attoma & Ieva, 2020). Marketing innovation can also provide an increase in high value customers and it can contribute to sales growth by converting demand elasticity to inelasticity. This customer value creation improvement can contribute to the competitive advantage of companies by making greater and more efficient marketing results that cannot be possible without marketing innovation (Na et al., 2019).

2.1.5 Organizational Innovation

The term organizational innovation covers a large spectrum of innovations, for example, it can mean innovations in management practices, administrative processes or in the organizational structure. Three activity dimensions can be considered: business practice, workplace innovation, and external relationship. Organizational innovation allows the

creation of more value and more efficiency, and therefore it leads to the growth of the business. It is a structural component that keeps organizations and people moving forward in the right direction in a more efficient and better way (Lee et al., 2019).

Organizational innovation can provide rare, valuable, inimitable, and non-replaceable working practices allowing companies to implement technical innovation capabilities for its product or services and process innovation. Process innovation activities can obtain higher results when it is accompanied by organizational innovation by moderating the relationship between process innovation with the performance of the company (Christa & Kristinae, 2021). Organizational innovations focus on aspects that improve organizational structures, processes, and their adaptation to the environment. With the current technologies available, organizational innovation can be leveraged more than ever before by the use of technological systems and tools that can from an organizational viewpoint, generate more organizational capabilities as well as the quality and efficiency of work and communication, and improve the organization's ability to learn and use new knowledge (Schachter, 2018).

As an example, Samsung introduced an extensive program of management transformation in the last decade. Due to its size in the electronics industry, Samsung redefined its organizational structure in each business area to improve internal efficiency, performance, and creativity. This new management structure was highlighted by three key business sectors consumer electronics, device solutions, and information and technology & mobile communications. As a matter of fact, this last business sector referred has a high contribution to making Samsung a market leader and due to its fast follower strategy to design and production, it allows Samsung to get ready for any changes in the market demands (Fitrah et al., 2020).

2.2 Open Innovation

As early as the second half of the past century, the benefits and driving forces behind increased openness have been noted and discussed. Since then, openness practices have been increasing and being considered by companies (Daemmrich, A., 2017). The term Open Innovation was reinforced and promoted since the beginig of the century by Henry

Chesbrough, theorist, and professor at the University of California, where there has been a significant increase in the term's popularity in organizations since then.

2.2.1 Open Innovation concept

The exact definition and meaning of Open Innovation is a subject of much discussion and mainly because it is being complemented over time. But it is of general consensus that the term Open Innovation refers to a paradigm that assumes that organizations can and should use external ideas, knowledge, and paths, in addition to internal ones, to advance in their technology and development (Chesbrough, H., 2019). The term explores a wide range of internal and external sources that can go beyond the level of organizations and can be used in many ways for every organization (Cooper, R., 2018).

The practices of Open Innovation can be classified into three types:

- Inbound Open Innovation: Innovations generated internally and not necessarily used in the organization can be monetized through externalization or commercialization to other companies.
- Outbound Open Innovation: The enrichment of the organization's knowledge through the integration of suppliers, customers, and external knowledge, thus increasing the organization's capacity for innovation.
- Coupled Open Innovation: The focus on both practices (Inbound and Outbound) as a company strategy (Chesbrough, H., 2019).

In contrast to the Open Innovation concept, the Closed Innovation concept, also known as the traditional concept, presents opposing principles characterized by the use of only organization’s internal knowledge with the total or almost total exclusion of external knowledge (Naqshbandi, M. & Jasimuddin, S., 2022). The following principles express some of the main differences between the two concepts:

- Closed Innovation principles:

  - Talented and smart people need to work inside the organization.

  - The organization must discover, develop and ship it to profit from R&D.

  - If the organization creates the best ideas in the industry, the organization will win against others.

  - If the organization commercializes an innovation first, the organization will win against others.

  - The organization should control its intellectual property so that competitors don't profit from its ideas from the organization.

- Open Innovation principles:

  - Not all of the smart people work for the organization, so the organization must collaborate with bright external individuals to acquire more knowledge.

  - Internal R&D is needed to claim value but external R&D can create significant value.

  - The organization doesn't have to originate the research in order to profit from it.

  - If the organization makes the best use of internal and external ideas, the organization will win.

  - The organization should profit from others' use of its innovation and the organization should buy others' innovation whenever it advances its business model (Chesbrough, H., 2019).

Open innovation has become recently one of the most popular topics in the innovation management such as R&D areas. Although it has not yet been fully explored, it is a rich and useful concept, that can be used in many different ways inside organizations (Yun et al., 2020).

Some studies already carried out about the practice of the concept based on quantitative and case studies, have shown very positive results in several companies, and also in various contexts (Huizingh, E., 2011). It is noticed a progressive building trend in the Open Innovation practice in industries such as software, telecommunications, semiconductors, pharmaceutical, biotechnology, and electronics, where Open Innovation is seen as a powerful resource for an efficient and fast development (Chesbrough, H., 2019). Companies such as Siemens and ABB have already consider it, building

decentralized research labs in several parts of the world as a way for acquiring new research knowledge and promoting innovation development. In addition, partnerships with universities are also verified, being another way to create centers of outside-in innovation processes interchange, improving the knowledge's company (Gassmann et al., 2010).

A clear innovation strategy can help to understand which practices will be appropriate for the organization. To be able to innovate, three things should be considered, innovation capacity, which is creativity inside the organization, motivation to make the innovation, and innovation essence, meaning that the necessary knowledge is available (Schmuck, R. & Benke, M., 2021). Open innovation is a way to increase the rate of innovation and decrease the according risks. Open innovation refers to external knowledge flowing into, and internal innovation flowing out of the organization. By using an Open Innovation strategy organizations not only use external knowledge but they are also willing to share their knowledge with others in a way that can provide more benefits for the organization than not doing it. However, external knowledge should be integrated with existing knowledge in the organization and be linked with the core business model, internal and external innovations are not complementary (Naqshbandi, M. & Jasimuddin, S., 2022).

Initially, Open Innovation research provided evidence of many positive influences of its adoption in large multinational organizations as IBM and P&G. Further studies investigated the potential for the implementation of Open Innovation practices, also in small organizations. The increasing interest in Open Innovation in both large and small organizations is resulting effects of Open Innovation practices in small relative to large organizations. It is been noticed that Open Innovation activities are performed more intensively in small than large organizations. Not only, small organizations depend more on Open Innovation than larger ones, because their practices impact them much more in their percentage revenue, but also, in strategic terms, small organizations depends more and have less flexibility to run those Open Innovation activities (Radziwon, A. & Bogers, M., 2019).

Open Innovation is a concept in evolution and is no longer a linear and bilateral process of transactions and collaborations within the innovation process, but a dynamic

process with network and multi-collaborative participation in an ecosystem of Open Innovation (European Commission, 2016). Specific innovation can no longer be seen as the result of predefined and isolated innovation activities but instead as an outcome of a complex creation process involving knowledge flows across the entire economic and social environment. A fundamental notion is that knowledge for innovation is widely distributed in the economy, or in more popular terms, “most smart people work for someone else”. Some important factors that have increased the importance of Open Innovation include the increased mobility of workers, more capable universities, the rise of the Internet, social media, and the supporting information and communication technologies (Bogers et al., 2018).

Some studies highlighted potential positive and negative effects of Open Innovation systems. As positive effects, it is being mentioned the increase of profit, higher R&D performance, more product or service innovation, greater access to sources of knowledge and the success of new products or services on the market (Lee et al., 2019). As negative effects, it is being mentioned excessive costs of exploration for external flows of knowledge, negative attitudes towards Open Innovation, and the struggle to control knowledge assets (Cooper, R., 2018).

Contemporary innovation models have shifted from closed and internal R&D to combining both internal and external sources of ideas, technologies, and other kinds of information that could help organizations to innovate. In literature, most of the attention is being given to the inbound process of knowledge inflows to accelerate internal innovation, giving less attention to the outbound process of knowledge outflows (Radziwon & Bogers, 2019).

2.2.2 Inbound and Outbound Practices

Open Innovation can be divided into two types: inbound and outbound. Inbound Open Innovation refers to the internal use of external knowledge, while outbound Open Innovation refers to the external exploitation of internal knowledge (Tsai et al., 2022).

The inbound Open Innovation requires organizations to allow unused ideas and knowledge to go outside the organization for others to use in their businesses and business models. In contrast, the outbound is less explored and hence less well understood, in both academic researches and in business (Lee et al., 2019). Inbound practices are types of openness in which external resources can be provided to the internal environment with organizations being able to do it by sourcing or acquiring practices. Sourcing can be seen as a process to find, evaluate, and engage suppliers to achieve cost savings and to produce more benefits for the organization. On the other hand, acquiring is an entry that involves all forms of purchasing knowledge or technology and R&D efforts (Leitão et al., 2020).

The outbound Open Innovation involves opening up an organization's innovation processes to many kinds of external inputs and contributions. This aspect of Open Innovation has received the greatest attention, both in academic research and in industry practice (Bogers et al., 2018). Outbound practices are types of openness where internal resources can be provided to the external environment. Organizations practice it by revealing and selling. Revealing does not involve monetary exchange and concerns on the sharing of knowledge with the network partner without immediate financial benefit. On the other hand, selling corresponds to an exit involving monetary exchange, allowing the leverage of the R&D investments and direct use of it (Leitão et al., 2020).

Both inbound and outbound Open Innovation includes multiple activities, as an example, three inbound and outbound activities can be licensing agreements, technical and scientific services, and non-equity alliances. Empirical studies have been founding that companies perform more inbound than outbound activities, suggesting that organizations fail to capture potential benefits of a fairly large magnitude (Bogers et al., 2018). The inbound and outbound Open Innovation can be related to three processes of knowledge: exploration, exploitation, and retention. These processes can be performed either inside or outside an organization. Exploratory innovation is developed to search and acquire unfamiliar knowledge, technologies, and resources and aims to generate a variation. It includes things captured by terms such as search, variation, risk taking, experimentation, and flexibility (Gonzalez & de Melo, 2018). Exploitative innovation is conducted to meet the needs of markets and customers, expanding the existing products and services, and also improving the efficiency of the processes (Bigliardi et al., 2020).

Retention involves capturing knowledge in the organization in a way that it can be used later, it is a process of absorbing knowledge over time (Gonzalez & de Melo, 2018).

2.2.3 Technological innovation

Open Innovation is becoming more and more popular thanks to new large-scale trends such as digitalization, automation, and the mass collaboration and participation in innovation that it enables (Bogers et al., 2018). The scale and speed of digitalization and automation are accelerating and transforming the way organizations design, develop and manufacture products or the way services are being delivered. In this way, it is creating new innovation processes and new ways of doing business, introducing new cross-sector value chains and infrastructures (European Commission, 2016). Some research showed that using an Open Innovation strategy increases the innovation outputs as well. Idea generation inside the organization can be considered essential and these new methods can be an essence of innovation and create value for customers. Rolls-Royce, Caterpillar and Michelin are companies, which are examples of client-focused innovation (Schmuck, R. & Benke, M., 2021). As a business practice, it is been noticed an increasing use of Open Innovation to achieve competitive advantage. The former CEO of Procter & Gamble (P&G) Allen Lafley referred that the majority of P&G's best innovations had come from connecting ideas across businesses, with about half of their new products generated through them and the rest from their own labs (Pustovrh et al., 2020).

The company Alibaba planned to radically change the manufacturing sector globally. Business-to-business (B2B) platforms, such as the Alibaba platform, are forcing industrial organizations to rethink their business models. Organizations have to look beyond just making products and controlling the pipeline for selling them through traditional marketing channels. These platforms can create network effects changing industrial value chains. Open platforms such as Alibaba makes the openness a part of the value proposition and produce competitive advantages. The transformation of Alibaba into digitalization can be an example of the right combination of innovation and business strategy, where the company shifted its traditional commerce activity to online commerce using innovative and radical advancements in digitalization. Today Alibaba is in the global top 10 with sales exceeding Wal-Mart (Schmuck, R. & Benke, M., 2021).

Innovation strategy can show how an organization grows and utilizes its resources, capabilities, and processes to achieve corporate purposes. It is important for an organization to develop the appropriate strategy and a related innovation strategy. A good strategy usually determines how each function, such as manufacturing, finance, R&D, or marketing supports the overall company strategy (Fitrah, et al., 2020). As an example, part of Alibaba's success comes from the implementation of what is called smart manufacturing as they automate as many processes as possible using their disruptive innovative strategy (Schmuck, R. & Benke, M., 2021).

The company Siemens AG, a leading technology firm in Germany and famous for its R&D capability, embraces and use Open Innovation as an important tool to produce competitive advantage. The company bets on bringing different people together and establishing collaborative relationships with them. It has developed some separate platforms as MindSphere, to attract potential partners and develop disruptive ideas. As a leader in this type of platforms, Siemens has developed a platform based innovation ecosystem through continual interactions between collaborators. This ecosystem helps the company to keep a continuous innovation process alive across different organizational units, which not only allows Siemens to offer localized products and customer oriented service solutions for customers, but also incubation environments and services for startups (Wei et al., 2020).

In addition, sustainability is a topic that is becoming more popular than ever before and it will affect and be considered in the creation of new innovations in organizations. The company 3M, known for its very innovative culture and its interest in sustainability, announced in 2019 that all of its new products would have to include at least one sustainability benefit. 3M spends 6% of revenue on R&D, launches about 1000 new products every year, and it generates roughly one-third of its revenue from products released in the past five years, this is a very significant commitment (Visser, 2020).

Not only innovation have a very important role in technological organizations but also Open Innovation can produce many advantages when it is considered and used. A study of 265 Chinese companies showed that Open Innovation speeds up new product or service development and another research of 288 new Chines ventures showed that having

innovation strategies provide a positive effect on the competitiveness of companies (Schmuck, R. & Benke, M., 2021).

Because the research theme is very complex and is still under development, a big amount of issues and suggested future researches were verified in the literature review by the authors about the field of the contribution of Open Innovation to Entrepreneurship. On table 1 it is possible to see a summary of the main topics and issues that came from the literature review and its relationship with the research objective and research questions.

Table 1 Relationship between literature review, research questions, main issues and future

Research Objective	Author, Year	Main Topics (Actual Research)	Main Issues (Future Research)
	Chandler & Krajcsák 2021	(Q1) How important is the role of innovation in entrepreneurship?	How an existing culture can be managed in order to ensure a good intrapreneurs management?
	Chirumalla, 2021		What is the impact of IoT, AI and cloud computing in the innovaion process? How digitally-enabled process innovation can improve the business strategy?
	Cooper, 2018		Research into new-product success drivers and NPD practices are not well known yet. Keys to product innovation success still remain quite elusive.
	Christa & Kristinae, 2021		What management methods can improve business performance based on a well-managed resource view and knowledge-based view?
	D'Attoma and Ieva, 2020		When the determinants of innovation failure play a different role due to the type of innovation project that has been abandoned? What are the synergistic roles of marketing and organisational innovations that are the drivers of innovation success and preventing innovation failure?
	Na et al., 2019		What variables are related to marketing innovation of sharing economy business to the aspects of cost, sales, and distribution?

Research Objective	Author, Year	Main Topics (Actual Research)	Main Issues (Future Research)
Understand the contribution of Open Innovation to Entrepreneurship	Tsai et al., 2022	(Q2) Can Open Innovation makes the difference and become a competitive advantage in entrepreneurship?	Can cultural issues be inherent to Open Innovation practices?
	Leitão et al., 2020		What are the effects associated with inbound and outbound open innovation practices on the eco-innovative performance of firms with different profiles of technological intensity?
	Radziwon, A. & Bogers, M., 2019		Considering various types of knowledge and sources, what advantages a company can get with the exchange and share of knowledge? How digital transformation and the accumulation of easily accessible knowledge can affect a business?
	Zhu et al., 2019		Can the aligment of radical and incremental innovations with different Open Innovation strategies produce higher competitive advantages? What are the influences of individual characteristics on Open Innovation effectiveness?
	Pustovrh et al., 2020	(Q3) What are the impacts open information and knowledge access can bring to companies?	What are the actual contributions and benefits, as well as failures, of business accelerators?
	Fitrah et al., 2020		What are the customers' changing needs nowadays in technological companies?
	Wei et al., 2020		How the rapid development of Internet and open information access can affect a technological company? How to make customers engaged in?
	Visser, 2020		Is innovation merely an intellectual exercise, or a more effective practice?
	Bogers et al., 2018		What implications can be found on innovation dissemination, diffusion, and standardization?

Source: Author's elaboration

As a complement, in table 2 it is possible to see all the literature considered for each research question of this dissertation.

Table 2 Literature used for each research question

Research objective	Research questions	Literature review
Understand the contribution of Open Innovation to Entrepreneurship	(Q1) How important is the role of innovation in entrepreneurship?	Chandler & Krajcsák 2021 Chirumalla, 2021 Schmuck & Benke, 2021 Christa & Kristinae, 2021 D'Attoma & Ieva, 2020 Fitrah et al., 2020 Na et al., 2019 Lee et al., 2019 Rexhepi, G., 2019 Cooper, 2018 Schachter, 2018
	(Q2) Can Open Innovation makes the difference and become a competitive advantage in entrepreneurship?	Naqshbandi, M. & Jasimuddin, S., 2022 Tsai et al., 2022 Bigliardi et al., 2020 Leitão et al., 2020 Yun et al., 2020 Chesbrough, H., 2019 Radziwon, A. & Bogers, M., 2019 Lee et al., 2019 Zhu et al., 2019 Cooper, 2018 Bogers et al., 2018 Gonzalez & de Melo, 2018 Daemmrich, 2017 European Commission, 2016 Huizingh, 2011 Gassmann et al., 2010
	(Q3) What are the impacts open information and knowledge access can bring to companies?	Schmuck & Benke, 2021 Pustovrh et al., 2020 Fitrah et al., 2020 Wei et al., 2020 Visser, 2020 Bogers et al., 2018 European Commission, 2016 Gassmann et al., 2010

Source: Author's elaboration

3. Methodology

In the previous chapter of the literature review, it was verified that the existing studies and knowledge about Open Innovation applied to entrepreneurship still present some general gaps and limitations. Although this concept has been gaining popularity and being put into practice in several organizations, some issues and effects are still not fully known and due to the broad characteristics and complexity of the theme make it more difficult to obtain clear conclusions and consolidate information and knowledge on the theme. From this perspective, this chapter aims to make a general framing of the methodological bases that support the model to be developed within the scope of this dissertation.

3.1 Research Methodology

Since the present study has the objective to understand and analyze the impact of Open Innovation in entrepreneurship with the aim to produce new information for the scientific community, through the research about the integration of Open Innovation to entrepreneurship in a way to enrich and completes the current knowledge about this theme, the methodology adopted on this research was made by qualitative methods, more specifically, interviews centred on the investigation questions presented and main issues from the literature, on the topic of the contribution of Open Innovation to entrepreneurship, as it can be seen in table 3, a schematic summary was created for better comprehension.

Table 3 Research questions and research objectives integrated with main issues from

Key Research Question:	What is the impact of Open Innovation in entrepreneurship?	
Main Issues (Author, Year)	**Research Question**	**Research Objective**
What is the impact of IoT, AI and cloud computing in the innovaion process of a company? (Chirumalla, 2021)	How important is the role of innovation in entrepreneurship?	Understand the impact of innovative approaches as IoT, AI and cloud computing in entrepreneurship
Considering various types of knowledge and sources, what advantages a company can get with the exchange and share of knowledge? (Radziwon, A. & Bogers, M., 2019)	Can Open Innovation makes the difference and become a competitive advantage in entrepreneurship?	Explore advantages of Open Innovation practice in entrepreneurship
How the rapid development of Internet and open information access can affect a technological company? (Wei et al., 2020)	What are the impacts open information and knowledge access can bring to companies?	Explore challenges that open and easy access of knowledge and information can create to companies

Source: Author's elaboration

As it was already mentioned, the present study takes a qualitative approach. This option results from the fact that the theoretical saturation necessary to ensure a global and detailed understanding of the Open Innovation application process to entrepreneurship still has its own information and knowledge limitations, where fundamental issues still exist and because of that, a qualitative approach by interviews was seen as a good and efficient approach for the concept consolidation that can provide more value to this research.

3.2 Qualitative Analysis

The qualitative methodology used in this study based on an interview model is constituted of eight questions in order to achieve the purposes of this research. Firstly, descriptive questions are made to characterize the samples and get a clear overview of the people and companies interviewed. Then, the interviews are followed by exploratory questions that were created with the purpose to analyse technical questions chosen that are not yet developed in current literature about the theme of contribution of Open Innovation to entrepreneurship. In table 4 it is possible to see the questions created for the interviews.

Table 4 Interview questions

Nº	Research Objective	Question	Type of Question
1	Characterize sample	In which sector of activity does your company act?	Descriptive Question
2		About the company dimension, what is the number of employees?	Descriptive Question
3		What is the average annual revenue of the company?	Descriptive Question
4		What is your position in the company?	Descriptive Question
5		What is the main country where the company operates?	Descriptive Question
6	Understand the impact of innovative approaches as IoT, AI and cloud computing in entrepreneurship	In your point of view, what are the main advantages that innovative approaches such as artificial intelligence, cloud computing, among others, can have in a company?	Exploratory Question

Nº	Research Objective	Question	Type of Question
7	Explore advantages of Open Innovation practice in entrepreneurship	What are the main advantages you notice in using an Open Innovation approach compared with companies that don't consider it?	Exploratory Question
8	Explore challenges that open and easy access of knowledge and information can create to companies	How digital transformation and the accumulation of easily accessible knowledge can affect a company's innovation process?	Exploratory Question

Source: Author's elaboration

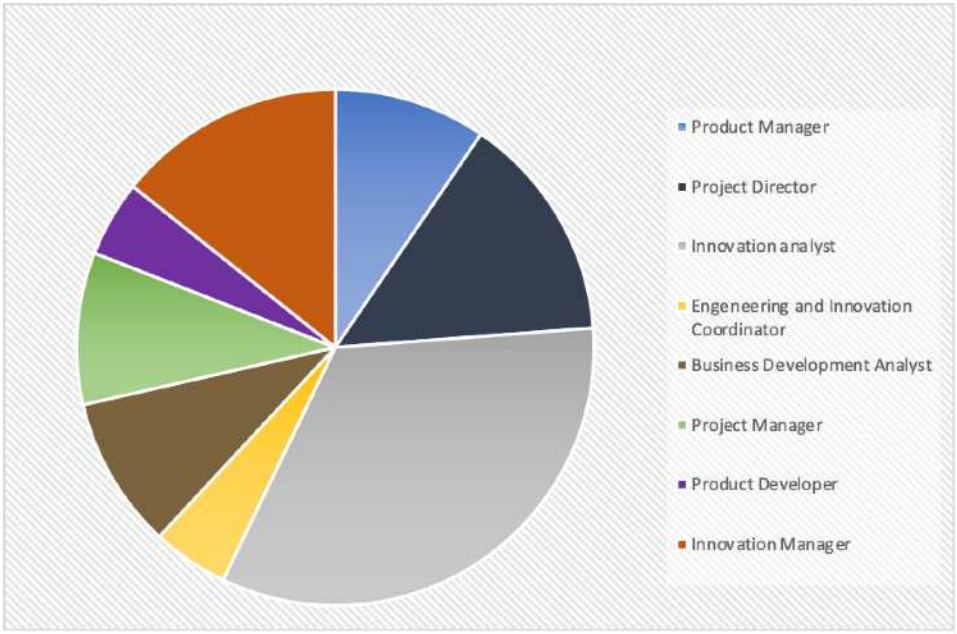
4. Data Analysis

The data obtained from the qualitative methodology used in this study has resulted from twenty interviews made to companies that are using and considering the concept of Open Innovation. With the purpose to get more broad and solid data from a global perspective, the interviews were made with companies that have their main operations in different countries around the world.

4.1 Sample characterization

Regarding the people interviewed, the entire sample was related to the management area with direct connections and duties with the innovation field and in some cases more specifically with the Open Innovation field. So the inputs collected were relevant and reliable to contribute to this research. Due to the relevance to obtain a broad sample from different countries and continents to increase the reliability and solidity of the sample and get different thoughts and perspectives about the research field, the contacts were made to international companies located in several countries that use and consider innovative approaches in some way on its business model. Most of the interviewees were experts in the field of innovation and were invited through the social network LinkedIn to participate in the investigation. In the figure below it is possible to observe the different interviewee positions.

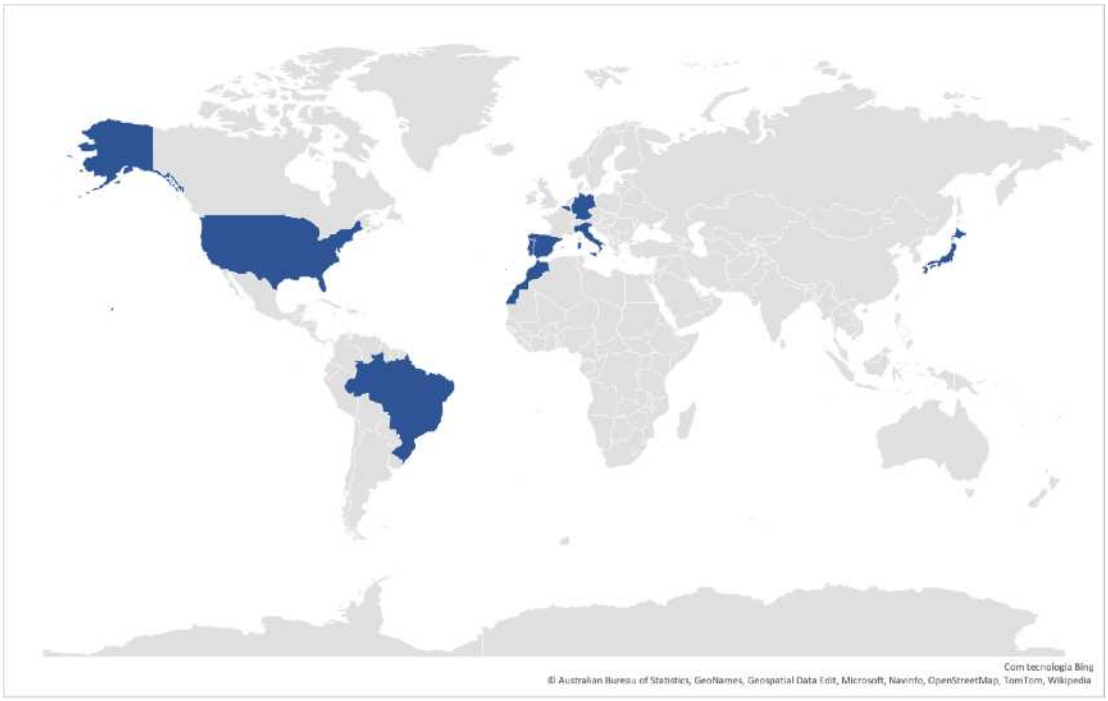
Figure 1 The different interviewee positions



Source: Author's elaboration

The twenty interviews were made to companies that have their main operations in nine countries on five continents. With more detail, the companies addressed were based in the following countries: Portugal, Spain, Italy, Belgium and Germany, from Europe,

Figure 2 Main operations location of companies interviewed

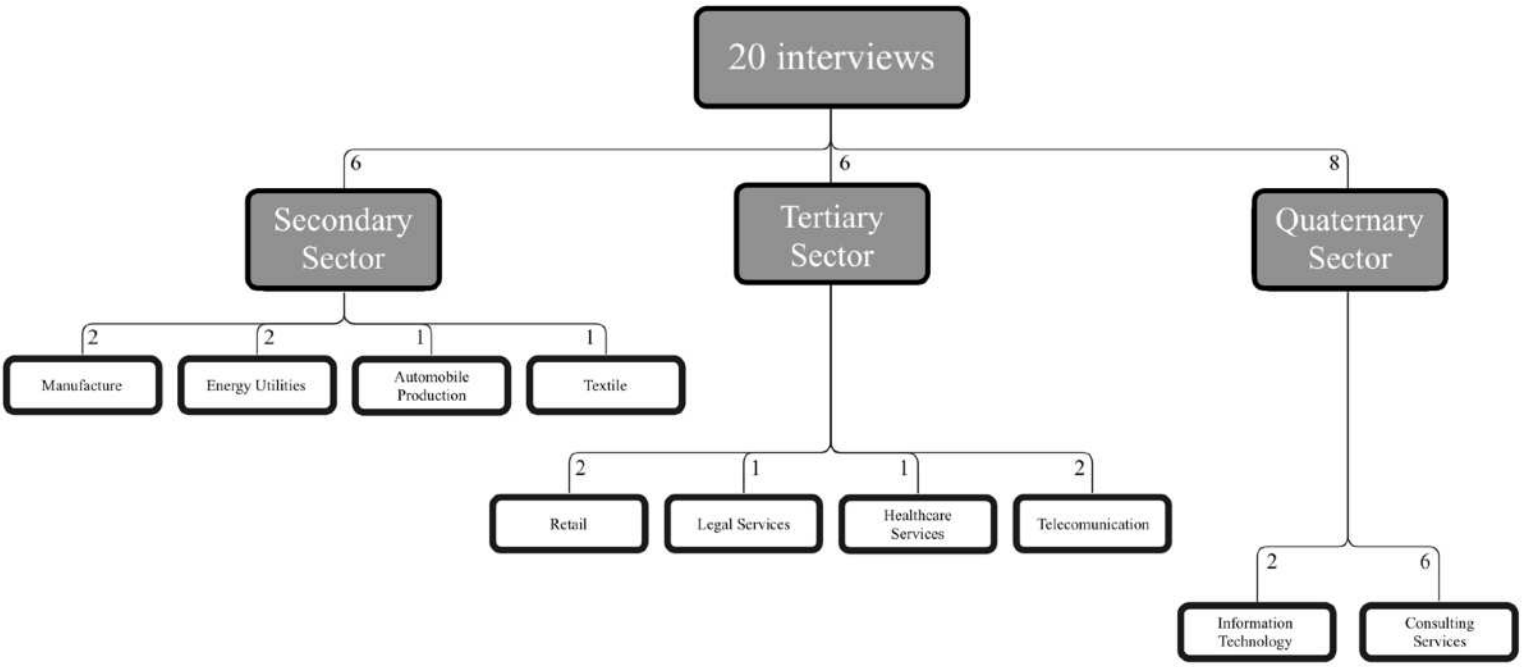


Source: Author's elaboration

Japan, from Asia, Marrocco from Africa, Brazil from South America and the United States of America from North America.

The sample collected from the companies interviewed is characterized to act from the secondary to the quaternary sector. In the secondary sector, it was interviewed six companies where were acting in the areas of manufacturing, energy utilities, automobile production and textile. In the tertiary sector, it was interviewed six companies that were acting in the areas of retail, legal services, healthcare services and telecommunication. From the quaternary sector, it was interviewed eight companies that were acting in the areas of information technology and consulting services. Due to the sample collection of different sectors and different areas, the sample diversity was promoted, obtaining different perspectives and other thoughts from different sectors and areas of activity about the research field.

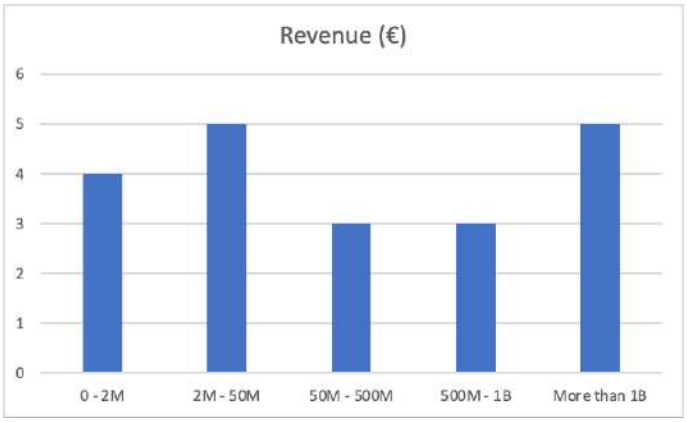
Figure 3 Sector of activity of companies interviewed



Source: Author's elaboration

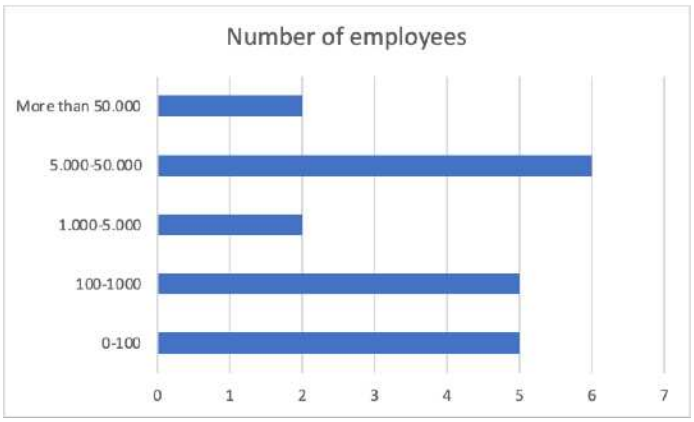
Another sample characterization is the company dimension, where the average revenue and the total number of employees were collected. The two figures below present

Figure 4 Revenue of companies interviewed



Source: Author's elaboration

Figure 5 Total number of employees of companies interviewed



Source: Author's elaboration

the values of the average revenue in euros from the past five years and the total number of employees respectively.

With the data from these two figures, it is possible to observe that our sample is constituted by companies of different dimensions, characterized by small to large companies. After completing the interviews, a content analysis was performed to obtain analytical data for theoretical and empirical conclusions.

The data resulting from the interviews were initially pre-processed and transformed into a text document and processed in the KH Code software to analyse the content obtained from the interviews. The KH Code is a software for quantitative content analysis, text mining and computational linguistics. The data analysis is described in the following chapters, according to the types of analysis which were performed.

4.2 Term frequency

The first analysis used was the term frequency with the purpose to identify the most relevant words across all the interviews made, to get a general understanding of the research topic and the common thoughts mentioned by the guests interviewed.

Table 5 Term Frequency Analysis Output

Words	POS	Term frequency	Words	POS	Term frequency
company	Noun	112	product	Noun	14
innovation	Noun	83	solution	Noun	14
technology	Noun	70	work	Noun	14
process	Noun	47	accelerate	Verb	13
new	Adj	44	cloud	Noun	13

Words	POS	Term frequency	Words	POS	Term frequency
transformation	Noun	40	open	Noun	12
think	Verb	33	able	Adj	12
business	Noun	32	big	Adj	12
digital	Adj	31	cost	Noun	12
bring	Verb	29	development	Noun	12
knowledge	Noun	29	example	Noun	12
advantage	Noun	28	model	Noun	12
project	Noun	26	point	Noun	12
open	Adj	25	use	Verb	12
way	Noun	24	different	Adj	11
access	Noun	22	know	Verb	11
people	Noun	22	management	Noun	11
information	Noun	21	reduce	Verb	11
make	Verb	21	artificial	Adj	10
work	Verb	20	benefit	Noun	10
approach	Noun	19	data	Noun	10
time	Noun	17	idea	Noun	10
startup	Noun	16	intelligence	Noun	10
area	Noun	15	need	Verb	10
help	Verb	15	problem	Noun	10
innovative	Adj	15	team	Noun	10
allow	Verb	14	thing	Noun	10
main	Adj	14	accumulation	Noun	9
market	Noun	14	better	Adj	9

Source: Author's elaboration

The results obtained from the data collected present a general understanding and thoughts mentioned in the interviews made. The terms ‘company’, ‘innovation’ and ‘technology’ were the terms used more times in all twenty interviews.

4.3 Keyword in context analysis

This analysis allows analyzing how an extracted word is used in the text resulting in interviews. It is a method that analyses a word and its every sentence used in a text to find out its meaning and usage. This analysis turns out to be useful when the intention is to obtain deeper research on a specific term. As an example, the output of keywords in context analysis can be seen in the next table, for the term ‘innovation’, the second term with more frequency in the twenty interviews and a term with high relevance for the study. Additionally, the introduction of concordance requirements can enrich the analysis allowing to be analyse on another level, and for that, using the same KWIC analysis example, it is interesting to investigate the context in which the term ‘process’, another term with relevance to the study, being the fourth term more repeated in the term

frequency analysis, is mentioned close to our main keyword ‘innovation’. The output results present the situations where ‘innovation’ and ‘process’ appeared together or separated by five words, as was defined in the analysis parameters.

Table 6 KWIC Analysis Output

Interview Index	Left	Keyword	Right
3	… like others in the	innovation	process . The risk of…
3	…can affect a company 's	innovation	process in general . So…
5	…an invaluable source in the	innovation	process . First , an…
5	…a game-changing role in the	innovation	process . It remains of…
7	…many more people in the	innovation	process of a company…
8	…more agility and assertiveness to	innovation	processes . It ensures a…
9	…efficient processes in terms of	innovation	. Innovating is always…
17	…ecosystem , can affect the	innovation	process because it can be…
17	…and it also affects the	innovation	process , especially because it…
17	…process together , even because	innovation	and digital transformation are ,…
20	… I think that this	innovation	process tends to be more…
20	…that we can accelerate the	innovation	process of companies . Because…

Source: Author's elaboration

As a complement to this analysis, a collocation map can be used to present the relation of the keyword with other terms, find other terms that can have an important relation with the keyword and analyse them by the concordance requirements filter. The table 7 shows the four words more repeated that appeared at a five word distance to the keyword ‘innovation’. With these results, a new KWIC analysis can be made to understand the relation of these words with the keyword ‘innovation’. Terms such as open

innovation, innovation in companies and innovation ecosystem make sense and are relevant for this research study in order to get new research results.

Table 7 Collocation Analysis Output

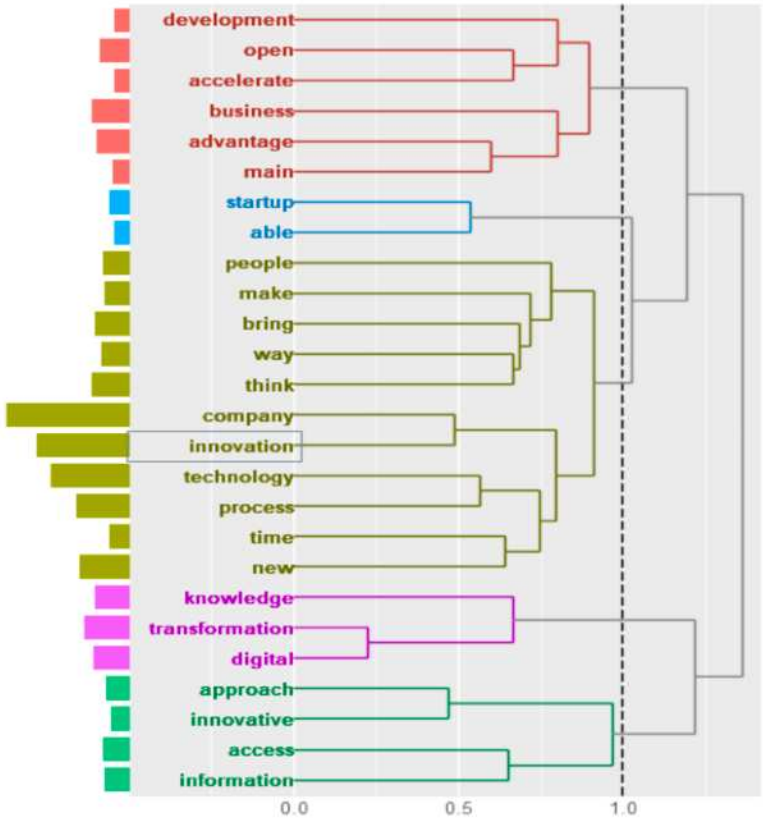
Word	POS	Total matches	Left matches	Right matches
'open'	Adj	33	31	2
'process'	Noun	18	3	15
'company'	Noun	17	6	11
'ecosystem'	Noun	6	1	5

Source: Author's elaboration

4.4 Hierarchical cluster analysis

The hierarchical cluster analysis is a method of cluster analysis that seeks to build a hierarchy of clusters. This analysis allows to find which combinations or groups of words have similar appearance patterns in the data collected. By running the analysis in KH Coder for the 26 most frequent words across all the interviews, a dendrogram is obtained with five word groups.

Figure 6 Dendrogram of hierarchical cluster analysis

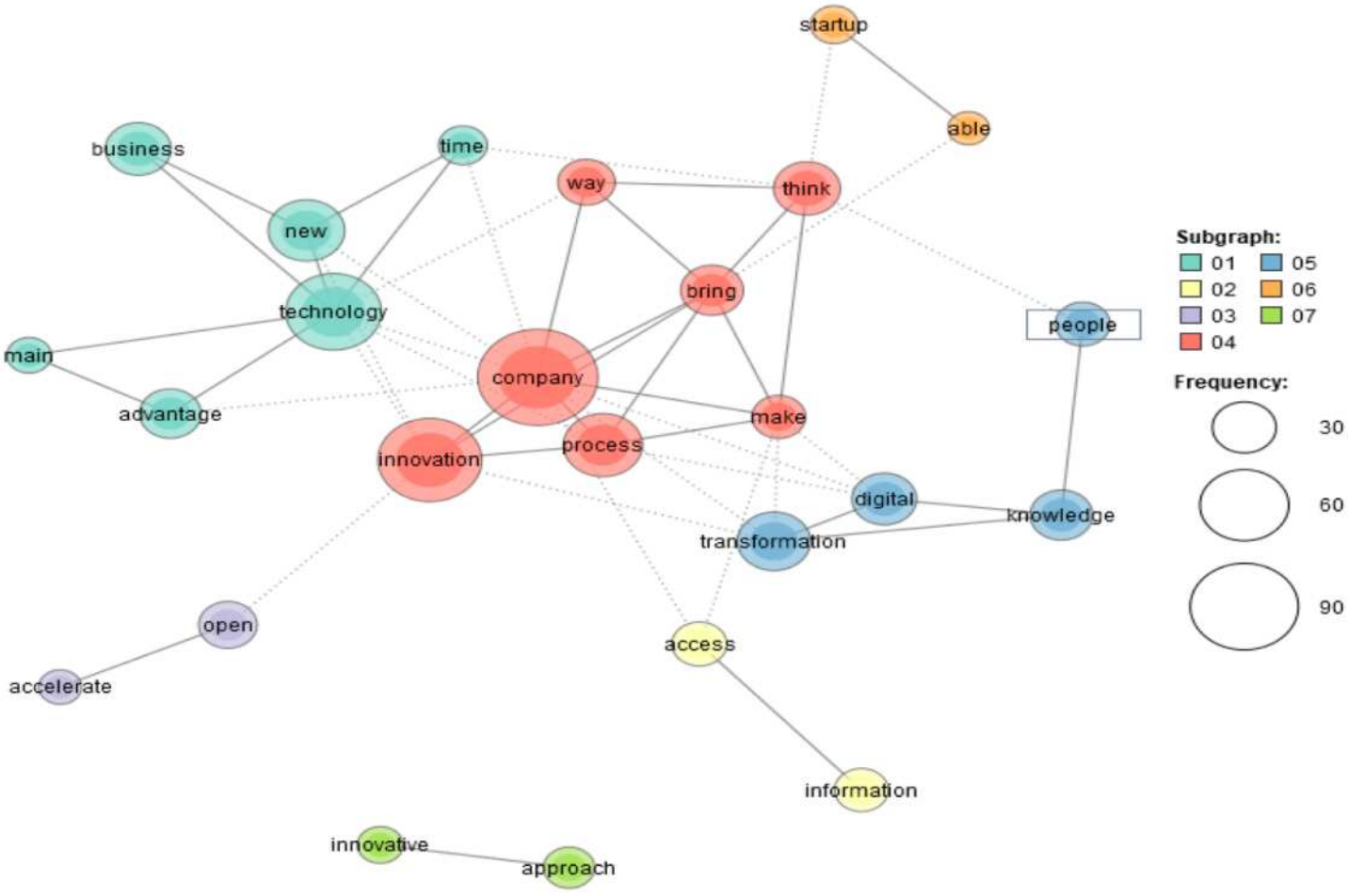


Source: Author's elaboration in KH Coder

4.5 Co-occurrence Network of words

This method allows drawing a network diagram that shows the words with similar appearance patterns with high degrees of co-occurrence and connected by lines. It provides a broad and easy way to understand and get a better perspective of the co-occurrence structures of the data collected in all interviews. It can be used for each interview individually or all together at the same time. In the figure below, it is possible to observe the output result of the data collected. Strong relations are verified mainly in three groups.

Figure 7 Co-occurrence Network of words



Source: Author's elaboration in KH Coder

4.6 Self-organizing map

The self-organizing map is an analysis that produces a map that visually organizes the words into clusters, given their association and proximity across the interviews made. In the figure below it is possible to observe the output map generated for the thirty three most frequent words across all the interviews. It is possible to observe that eight clusters were generated for these words, represented by colours.

Figure 8 Self-organizing map



Source: Author's elaboration in KH Coder

4.6 Distinctive words analysis

Another analysis consists in the identification of the more distinctive words of each interview. This analysis contributes for the identification of the key terms that characterize each interview and provides a search method to identify relevant topics by term identification in each interview. By this way, it is possible to identify key topics in each interview that can lead to further analysis. The table 8 represents the distinctive words analysis output for the first ten distinctive words for each of interview.

Table 8 Distinctive words analysis by each interview

1	2	3	4	5	6	7	8	9	10
commercial	accelerated	majority	kind	activity	greater	participation	align	provide	acquire
feel	cite	badly	deal	invaluable	assist	solutions	assertiveness	simpler	bottom-up
shape	decrease	comment	factor	adapt	capillarity	service	coast	generate	co-create
cultural	directly	conduct	value	experience	complete	creation	curve	emerge	data-driven
big	maximization	current	attribute	offer	design	generation	diminish	innovate	discovery
example	models	differential	automate	player	embrace	approach	fit	accelerator	exploration
know	precise	difficult	face	adopt	error	innovative	increase	adjacent	flow
impact	algorithm	execution	industry	better	human	opportunity	infra	architecture	flow
thing	feed	frustration	key	Access	include	main	mitigate	developer	interact
lot	generation	gain	long	active	Intelligence	accessible	specialist	diruptive	interaction
11	12	13	14	15	16	17	18	19	20
avoid	assertive	internal	bridge	creative	capital	academia	energy	efficient	consumer
construct	drive	addition	correctly	good	conflict	talk	strategy	simplify	act
network	establish	commercially	count	bit	minimise	beginning	achieve	consider	connect
reflect	access	historically	false	bombard	reduction	faster	ambitious	aggressiveness	speed
today	action	internationalisation	leverage	brain	rework	revenue	context	assess	tend
solve	adjust	invest	competitor	catch	gain	scale	cybersecurity	broadly	contribute
point	board	investor	future	check	savings	work	decarbonisation	business-critical	facilitate
lot	capture	old	huge	constantly	experience	case	earlier	capability	partner
agro	combine	pioneer	partnership	drastically	improve	large	industrial	central	university
analytic	concept	present	specialize	efficiently	efficiency	perspective	objective	certainly	area

Source: Author's elaboration

5. Discussion and Findings

After the theoretical and methodological framework, the present chapter aims to answer the research questions, supported by the literature review and data analysis methods explained in the previous chapter.

5.1 The role of innovation in entrepreneurship

The first research question defined in the research was to investigate how important is the role of innovation in entrepreneurship. In this way, it was focused on correlating the empirical evidence obtained in the Literature Review with the knowledge, experience and thoughts of the interviewees, concerning the most significant concepts and factors around this research question.

The results demonstrate that innovation plays a fundamental role in business performance. Given the general increase in aggressiveness and competitiveness between companies in current times, marked by various factors such as technological advances that provide the globalisation of markets and access to technologies at reduced prices, the role of innovation increases more than ever. The role of innovation in entrepreneurship can be observed in two distinct parts, in the launch and development of new products and services, and in business management and organisation.

In the part of the launch and development of new products and services, it was identified, in general, in the interviews that innovation is essential for the creation and development of new values, which offer better experiences to customers and ensure a better position in relation to competition and thus stimulate the success of the product or service. In the literature it was mentioned that one of the key factors is the practice of innovation in promoting product and service differentiation with unique features and benefits and with a compelling value proposition for the customers, which distinguishes new product/service winners from losers more often than any other single factor. On the other hand, it is referred that innovation can allow companies to explore new markets and opportunities while minimizing risks and costs, gaining in responsiveness and flexibility. Through term frequency analysis of the data acquired in the interviews, the term 'technology' was obtained as the most used term. It is revealed that technology is directly

associated with innovation and vice versa, being important for the success and smooth running of activities in companies.

In the part of business management and organization, it was identified in the interviews that innovation can promote cost reduction, increase efficiency, as well as increasing the performance and productivity of companies, simplify the execution of processes and tasks and improve communications and social relations within the company. In the literature it was mentioned that innovative practices leverage the skills and capabilities of companies, improving the way they work and organize, making companies more efficient structurally, with faster performance and with greater flexibility to adapt to unexpected adversities of the environment where they are.

More specifically, regarding specific innovation practices, it was identified in the interviews that the use of AI allows the reduction of human error rate, reducing costs and simplifying processes, as well as helping in data processing, in order to make the company more efficient and faster in decision making. In the case of IoT and cloud computing, it was identified that these practices can give more flexibility to companies, facilitating access and sharing of information, bringing more transparency and security to business, reducing costs and infrastructure, and in some cases, improving the distribution of products and services at various levels.

Currently, companies can't exclude digital tools and technologies in order to offer products and services to customers at the same or higher level as competitors, and the advantages of considering it are enormous compared with its disadvantages. As an example, the pandemic period of 2019 showed the potentialities that digital technologies can offer and how important can be for the proper functioning of companies in atypical and challenging times. In the literature, it is mentioned that innovation is getting more attention from public authorities, enterprises, and academics due to the current increasing competition against companies although it is vital to plan and analyse beforehand where and when to use innovative practices, and what is the best way to do it, otherwise, a different effect may be obtained than the one foreseen. A key rule is to understand how each one of these innovative approaches fits in the company and decide which ones are the right ones to use. It is important to mention that, as referred in the literature, that the effects of innovation in entrepreneurship can vary in different industries, for example, the

banking industry has less effects and requirements of innovations than the electronics industry due to its characteristics, but in all of them innovation plays an important role.

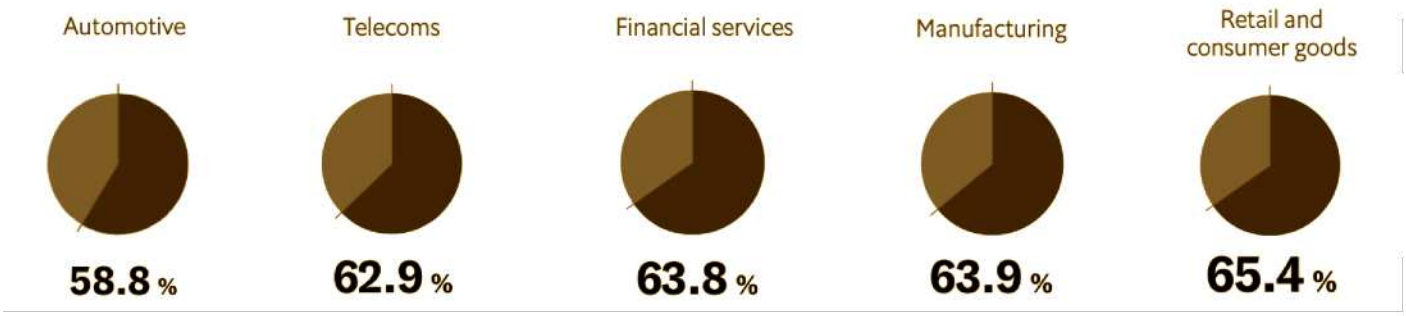
5.2 Open innovation as a competitive advantage in entrepreneurship

The second research question defined is the main question of this research and it aims to investigate if Open Innovation really can make a difference and become a competitive advantage for companies.

The results demonstrate that Open Innovation is characterized mainly to provide access to more creative minds and better ideas that can leverage the company's capabilities and performance to another level, in a way by having an open behaviour with the exterior, allowing the flow of ideas, knowledge, information, feedbacks and so on. It was revealed that Open Innovation can make the difference and can become a competitive advantage for companies. It can provide the access to new talents, new streams and channels, reduce timescales, costs and risks, and increase capabilities. In the literature, it is referred that Open innovation is a way to increase the rate of innovation and decrease the according risks by creating a bridge to connect external knowledge flowing with internal innovation flowing in one organization. By considering and using an Open Innovation strategy, companies not only can access external knowledge but they are also willing to share their knowledge with others and receive feedback, new ideas and solutions for their problems, being a good resource to perform faster, with lower costs and risks. It is defended that external knowledge should be integrated with existing knowledge in the organization and be linked with the core business model. Internal and external innovations are not complementary, so it is important to consider an Open Innovation approach. Open Innovation can be seen as a dynamic process with a network and many collaborative participation in an open ecosystem of innovation. Due to the current challenging business environment characteristics, is getting more harder to see well succeded innovations resulting only from predefined and isolated activities, and it is becoming a good alternative instead, consider it as an outcome of a complex creation process involving knowledge flows across the entire economic and social environment.

According to the Open Innovation barometer by The Economist (2022) composed by a survey of 500 business executives in the United States of America, Germany and United Kingdom, 62.9% of companies of different sizes across various industries are considering the practice of openness innovation. This is an indicator that weighs 65 factors explored through survey questions that take into account the extent of Open Innovation practices adopted by organizations, staff allocated and budget for Open Innovation, and the adoption of open source technology. With more detail, the figure below presents the results for each of the five sectors considered:

Figure 9 Open Innovation barometer



Source: The Economist 2022

The barometer reveals that more than half of the companies are already considering the practice of openness innovation and all the five sectors have similar results, which means that there is no particular sector that is approaching it in a different way. According to The Economist (Economist Impact, 2022), this survey revealed that the teams of internal innovation still dominate the development of products, services and processes and due to this fact, it indicates a big growth opportunity for the Open Innovation practice.

It was identified in the interviews that to offer innovative and the best experience to customers, an Open Innovation approach can really make the difference allowing companies to offer more complete solutions such as products and services and also in a much faster way. Open Innovation can be seen as a complementary resource that will allow companies to create more value in some way. It was noticed that it can be very

common to find companies that do all the innovative processes internally struggling at some point due to several reasons as the lack of knowledge, time or resources, which in some cases can compromise entire projects.

Another perspective in the literature is that some important factors that have increased the importance of Open Innovation are related to the increased mobility of workers, the existence of more capable universities, the rise of the Internet and social media, and the supporting information and communication technologies. However, it is important to consider that to achieve positive results with the implementation of Open Innovation, it is required some degree of reorganization, to enable a company to access and integrate the external knowledge acquired in a proper way. It often includes the establishment of new roles and duties to support the implementation. There is no doubt that a big potential value can be obtained through Open Innovation practices, however, companies must define, organize and have the right culture for that, otherwise, it could result in a failed practice. In addition, to be successful, resource investments need to be made, such as investments in people, processes and open systems. The results of Open Innovation practices will become more clearer as more companies embrace openness, where the value of specific Open Innovation strategies, approaches and interaction variables turn more clear and evident.

5.3. The impacts open information and knowledge access can bring to companies

The third and last research question defined in the research was to investigate the impact of open information access in companies.

The results demonstrate that open access to information and knowledge has far more advantages than disadvantages. Nowadays, the new forms of access to information and knowledge, marked by digital transformation, provoke a need of change in the way companies work and operate. These new forms, while opening new ways and means to do business in a more efficient and productive way, can in the other hand, force companies to constantly update and adapt to new technologies to remain competitive, otherwise, companies could become increasingly obsolete with less competitive capabilities and therfore it could compromise their business success. From a communications perspective, the use of today's digital accesses offers a new dimension to connectivity and dispersion

of information, improving both internal and external communications in a faster, more efficient and less costly way, stimulating a better cultural environment in companies, removing geographical barriers and increasing a company's communicative capabilities. Open access to knowledge and information allows a significant reduction of resources for project development within a company and is vital, especially for small companies who may have more limited access to information and knowledge. From a community and societal perspective, open and free access to information and knowledge can provide better and fast conditions for the development of current knowledge and science. It was referred by the European Commission (2016) that making research results more accessible leads to better and more efficient science and innovation in the private and public sectors. It is also referred that accessible networks of information and knowledge can establish a structural dynamic among heterogeneous partners for companies, where startups, companies, government agencies, research institutions, and others can share and collect relevant content and create value for all entities in some way.

Another perspective in the literature is referred that open access to information and knowledge can create more diversity that increases the chances to have multiperspective and interdisciplinary collaboration, making companies less dependent on narrow resources or homogeneous ideas and perspectives, promoting more creative idea generation and problem solving. By this way, companies can have access to more creative adaptations and innovative processes avoiding some potential information and knowledge limitations. The existence of multiple content forms, not only enriches the knowledge capabilities but also increases a company’s resilience, helping a company to take the right decisions in their business.

6. Conclusion

Nowadays there are more competing businesses than ever before, making it harder for a company be well succeeded. The many challenges and pressures that companies are facing, create a necessity to be more productive and efficient, in a way to generate more added value and be ahead of competitors. In this context, the topic of innovation is being revealed as an important key factor to help companies to achieve their objectives in a more efficient and competitive way.

It was revealed in this research that innovation plays an important role in business performance. Due to the general increase in current times of competitiveness between companies, influenced by factors such as technological advances that provide the globalisation of markets and access to technologies at reduced prices, innovation is being considered a decisive factor to a company be well succeded. Not only innovation can be important in R&D but also in the other parts of a company such as all the activities of the company's value chain.

The concept of Open Innovation was revealed to be an important element to make the difference, becoming a competitive advantage for companies that consider and practice it. It can provide the access to new talents, new streams and channels, reduce timescales, costs and risks, and increase capabilities. It is seen as a method to have access to more creative minds and better ideas that can leverage the company's capabilities and performance to another level, in a way by having an open behaviour with the exterior, allowing the flow of ideas, information, knowledge and feedback. It is mentioned that companies should not just rely on their internal resources and knowledge for their innovation processes but also use multiple external sources to drive innovation in a more productive and efficient way. In a product, service or process development perspective, innovation no longer depends entirely on R&D departments, and starts to be complemented by joint efforts of external initiatives being incorporated into the company and possible outsourcing, or a combination of several inputs from the external environment are considered for value creation.

Regarding the impacts that open information and knowledge access can bring to companies, it was revealed that it has far more advantages than disadvantages. The new forms of access to information and knowledge, marked by digital transformation, provoke a need of change in the way companies work and operate. These new forms, while opening new ways and means to do business in a more productive and efficient way, can in the other hand, force companies to update and adapt to new technologies to remain competitive, because otherwise, it could lead a company to become increasingly obsolete, with less competitive capabilities that therefore it will compromise their business success.

The interviews showed a general concordance with the existing literature in the research topics centred on the concept of Open Innovation. The interviews made to companies that have their main operations in different countries allow to have diversified results and to get a more broad perspective on the topic and to understand how it is considered in each one. Surprisingly, it was verified in interviews similar perspectives about the research topic in terms of the potential capabilities and outputs that innovation and Open Innovation can provide. Differences were noticed in the purposes of its practice and its concerns about the topic, revealing different methods of practice.

It was clear that Open Innovation can bring more value for the companies and the concept must continue to be explored due to the existence of gaps and incomplete concept topics. As future research, it is proposed to study the differences of impact on the Open Innovation practice in different industries, comparing and understanding the differences and similarities of its practice. It was noticed that Open Innovation could need to be practised in different ways according to the business characteristics and company's industry, where some industries have more innovation requirements than others. Another future research proposal is to study the importance of Open Innovation practice in startups, that it was not developed in this research. It was observed in some interviews and also in the data analysis an interesting connection between startups and the Open Innovation practice, and it could be an important and relevant research topic to develop.

As limitations for this research, it was noticed that the number of interviews carried out could have been greater, feeling that more interviews could have been important to obtain a better and more complete sample, and therefore in the end obtain more solid results for the research.

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