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Major in Politics, Philosophy and Economics
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Open Innovation: An Assessment

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ID Number 097712

ACADEMIC YEAR 2022/2023

Abstract

This paper critically reviews the fast-growing changes that have affected the concept of innovation inside firms over the years. A particular emphasis is drawn on the role of closed and open innovation, defined by Henry Chesbrough, by providing these theories' features and implications. The aim of this dissertation is twofold. First, departing from the existing literature provides an overview of how the shift from closed to open innovation happened and how this last one works inside multinational corporations. Secondly, the analysis is brought forward by considering the importance of open innovation inside the new type of firms, start-ups. A link between open innovation, multinational corporations and start-ups is established, but innovation is also shown to be a fundamental cause of differences in prosperity across firms.

Keywords: innovation, multinational corporations, start-ups, development

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0. Introduction

A nation's prosperity and economic dynamism depend on the competitiveness of its businesses, which in turn depends on the skills of its owners and managers. Throughout his career and up until the 1950s, Schumpeter's theory of creative destruction provided economics scholars with fuel for thought. Since the 1940s, the term "creative destruction" (sometimes referred to as "Schumpeter's gale") has come to be most closely associated with the Austrian American economist Joseph Schumpeter. By deriving it from Karl Marx's writings, he popularized it as a theory of economic innovation and the business cycle. Schumpeter defined creative destruction as the "*process of industrial mutation that incessantly revolutionizes the economic structure from within, destroying the old one, incessantly creating a new one*". According to Schumpeter, an innovator who starts a business creates business chances by developing a new product, a production method, or a marketing plan. When an entrepreneur hypothesizes that a set of resources is not being used voluntarily, an entrepreneurial invention results. Companies encounter a lot of creative destruction ideas while conducting exploratory operations. Still, their true success is in the successful process and development of the existing and new fields concurrently rather than in the pure application of these ideas. An entrepreneur, as an innovator, creates profit potential by coming up with a new product, a new production process, or a new marketing strategy, according to J. Schumpeter's theory of economic development. According to Schumpeterian thought, the basic tenets of economic growth and development boil down to making invention the key to competitiveness and the entrepreneur the destroyer of financial balance. He claimed that economic discontinuities are produced by creative destruction in capitalism, socialism, and democracy. He suggests that:

- An entrepreneurial function is the act of will of the entrepreneur for the introduction of innovation in an economy.
- Entrepreneurial leadership is the source of creative energy for innovation.

- Entrepreneurial profit is the temporary monopoly return on personal activity of the entrepreneur (Schumpeter, 1942).

The core of Schumpeter's theories is the role profit plays in encouraging innovation as a forerunner to creative destruction, even if his idea of a "gale of creative destruction" has received the most excellent attention in academic and practitioner works of literature. The foundation framework for traditional strategic management theories has traditionally been the equilibrium-oriented approach of industrial organization, rejecting the Schumpeterian idea of disequilibrium. In doing so, they emphasized developing a lasting competitive edge for a firm and what Schumpeter called the "adaptive response" of managers. According to Schumpeter, technological advancements purportedly developed for purposes unrelated to specific industries were made available to entrepreneurs who brought those discoveries to market. By introducing a product that was entirely original to the market, the successful innovator was able to establish a monopoly there, only to have that monopoly successfully destroyed by the introduction of copycats. The Schumpeterian approach is an ancestor of the dynamic capabilities approach. However, it places a greater emphasis on organizational dynamics within the company than Schumpeter ever did, and it is not only a supportive theory of industrial transformation. Because of its firm-level perspective and focus on looking inside enterprises to explain market processes, it can also provide a prescription.

The first goal of Schumpeter was to outline the course of economic development in advanced economies. As a result, he began to emphasize significant, revolutionary changes in technology and the product market (Schumpeterian shocks) while dismissing enterprises' prices and other competitive actions as largely inconsequential in the long run. Firms can only predict revolutions in the product, market, or technology to a limited extent. Revolutionary inventions will impact a company in an industry in unforeseen ways, either favorably or unfavorably. Firms in an industry may occasionally survive a revolutionary innovation to play significant roles in a thriving industry. The claim that Schumpeter's theories on innovation and economic development are best summed up in his book "The Theory of Economic Development" (Schumpeter, 1934) lies at the core

of his theory of competitive behaviour. His traditional view of development entails: “(1) *The introduction of a new good – that is one with which consumers are not yet familiar – or of a new quality of good.* (2) *The introduction of a new method of production, that one not yet tested by the branch of manufacturing concerned/.../*(3) *The opening of a new market/.../*(4) *The conquest of a new source of supply of raw materials or half-manufactured goods/.../*(5) *The carrying out of new organisation of any industry/.../*” (Schumpeter, 1934). In light of this, Schumpeter’s definition connects entrepreneurship with innovation in the business sense, specifically identifying market possibilities and using novel strategies to take advantage of them. However, the debate over what constitutes an entrepreneur or “hip” person continues, although Schumpeter’s definition includes an element of entrepreneurship that is new and widely acknowledged: innovation. This reflects the intent of innovation, mainly whether it refers to incremental or quantum changes.

1. Open Innovation

1.1. Closed Innovation and the shift to Open Innovation

Henry Chesbrough (2006) stated “Innovation means invention implemented and taken to market”. Therefore, innovation is the primary factor enabling businesses to thrive, expand, and maintain high profitability. On the other hand, Closed Innovation refers to the traditional approach where companies rely on their internal resources and capabilities to innovate and develop new products, services, or technologies. This model assumes that the company has all the necessary knowledge, expertise, and resources to innovate and create value. Moreover, according to this point of view, successful innovation necessitates control.

If the company has all the necessary resources and expertise to innovate and create value, closed innovation is a self-sufficient model. This model involves a structured

process where the company generates ideas, selects the most promising ones, develops and tests prototypes, and finally launches the product or service. The process is usually managed by a dedicated research and development (R&D) department responsible for the entire innovation process from idea generation to commercialization.

The closed innovation model often relies on a solid intellectual property (IP) strategy to protect the company's innovations from competitors. For example, the company files patents, copyrights, and trade secrets to prevent others from using or copying its innovations. While the closed innovation model has some advantages, such as tight control over the innovation process and the ability to protect intellectual property, it also has some limitations. For example, it may limit the company's ability to access external sources of knowledge, such as market trends, customer needs, and emerging technologies. In addition, it may be slow and expensive, as the company must develop all the necessary capabilities in-house.

According to the closed innovation paradigm, control is necessary for successful innovation. A corporation should, in particular, be in charge of idea generation, production, marketing, distribution, servicing, financing, and support. Internal logic served as the foundation for closed innovation thinking. Some of the closed innovation's implicit rules can be listed as follows:

- We should hire the best and the brightest people, so that the smartest people in our industry work for us.
- In order to bring new products and services to the market, we must discover and develop them ourselves.
- If we discover it ourselves, we will get it to the market first.
- The company that gets an innovation to market first will usually win.
- If we lead the industry in making investments in R&D, we will discover the best and the most ideas and will come to lead the market as well.
- We should control our intellectual property, so that our competitors don't profit from our ideas (H. Chesbrough, 2006).

Closed Innovation's logic started a virtuous cycle (Figure 1). First, businesses made internal R&D investments, which produced several ground-breaking breakthroughs. These discoveries enabled those businesses to launch brand-new goods and services, increasing sales and profit margins. As a result, the companies increased their internal R&D spending, which produced more breakthroughs. Additionally, since the intellectual property that results from this internal R&D are highly guarded, others may not profit from using those concepts.

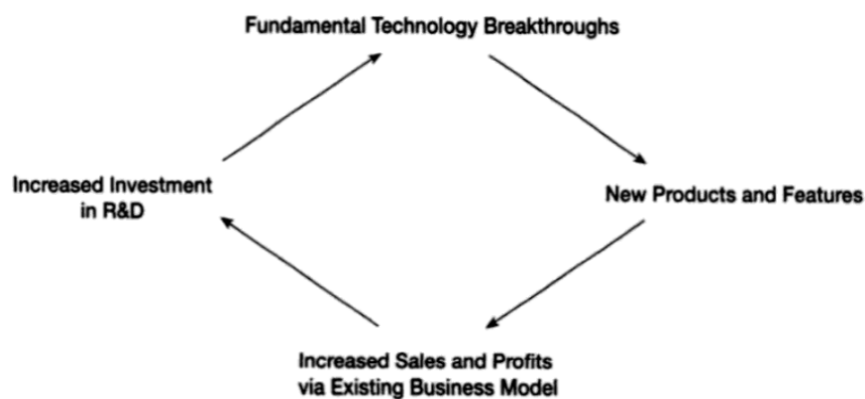


Figure 1, Chesbrough (2006), *The New Imperative for Creating and Profiting from Technology*

This theory was motivated by the fact that academic and governmental organizations were not involved in the commercial application of research at the beginning of the 20th century. As a result, other businesses were left to manage the new product development cycle independently. The scientific community needed more time to engage in more practical science applications. Also, there needed to be more time to wait for other businesses to begin manufacturing some of the parts necessary for their finished product. As a result, these businesses developed into largely independent ones, with little interaction with other companies or academic institutions.

The foundation of closed innovation was weakened by several elements working together. One factor in the decline was the growing amount of college and post-college instruction that many people received. Another contributing factor was the expansion of private venture capital (VC), which specialized in founding new businesses that exploited outside research and turned these businesses into expanding lucrative

corporations. The ever-shorter time to market for many goods and services, which reduces the useful life of a given technology, further challenges the logic of closed innovation. However, consumers and suppliers becoming more aware further hampered the company's capacity to profit from its information silos. Also, foreign companies grew to be more and more potent rivals. When significant technological advances were made, the scientists and engineers who developed them were aware of a second alternative they had not previously had. The start-up business would commercialize these innovations. However, the firm typically failed, but if it was successful, it might succeed in going public or be bought out at a reasonable price. The existence broke the virtuous cycle of an outside path.

As a result, many companies have shifted towards Open Innovation, which involves collaborating with external partners, such as customers, suppliers, and academic institutions, to generate ideas, share knowledge, and co-create value. The notion of open innovation comes from Henry Chesbrough, a Berkeley professor at the University of California who has gained international fame through his book *Open Innovation: The New Imperative for Creating and Profiting from Technology*, which appeared in 2003. This approach can help companies to access a broader pool of ideas and resources, reduce development costs, and accelerate innovation. Each industry has a different level of open innovation due to its particular competitive dynamics and requirements. However, significant economic shifts in recent years have prompted businesses of all sizes to reconsider long-held beliefs about how innovation can and should take place.

Open innovation is founded on the fact that a wealth of knowledge must be exploited quickly to benefit the organization that generated it. The information a corporation learns through research cannot be limited to internal distribution channels. Similarly, the company's internal routes to the market are only sometimes limited to utilizing internal information. This viewpoint puts forth several distinct organizing ideas for research and creativity.

Table I-1 compares the new paradigm's guiding principles to the older logic of the Closed Innovation approach.

Contrasting Principles of Closed and Open Innovation

Closed Innovation Principles	Open Innovation Principles
The smart people in our field work for us.	Not all the smart people work for us. We need to work with smart people inside <i>and</i> outside our company.
To profit from R&D, we must discover it, develop it, and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to market first will win.	Building a better business model is better than getting to market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our IP, so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

Table I-1, Chesbrough (2006), *The New Imperative for Creating and Profiting from Technology*

Generally, the main differences between the closed and open innovation principles are built on the fact that the first is based on self-working, while the second is on collaboration. One example is that before, in the closed innovation model, research was built on the hands of a few intelligent people internally at the firm. In contrast, in the open innovation model, a firm should rely both on internal and external people and do the best work than before by collaborating. Moreover, open innovation is usually less expensive overall than closed innovation because innovators can more closely relate to others' research. In this way, firms no longer have the pressure of originating the ideas themselves to put them into the market before the others and make a profit.

1.1.1. Definition of Open Innovation

Open Innovation is an innovative attitude for the information age that contrasts with traditional corporate research facilities' secrecy and silo mentality. The concept was

initially described as “*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology*”. It is presently described as “*a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model*”. This more current definition recognizes that open innovation involves “creative consumers” and communities of user innovators in addition to being firm-centric.

Although much of the early literature on economic development focused on technology transfer and spin out/spin in, the ideas of open innovation emerged from experiences with developing open-source software (OSS), where new principles for development projects were discovered. However, the scope of the movement has quickly expanded. Regarding patents, open source and open innovation could clash. This tension becomes evident when considering technology that might save lives or other *open-source-appropriate technologies* that might help with poverty alleviation or sustainable development. Participating enterprises can contribute their patents to a third-party organization, pool them, or issue unlimited licenses to anyone, which means that open source and open innovation are not mutually exclusive.

Open innovation is a paradigm that increasingly integrates research across various management science domains. Whilst the idea is still up for debate, many academics believe that open innovation has a broader range of applications. It is predicated on the notion that not all of a company’s best concepts, information, and skills can be used to spur innovation and expansion. In open innovation strategy, businesses actively seek out and collaborate with external partners to co-create, co-develop, and co-commercialize fresh concepts and solutions. These partners may include clients, suppliers, start-ups, and academic institutions. With this cooperative strategy, businesses can access more significant resources, expertise, and capabilities, speed up innovation, cut costs, and improve competitiveness. Furthermore, innovations are easily transmitted between businesses and other firms and between companies and creative consumers, impacting the consumer, the business, the industry, and society. Open innovation investigates

various internal and external sources; therefore, it can also be studied at the industrial, regional, societal, and firm levels and intra-organizational, extra-organizational, and inter-organizational groups. Several studies have also begun to examine open innovation at the individual level (managers, entrepreneurs, or decision-makers), its human side, and how business decision-makers frame the option to apply open innovation or more conventional ways to innovate.

The open innovation approach still eliminates false positives. However, it also makes it possible to recover false negatives or projects that, at first glance, appear almost useless but end up being very profitable. These projects frequently have a market in a new area; if they can be coupled with other initiatives, they might be beneficial. At its core, open innovation is built on the premise that a wealth of knowledge is available, and that this knowledge must be exploited quickly to be helpful to the organization that produced it. Coupled with the successful proliferation of the open innovation principle, at least two forms of criticism have been raised: firstly, that it lacks a clear definition and, secondly, that it is “old wine in new bottles” (Chesbrough, 2006). This sparked a discussion on whether open innovation should be studied or if it is a barrier to theory development. The terms Groen and Linton (2010) and von Hippel (2010), and van de Vrande and de Man (2011) call for increased cross-fertilization among academic disciplines in focusing on integrative, practical problems related to collaborations across organizational boundaries. Groen and Linton (2010) propose dropping the term in favor of “supply chain management”. Von Hippel (2010) highlights the difficulty of different meanings of “openness” among academics.

Innovation’s “openness” unavoidably prompts concerns about access to and ownership of knowledge. Being open to trading assets with outside parties helps improve knowledge availability and makes it more difficult to exert complete control over the generation process and its outcomes. Most innovation research emphasizes the need for planned and structured procedures, either overtly or implicitly. Still, knowledge is also seen as relational and socially produced, making it difficult to bundle into commercial and controllable transactions. Lave and Wenger (1991) describe communities of

practice in which groups naturally form due to members' common interests or objectives rather than organizational affiliation.

Knowledge is sticky and leaky in these societies, where the organizing structure is founded on mutual participation, cooperative activity, and a standard repertoire. Similarly, there are at least two frequent applications of openness concerning innovation in the literature on open innovation. Von Hippel (2010) separates them in the following terms: 1) "open as in open source and open science refers to information commons that are free from intellectual property constraints and open to all" and 2) "open in Chesbrough's sense refers to organization permeability – the openness of a company to acquiring new concepts, ideas, patents, products, etc., from outside – often by licensing protected intellectual property". Even though open innovation is a particular innovation type, it can also be seen as a signpost for a critical aspect of the learning economy. Since a new combination of technology and the market or society is a fundamental phenomenon of economic development, according to Schumpeter (1934), we expanded the concept of open innovation to include a sort of economic model.

The entrepreneur drives innovation in the market open innovation sub-economy through open connections and creative pairings between technology and the market. In this economy, start-ups and small and medium enterprises (SMEs) are the dominant forces. Entrepreneurs create open links and a new business model between society and technology to market open innovation by participating or interacting with the social open innovation sub-economy. By participating in the sectorial innovation system through mergers and acquisitions (M&As), beneficial alliances, licensing, or other open innovation channels, they modify their businesses as they control the design of the closed innovation sub-economy.

The social entrepreneur drives innovation in the social open innovation sub-economy through open linkages and novel pairings between technology and society. Social enterprises are the dominant sector of the economy. Although large corporations contribute to acquiring loyal consumers or a successful business model, they encourage innovative open ideas and novel fusions of society and technology that are challenging to pursue in a profit-driven market. Government funding and assistance for the social

open innovation sub-economy is also evolving into a new socialist model known as the social economy or sharing economy. With democratic and efficient social enterprises, social entrepreneurs can replace bureaucratic and hierarchical socialist organizations. Market open innovation, closed innovation, and social open innovation are not the only types of economic innovation. For example, the relationship between the pace of economic growth and the degree of balance among open innovation (OI), closed innovation (CI), and social open innovation (SI) may be shown in Fig. 2.

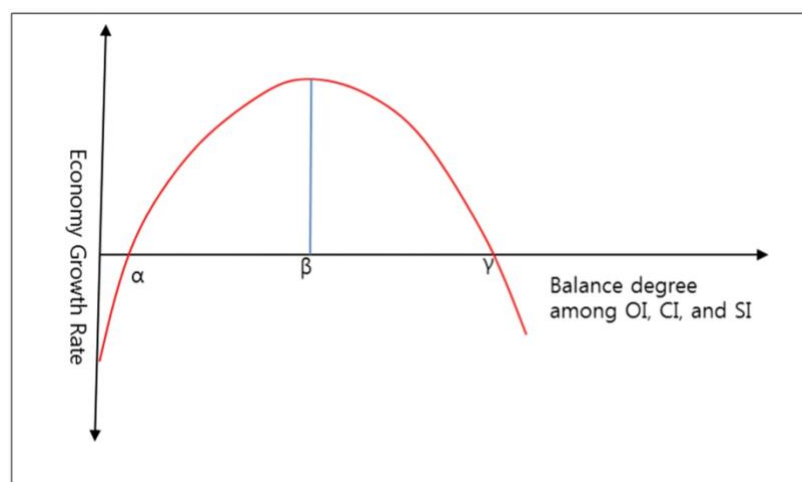


Figure 2, Yun, Won, Park (2018), *Entrepreneurial cyclical dynamics of open innovation*

The economic growth rate will appear negative for very low OI, CI, and SI balancing degrees, such as between 0 and α . However, if the degree of balance between OI, CI, and SI increases after this, the economic growth rate may rise in some regions, such as between α and β . The β point is the level at which any national innovation system (NIS), regional innovation system (RIS), or sectorial innovation system (SIS) exhibits a growth rate at the top of the balancing degree spectrum. Whether using NIS, RIS, SIS, or another approach, the precise position of β in the balance degree spectrum varies. Although the economic growth rate is positive in other balance degree areas between OI, CI, and SI, between β and γ , it will decline. This is because there will be fewer opportunities for innovative combinations between technology and the market or society if OI, CI, and SI are balanced too highly. Therefore, the economic growth rate will decrease in this area

while remaining positive if the balance between OI, CI, and SI improves. Finally, the economic growth rate will be negative at the other balance degree area between OI, CI, and SI, such as between γ and the maximum balance degree, and enhance the negative growth of the economy if the balance degree approaches the maximum. The dynamics are stable. Because the economy shows high growth in Fig. 2, slow growth is not necessarily caused by a lack of innovation in the market. High economic growth can be sparked not by the high invention but by a high dynamic balance of social open innovation, market open innovation, and closed open innovation. The dynamics of the capital or income ratio, the structure of inequality, and the distribution of wealth globally all played a role in the economic development of the 20th century (Piketty 2015). Dynamic balance can mean a variety of things. The first implication of dynamic balance is that innovation is not the primary driver of economic growth. Second, in addition to novel combinations, three open innovations include various non-economic elements as internal drivers of economic development that emphasize entrepreneurial profit, credit and capital, and the interest of money. The third finding of this dynamic balance model is that social open innovation has a new value and is a crucial component of economic growth. Social open innovation can function by combining solid social links with commercial success.

Even though open innovation can reduce costs and increase efficiency, it is not a cure-all. It has some significant drawbacks, posing several issues for a company that could be improved. The first is the possibility of knowledge leaking introduced by OI. Knowledge appropriation risk is presented as more participants take part in an organization's innovation activities and as technology and proprietary knowledge are exposed to more outsiders. Second, a firm's search and partnering costs may rise as it becomes more dependent on outside search and inputs. The price of partnering is increased by investments in partner discovery, managing an expanding number of partner connections, and creating a common ground to facilitate knowledge transfer. Regarding the third issue, open innovation may prevent a firm from gaining performance gains from its technology because of the engagement of outside parties (other firms). According to certain studies, the entry of outside parties weakens firm control over the

technological trajectories, preventing benefits from technologies from ever materializing. Finally, open innovation may impair the company's capacity for internal R&D. The company's R&D capabilities may stagnate and decline if the emphasis is on external contributions.

Although the open innovation research field remains relatively modest regarding the number of articles published, it has expanded dramatically since Chesbrough first established the terminology in 2003. Van de Vrande, Vanhaverbeke, and Gassmann suggest that open innovation should integrate multiple research streams because it encompasses various views. They contend that over time, theoretical connections have been made between, for example, transaction cost economics, the resource-based approach, the relational perspective, absorptive capacity, dynamic capacities, and open innovation research. Additionally, with the development of information technology, open innovation has recently come to encompass activities like crowdsourcing, toolkits, innovation competitions, and innovation communities. According to Huizingh (2011), the open innovation concept's appeal is significant since it meshes well with many current trends in the larger management field. Theoretically analyzed presentations of an increasing number of empirical investigations on the subject have also been made. Success in open innovation takes time to happen. For instance, they established open innovation-focused systems for managing intellectual property and licensing calls for investment in people and processes. The usefulness of open innovation techniques and methodologies and how they interact with specific industry variables (e.g., competitive landscape, regulatory and trade environments) will become more apparent as more businesses adopt openness. "The more people understand open innovation and do it skilfully and succeed, the more barriers to further success will fall away" (Wynblatt, 2022).

1.2. Chesbrough and the paradox of Open Innovation

Chesbrough defines open innovation as: “*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology*” (2006).

In an environment where knowledge is widely dispersed, and boundaries between a firm and its environment are becoming increasingly porous, businesses cannot afford to rely solely on their research and should instead buy or license processes or inventions from other companies, according to Chesbrough. Chesbrough contends that a fundamental change in how businesses develop and bring new ideas to market has rendered internal R&D no longer the invaluable strategic asset it once was. Businesses depended on the presumption that innovation processes were required to be under company control in the previous closed innovation model. The borders of innovation processes are beginning to blur due to changes in society and business that have boosted knowledge workers' mobility and resulted in new financial institutions like venture capital. Projects can start in an open innovation process from internal or external sources, and new technologies can enter different phases. There are other ways to commercialize projects, such as out-licensing or a spin-off business. The emphasis is on converting the organization's once rigid borders into a semi-permeable membrane, making it easier for innovation to flow between the internal R&D processes and the outside environment. The organization of the search for novel ideas with commercial potential is a crucial component of the innovation process.

According to Chesbrough (2007), a business model serves two purposes: it creates value and extracts a piece of it. To capitalize on intellectual property, he contends that businesses must modify their company structures to accommodate open innovation. Additionally, Chesbrough argued that it is more difficult for companies to defend their investments in innovation due to the rising expenses of technology development and the shorter product life cycles. A company can use open business models to tackle costs and revenue by licensing internal technologies and employing external R&D resources to save time and money. Additionally, he contends that businesses must improve their

capacity to test new business models, whether through exploratory brands or spinoffs, like 329 of them investigating the field of open innovation. According to Chesbrough and Schwartz (2007), co-development relationships are becoming more significant in open innovation models. Furthermore, foreign partners are viewed as colleagues rather than providers, according to Chiaromonte (2006). In the opinion of Chesbrough and Schwartz (2007), using partners can result in business models that lower R&D costs, increase innovation output, and access new markets if goals are defined, R&D capabilities are understood, and business models are compatible.

The decidedly non-high-tech consumer packaged goods sector illustrates the broad applicability of the open innovation methodology provided by Chesbrough in his book *Open Innovation* (2006). For example, Protector & Gamble (P&G) altered their innovation strategy in 1999. With an effort named Connect and Develop, the company expanded its internal research and development to the outside world. This project highlighted the need for P&G to look outside the company for fresh ideas. As a result, P&G has established an internal aim of sourcing 50% of its inventions from outside the firm in five years, up from an estimated 10% in 2002, and has created a position titled Director of External Innovation. The company's justification is straightforward: while 1.5 million people are outside, more than 8,600 scientists at P&G are expanding the industrial expertise that enables new P&G services. So why try to create everything from scratch? Also, P&G seeks to spread its viewpoints. After three years, other companies, even direct competitors, might use the concepts that P&G develops in its labs but still need to be adopted by its internal businesses.

However, claiming that all industries follow an open innovation policy today is incorrect. Several initiatives still operate under a closed innovation regime because the erosion factors mentioned earlier did not significantly influence them. Chesbrough asserts that not all businesses implement openness fully; instead, it can be considered a spectrum between high and low degrees of openness. He cites many roles businesses can play in open innovation models, such as funders, generators, or entities that commercialize innovation. In light of this, Chesbrough contends that open innovation businesses must integrate internal research with outside ideas before implementing those

ideas both internally and externally. The challenge for these businesses is determining which crucial component must be supplied internally and how to combine internal and external elements into systems and architectures.

The four components of Chesbrough's (2003) open innovation model is value creation and capture through the business model, transactions/networks with innovation partners, capabilities or competencies, and managing technological and market uncertainty, which is incorporated into the funnel concept. These factors suggest combining various management ideas is the only way to comprehend open innovation. As a result, combining different literature streams that have been generated independently is necessary to analyze open innovation in terms of its underlying theoretical premise. Several management philosophies only partially explain the phenomenon of open innovation. Combining these theories to some extent is necessary to comprehend open innovation from a scholarly perspective. The business model is a relevant framework for connecting these technical choices to economic effects. This concept helps us understand how companies of all sizes can turn technology potential into monetary value, even though it is typically used in the context of entrepreneurial firms. Companies can develop and profit from their new technology in one of three ways: by integrating it into their existing operations, licensing it to other businesses, or starting new ventures that use it in untapped markets.

The fact that technology doesn't have a single objective value by itself is an essential part of this process. Before a technology is commercialized in some form, its economic worth is latent, and the same technology commercialized in two distinct ways will provide different results. In some cases, innovation can successfully apply a firm-familiar business model. Other times, a diverse corporation will have a model that allows it to exploit the technology through licensing and "hire" it for its commercial usage. But, in other instances, a potential new technology could not have a clear economic strategy. Here, technology managers must broaden their horizons to identify a suitable business model, or "the architecture of the revenue," to realize that technology's full potential. These technologies will give the company less value if the management does not act appropriately. On the other hand, those outside the company may get more significant

value than the company that first discovered the technology if they develop a superior business plan. In other words, a mediocre technology pursued within an ideal business strategy might be more valuable than a particular technology in a subpar approach.

The phrase "business model" is frequently used but not always defined. A business model serves the following purposes:

1. To articulate the *value proposition*, that is, the value created for users by the offering based on the technology.
2. To identify a *market segment*, that is, the users to whom the technology is useful and the purpose for which it will be used.
3. To define the structure of the firm's *value chain*, which is required to create and distribute the offering, and to determine the complementary assets needed to support the firm's position in this chain.
4. To specify the revenue generation mechanism(s) for the firm and estimate the *cost structure* and *target margins* of producing the offering, given the value proposition and value chain structure chosen.
5. To describe the position of the firm within the *value network* linking suppliers and customers, including identification of potential complementary firms and competitors.
6. To formulate the *competitive strategy* by which the innovating firm will gain and hold advantage over rivals (Chesbrough, 2006).

A collection of case studies examining partnerships between two firms were given in open innovation. The idea is currently being applied to coordinate many participants across several stages of the invention process. The future of open innovation and innovation, in general, will depend more and more on designing and maintaining these types of innovation communities. This holds for businesses and the greater society in which these businesses function. This idea is called "Open Innovation 2.0" within the European Commission.

The management of community-level open innovation across a wide range of innovative activities is demonstrated by a specific case. The Taiwan Semiconductor Manufacturing Company (TSMC) offers manufacturing services. After receiving a design from a client, TSMC fabricates the semiconductor chip. Chip design is a challenging process that requires several design tools, including process recipes and reference designs. As TSMC rose to prominence in the semiconductor design and production environment, many third-party manufacturers of these tools started to ensure their products would work with TSMC's procedures. This growth in third-party tool offerings gives TSMC's clients additional design options - clearly a plus - but they also make it more challenging to control complexity, raising the likelihood of costly chip redesigns or revisions. Using its Open Innovation Platform, which mixes the firm's design and production capabilities with those offered by outside businesses and then tests them all together, TSMC has handled this issue. Customers receive certification from the tests that their designs will work as intended. With the help of this service, very costly "turns" of the chip design are avoided when the chip is completely redesigned to be mass-produced correctly. Customers of TSMC benefit from a shorter time to market and cheaper design costs as a result.

1.3. How open innovation works.

The technologies, instruments, and procedures used in open innovation are covered in several publications and divided into three primary categories: *Coordinating/aggregating*, *Liberating*, and *Allowing/Including*.

Coordinating/aggregating - Procter & Gamble has created a method of internal connection to enhance the attitude for initiatives that originate from outside the home department (both external sources and from P&G), a technique known as "Connect and develop" used to leverage the distributed innovative capacity. The C&D approach uses a multinational organization's extensive interaction with third parties to identify

potential new product ideas, comprehend market demands, and resolve technical obstacles. Similarly, Tao and Magnotta (2006) give an example of the "Identify and Accelerate" (I&A) process, which is used to develop an understanding of the unique needs of the organization and increase the company's market exposure by working with outside search providers to find solutions to those needs. These strategies also use standard open-source techniques, toolkits for innovation, and mass customization.

Liberating - According to Piller and Walcher (2006), customers possess "sticky information" that is difficult to uncover through conventional market research. They contend that concept competitions can unleash client creativity by utilizing hidden preferences and knowledge.

Allowing/including - Organizational structures frequently focus on internal sources of knowledge and expertise rather than on external sources. So, it is necessary to alter formal models that control the working environment before changing behaviour and culture. For example, extreme programming (XP) is a suggestion by Gassmann et al. (2006) to open innovation. Implementing new working systems must align with the organizational leadership, the employees' roles, duties, and connections, and the procedures already in use. Senior executives' participation is also essential.

Businesses must promote an environment of openness and cooperation, set precise objectives and success indicators, and forge solid partnerships with outside partners to implement open innovation successfully. They must also have the appropriate procedures and resources to manage intellectual property, reduce risks, and ensure that innovation initiatives align with their business plan.

Furthermore, the working mechanism of open innovation can be described in several stages. The first one is identified as *opportunities for collaboration*: businesses must determine what areas, such as research and development, market intelligence, or access to new markets, they can gain from outside expertise. Secondly, *engaging with external partners*: businesses can interact with external partners in various ways, including through alliances with other companies, collaborations with universities or research groups, and interactions with start-ups. Thirdly, *sharing knowledge and resources*: sharing information and resources between internal and external partners is a crucial

component of open innovation. This can involve exchanging ideas, information, know-how, and technology. The fourth is *co-creating value*: companies can co-create new goods, services, or procedures that benefit both parties by working with outside partners. Finally, *capturing value*: businesses need to use licensing agreements, joint ventures, or spin-off companies to capture the value created by open innovation.

In general, the mechanism of open innovation entails a change from a closed and proprietary approach to innovation toward a more open and collaborative process that involves utilizing the pooled knowledge and experience of a more extensive network of partners.

In their 2006 study, West and Gallagher identified four general open innovation strategies:

1. *Pooled R&D* (require shift in culture).
2. *Spinouts* - a way of escaping large firm bureaucracies.
3. *Selling complements* - accepting commoditization or developing differentiated products based on commodities.
4. *Donated complements* - general purpose technologies are sold so users can develop differentiated products (e.g., user toolkits) (West and Gallagher, 2006).

Open innovation scholars have long emphasized how an open innovation strategy boosts business performance. Most open innovation research consistently demonstrates the importance of exploring and exploiting internal and external knowledge for innovation success in dynamic situations. To create and take advantage of innovation opportunities, open innovation "is about leveraging and exploiting knowledge generated inside and even outside the organization." Nevertheless, there needs to be more focus on implementing an open innovation policy. This is unexpected, given how crucial strategy execution is to understand why some businesses succeed when implementing an open innovation strategy while others fail. Because of their knowledge of management challenges, companies frequently fail to implement an open innovation approach. The literature review distinguishes between the impediments to internal and external

knowledge transfer. Acquisition refers to enhancing the firm's internal knowledge base from external sources like suppliers and clients. Transfer refers to the dissemination of knowledge both inside and beyond the company.

Prior studies have shown that issues with knowledge transfer can be resolved by altering organizational norms, expectations, working procedures, and job functions; implementing ad hoc reward systems and formal practices; moreover, utilizing appropriate rules and directives, routines, and group problem-solving techniques. And finally, by creating an organizational structure with efficient governance mechanisms, incentives, and controls. Joia and Lemos (2010), for instance, list interpersonal traits (such as trust and a shared language) as well as strategic knowledge management methods (such as the type of training, rewards, and recognition) as elements impacting the transfer of tacit knowledge inside a company (networks, power, and hierarchy). According to some academics, improving one's ability to absorb information enables one to overcome certain obstacles, most notably the incapacity to recognize and value other sources of knowledge. Recent research implies that organizational, network, and individual characteristics influence the effective use of external source breadth. For instance, Dahlander et al. (2016) contend that for individuals to be successful in inventive search, they must allocate their attention to sources of knowledge and that two individual techniques are workable. They expressly point out that innovative results can result from a local strategy when people focus on the internal network or a cosmopolitan approach when people focus on a vast network of external partners. However, research has yet to examine the strategies used by family businesses that use an open innovation strategy to acquire and share knowledge.

It is possible to identify four archetypical approaches to adopting open innovation: "ad-hoc practice", "precursor Open Innovation adopters", "Open Innovation conscious adopters", and "Open Innovation communities of practice". These approaches are identified as they impact the open innovation path. It is crucial to stress that innovation processes are not limited to an open or closed system, with the former being traditional corporate R&D. Open innovation techniques inside a company can take many different shapes, only occur during specific stages of invention, and be implemented to differing

degrees. First, it appeared that there were two main forces behind implementing open innovation: businesses in stable environments tend to focus on inbound activities, whereas firms in unstable environments were compelled to develop both inbound and outbound activities due to the need for ambidexterity. Second, the publicity Chesbrough's open innovation approach received impacted how it was embraced. Before Chesbrough's book's publication in 2003, businesses that adopted open innovation techniques exhibited dispersed and uncoordinated open innovation efforts at the time of this study. However, companies have established open innovation implementation teams to facilitate the shift to open innovation since his idea gained widespread recognition. Thirdly, internal and external cultural factors influence the adoption of open innovation. Because of the legacy of their organizational culture, businesses may continue to prioritize inbound activities even in the face of technological changes. Yet, it was also noted that enterprises' open innovation strategies could shift due to external cultural factors.

Open innovation methods have gained popularity in recent years. Still, little research and analysis have been done on the level of innovation openness implemented by businesses of various sizes in various industries. Economist Impact created the Open Innovation Barometer after completing a custom poll of 500 corporate executives in the US, the UK, and Germany to close this knowledge gap. These executives work in the telecom, manufacturing, retail, financial services, and automobile industries.

Based on survey questions, the barometer rates an organization's level of openness from 0 to 100, with 0 representing the least open. The following 65 variables had an impact on barometer scores:

- The extent of open innovation practices adopted by the organization.
- Budget and staff allocated for open innovation.
- Executive team support for open innovation.
- Adoption of open-source software (OSS).
- Standard procedures guiding and evaluating open innovation activities (Economist Impact Group, 2022).

A clear image of open innovation advancement - albeit one that varies by industry and organization size - emerges from the barometer numbers. Even though internal (closed) innovation largely predominates, open innovation leaders - companies with sophisticated open innovation practices - say they outperform their industry peers in several crucial areas, including financial performance. Moreover, according to a barometer score analysis, firms that have advanced in their open innovation adoption are far more likely to report significant advantages in key performance categories than those still developing.

1.3.1. Why multinational organizations make use of open innovation.

Many industries are currently embracing open innovation as a management strategy. One of the critical trends in pharmaceutical innovation nowadays, for instance, has been highlighted as open innovation modalities. Based on his consulting model for open innovation, Gaule (2006) leans substantially on Chesbrough's work to examine the effects of open innovation on several organizational components. According to Motzek (2007), several factors drive businesses to engage in open innovation, many of which are also known to prompt entrepreneurs. Also, it is asserted that the main obstacles for start-up businesses (newness, smallness, and market entry) addressed in entrepreneurship literature apply less to open-source software.

Multinational corporations use the open innovation paradigm for a variety of reasons. Multinational firms pursue open innovation because they can access more resources, talents, and expertise than they could internally. They can take advantage of the knowledge and innovation of people outside their organization as well as the resources and abilities of other businesses by collaborating with external stakeholders. Lowering the costs and risks associated with innovation is another reason. Companies might avoid investing in potentially unsuccessful projects by using Open Innovation to share the

costs and risks of innovation with their partners. Utilizing the knowledge and resources of others also enables them to hasten the development of new goods and services. Multinational companies can maintain their competitiveness in a market that is changing quickly with the aid of open innovation. They may keep current on the newest trends, technology, and client needs by working with outside partners, and they can then modify their goods and services accordingly. Moreover, open innovation can assist multinational corporations in forging closer ties with their partners and clients and improving the perception of their brand. Finally, by engaging in open innovation, they may show their dedication to creativity and teamwork and establish a network of devoted and encouraging partners and clients.

So, to increase their competitive potential in the current environment, firms have to open up their processes and apply knowledge from outside sources. *Absorptive* capacity is an essential factor influencing the ability to acquire this knowledge, defined as “the ability of a firm to recognize the value to new external information, assimilate it and apply it to commercial ends” (Cohen, Levinthal, 1990). However, the literature concerning what absorptive capacity is, and its essential characteristics, is highly varied. Moreover, many empirical researchers use R&D intensity as an indicator for absorptive capacity, assuming that higher levels of R&D investments directly improve a firm’s ability to exploit external knowledge, which is not always the case, especially in low technology industries or among small and medium-sized enterprises. Cohen and Levinthal explained the main determinants of a firm’s motivation to invest in absorptive capacity, such as the scope of technological opportunities available to the firm, the nature of the technical opportunity, and the degree of technological performance improvement through external knowledge. The factors that affect absorptive ability can be broadly categorized into those that pertain to intra-firm level analysis and those that relate to inter-firm level analysis. Only when a company's internal structures and procedures and its interactions with other entities considered an absorptive capacity can it be explained entirely.

Investigations into absorptive capacity should consider organizations' competitive advantage and how it relates to inventive performance. Knowledge is the most strategic

resource a company may have from a resource-based perspective. According to Peteraf (1993), the critical components of long-term competitive advantages are founded on knowledge and subtle and intricate understandings that are difficult for those outside the business to get.

The significance of tacit knowledge is highlighted because it supports organizational learning and innovation and maintains a competitive advantage (Grant, 1996). Additionally, businesses gain a competitive edge by doing more than just utilizing their base of essential resources and adapting to changing market conditions. Therefore, acquiring and maintaining a competitive advantage depends on a firm's capacity to acquire, share, and use knowledge, forming its absorptive capacity.

According to Gassmann et al. (2010), outsourcing R&D to save costs and risks and employing complementary assets to spur growth is the first step toward Open Innovation. Chesbrough and Crowther (2006) claim that although the early adopters supported a top-down deployment of Open Innovation, there was also an evolutionary component to open innovation's introduction. What is evident is that significant change is needed to make innovation activities more open. According to evidence, this transformation occurs in three stages: unfreezing, relocating, and institutionalizing. According to the limited longitudinal studies that have been conducted, this transition from "amateur" to "professional" open innovation practice by companies is not smooth or continuous. Across various industries, it is asynchronous and characterized by shocks. It is incremental in that businesses gradually broaden their partner networks beyond their current focus areas and experiment with various organizational structures.

The platform created by Citrix is a good illustration of how open a large corporation uses innovation. Citrix has been pioneering a better way of working for more than 30 years by creating solutions for a secure and unified digital workspace that aids enterprises in unlocking people's potential and giving them a consistent working environment wherever they are and with whatever tool they are using. Thanks to Citrix, users benefit from a smooth working environment, while IT benefits from a unified platform to secure, administer, and watch over many technologies in complicated cloud environments. As a result, over 400,000 businesses, including 99% of the Fortune 100

and 98% of the Fortune 500, use Citrix solutions. Citrix joined the Cloud Software Group, a division of www.cloud.com's mission-critical enterprise software company, in October 2022.

As previously stated, the significant growth of innovation and the requirement to enhance the capacity to create and innovate support open innovation, which is acquiring relevant space in firm management. As a structural component of the approaches to open innovation for businesses that view sharing sensitive assets as an added value, IT plays a crucial role alongside the process methodology and the Citrix infrastructure, which is now enhanced by being a part of the Cloud Software Group. To pursue increasingly flexible work models and a secure digital perimeter around the digital workplace, Citrix's mission is to provide a digital platform that enables the interaction of people, organizations, and things, including third parties, in total security. For instance, a partnership with some Italian start-ups, primarily in the "green" and security sectors, accelerates novel scenarios, focusing on user experience, operational efficiency, and security. A cross-organizational team has been established to coordinate the many activities and collaborations to improve this process, including the cultural exchange between the corporation and the start-ups.

Citrix's openness in open innovation contexts enables businesses in any industry to allow various forms of cooperation dynamically and safely with innovation players, such as start-ups. Citrix can be an enabling partner for combining openness and security while streamlining and facilitating innovation for those businesses looking to evolve their systems effectively and flexibly, free from limitations associated with current or upcoming technological choices. Furthermore, Citrix can guarantee the security of digital spaces in a world where people travel between various locations and systems transparently across devices, networks, applications, languages, protocols, and anything else that supports the dynamic distribution of information applications or IT services.

Citrix creates technologies that support collaboration, workgroup management, and sharing by removing technological, functional, and organizational barriers that could impede improvements and progress, embracing an ecosystem that is always wider, and

favoring mobility and agility without compromising on safety when it becomes necessary to turn to external resources for innovation.

With solid synergies with start-ups and other corporations, open innovation has undoubtedly aided in developing an ecosystem centered on comparison and innovation within an organization. It has also helped to change the client/supplier relationship into a partnership. A platform that enables any organization to open up securely and utilize the best skills that the market makes available can lead to a significant competitive advantage with immediately observable benefits (e.g., increased employee satisfaction, talent attraction, beneficial effects on the bottom line, etc.).

Business dynamism is how businesses grow, die, expand, and compress. The ability to form and manage different capacities emphasizes innovation capacity, whereas business dynamics refers to an attitude toward a setting. Organizations operating innovative capabilities can integrate practical skills and resources to drive innovation successfully. Business dynamism in the United States has slowed in the last few decades. For instance, while market concentration and the corporate profit share of Gross Domestic Product (GDP) have increased, the rate at which new enterprises are starting up has declined, productivity growth has slowed, and the worker share of output has decreased. However, there needs to be more consensus regarding the underlying reasons behind these empirical tendencies, and these trends have typically only been examined in isolation.

2. Start-ups

2.1. How and when start-ups were first created

Over the years, the idea of a start-up has changed. Although the name "start-up" didn't enter the English language until the late 1970s, the idea has existed for much longer.

Small businesses were the first type of start-up, and although they are still common now, they were considerably more common in the early years in the United States. Small

businesses were crucial to the nation's development because they offered products and services that larger enterprises could not. The fundamentals of starting a business - finding a chance, taking a risk, and investing resources to produce something new - remain the same, even though start-ups are more frequently linked with technology-based companies that provide cutting-edge goods and services. Throughout history and into the future, start-ups, in whatever shape they may take, have been and will be crucial to economic growth. One of the most well-known instances of a young company was Benjamin Franklin's printing company. Franklin was a businessman who saw a profit-making chance by publishing books, pamphlets, and newspapers. He opened his company in 1730 and prospered right away. His inventive printing methods and dedication to high-quality customer service contributed to his success. As a result, he resigned from his firm at 42 and devoted himself to public service because of his achievement.

Throughout the past few decades, it has been fascinating to observe the start-up culture flourish. The classic company structure dominated business for the majority of the 20th century. This system features large, hierarchical organizations and a top-down management style. This paradigm had some benefits, such as stability and predictability, but it needed more creativity and dynamism. Therefore, many people found starting a company from scratch appealing. It gave those without access to current business structures a chance to leave their impact on the world. This was especially true in Silicon Valley, where venture capital invested significantly in these start-up businesses. As more individuals learned about this new business manner, the number of start-ups rose quickly. Technology also had a significant impact on the development of the start-up culture during the same period. Computers and software made developing innovative goods and services simpler for business owners. This made them more accessible by enabling them to launch businesses fast and affordably.

Italian venture capital is gradually assuming increasingly significant dimensions: there is still a stage of development that is not entirely satisfactory compared to other countries that are significantly comparable to Italy, but the last few years have indeed been marked

by a reduction in the gap that characterized the system. Moreover, the alignment between venture capital, start-up and corporate is a new opportunity for Italy.

Millions of start-ups are now launched every year in nations all over the world, making them a worldwide phenomenon. They have contributed significantly to our culture and economy, generating wealth and employment for many people. The start-up culture's emergence is a thrilling journey that has just started. As companies change the world in novel ways, we will likely see more innovation and disruption. Right now, start-ups are significant role models for the innovation sector. Offering new items is essential, but so is helping to increase production and create jobs. This is because start-ups are growing in quantity and variety at the same time as they are also developing into complex problems. Moreover, their development and creation involve various actors. Among others, from colleges to incubators and accelerators, established businesses to governments.

Giving a singular definition of start-ups is challenging. Start-ups are businesses created to test new business models built around novel concepts, usually by several co-founders or team members. Furthermore, start-ups are human organizations designed to produce creative goods or services in the face of great uncertainty. Various writers outline the characteristics of start-ups, first, as a form and merit dynamism that comes from surviving in a volatile, unpredictably changing environment. Yet, each author has their interpretation of the idea, and there is no agreed-upon description of what a start-up is in the literature. The definitions mentioned above are general, and this circumstance illustrates the absence of scholarly literature on the meaning of start-ups. *“A startup is a company, a partnership or temporary organization designed to search for a repeatable and scalable business model. Through the startup phase, new ideas are brought to the market and transformed in economically sustainable enterprises”* (Blank, 2010).

“After about three years in business, most startups cease being startups. This often coincides with other factors that indicate a graduation from startup-dom: acquisition by a larger company, more than one office, revenues greater than \$20 million, more than 80 employees, over five people on the board, and founders who have personally sold shares. Somewhat ironically, when a startup becomes profitable it is likely moving

away from startup hood. One thing we can all agree on: the key attribute of a startup is its ability to grow” (Robehmed, 2013). This Forbes quotation lists several interrelated factors. It refers to these criteria using relative terms, implying that most (but not all) start-ups cease to exist after three years. This definition coexists with many other factors, the most crucial of which is the capacity for growth, though without providing a clear explanation of development. Given that start-ups are also anticipated to be small and that many of the interviewees' accounts below identify start-ups with the absence of a finalized product and, thus, the inability to develop meaningfully, the growth definition of a start-up is particularly intriguing. According to the Forbes quotation, defining a start-up involves setting standards for determining which businesses qualify for or not for inclusion in the start-up parameter. Instead of asserting that start-ups are empirically unique from other types of small businesses, much of the process of defining start-ups is about setting the trend or the discursive management of which enterprises can or should be excluded from the term.

A firm's size can help identify whether it is a start-up. Although "size" isn't always precise, it's typically assumed that length refers to the total number of employees, whether they are paid formally as employees, receiving other forms of compensation, or working for free. Practically, the number of paid or unpaid employees is an illustrative requirement for start-up definitions. Still, by itself, this is not an accurate indicator of whether a company is a start-up or not. First, there needs to be more disagreement over how many employees a company need to stop being a start-up. Second, the number of paid employees might need to accurately reflect the number of company employees, including those without formal employment agreements or pay. Many people live off savings during the early stages of a start-up business, while others (albeit less frequently) get paid in rent, food, and a modest stipend below market rates. Third, many small firms, such as family-owned eateries, would not likely fit under a definition of a start-up that is not based on the number of employees. Fourth, companies that employ many people but need a marketable product or are still in the funding or user-acquisition stages should be kept from the definitions of start-ups.

However, it is necessary to relate to a start-up statistic to better understand the world of start-ups. Firstly, it is relevant to point out that approximately 90% of start-ups around the globe fail; lack of product demand is the prime reason for start-up failures in 2023, and it takes 2-3 years on average for start-ups to make a profit. On the other hand, North America has the highest number of unicorn start-ups, followed by Asia and Europe; start-ups around blockchain, E-commerce, artificial intelligence, and Fintech are overgrowing as of 2023. Additionally, 60% of start-ups begin at home, equivalent to around 32.5 million small businesses in the U.S.A.; as it is possible to see in Figure 3, the U.S.A. created 3,114,111 new jobs in 2020 alone via start-ups.

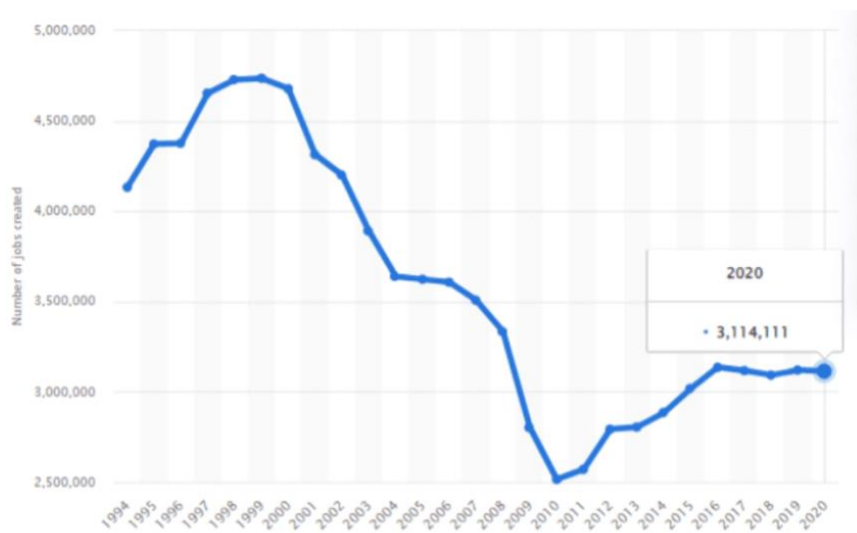


Figure 3, Statista

There are 31.7 million small businesses in America, and small businesses account for 99.9% of U.S. businesses. Figure 4 shows an overview of the top 10 countries with the most start-ups. Indeed, the U.S.A. leads the way regarding the number of start-ups. It is home to around 72,560 start-ups.

Country	Number of Startups
The USA	72,560
India	13,905
The UK	6,396
Canada	3,446
Australia	2,399
Indonesia	2,391
Germany	2,320
France	1,579
Spain	1,411
Brazil	1,165

Figure 4, Ruby (2023), *Demandsage*

The global e-commerce unicorn market size is \$114 billion; moreover, unicorn start-ups in the finance and insurance sector had the most significant market valuation accounting for \$526 billion.

Even so, only 40% of start-ups are profitable, and 1/3rd of start-ups continue to lose money. Figure 5 shows an overview of the most common reasons for start-ups to fail, and the most relevant to notice is the lack of product demand – 34% of start-ups fail due to it.

Reason for failure	Share of Startups to fail due to it
Lack of product demand	34%
Marketing Problems	22%
Team Problems	18%
Financial Problems	16%
Technical Problems	6%
Legal Problems	2%
Operational Problems	2%

Figure 5, Ruby (2023), *Demandsage*

Progressively, in Figure 6, there is the possibility to see the balances between the start-up failure and success rate through the top 10 high scores countries. The general trend in all countries is having a failure rate higher than that of success. For example, the five-year survival rate for start-ups in the United States is 51.3 per cent.

Country	Startup Failure Rate	Startup Success Rate
The USA	80%	20%
Canada	80%	20%
The UK	70%	30%
France	80%	20%
Germany	75%	25%
Switzerland	65%	35%
Estonia	75%	25%
South Africa	86%	14%
Hong Kong	70%	30%
Singapore	70%	30%
Australia	75%	25%

Figure 6, Ruby (2023), *Demandsage*

Studying start-ups as a strategic element of the growth of the creative economy brings to light the key traits that define their unique function in economic development. The forerunners claimed that start-ups:

- Have unlimited potential, both in terms of customer base growth and product profitability.
- Implement “breakthrough innovations” that open a new technological cycle, because their goal is not to develop the existing basic technology, but to completely change the technology and radically change the market.
- Are implemented with a high level of uncertainty.

- Are implemented based on an idea that is intended to change the current state of affairs, improve the way a goal is achieved, or solve a specific problem.
- Are likely to provide a high return on investment (Ivanova et al., 2021).

Many of today's mega-corporations, such as Meta, Apple, Google, Amazon, Canva, Bijous, and many more, began with a person and an idea. Finally, today thousands of companies are attempting to do so in the gaming, crypto, healthcare, fashion, and banking industries. For example, suppose an entrepreneur wishes to achieve unicorn status. Then, they must coordinate several aspects, including the excellent product, the quality of the service, the suitable market, and the timing. These elements are essential for luring investors and establishing a new business.

2.2. How start-ups work

The core function of a start-up is to turn concepts into tangible goods, gauge consumer reaction, and decide whether to pivot or press forward. Successful start-ups build a parallel approach to product development through trial and error, hiring and dismissing. When the product is being developed, the business is also engaged in a learning process. Product development is concentrated on internal product-centric activities, whereas the learning process primarily involves customer-centric activities outside the organization. Even though most companies fail in the early phases, an entrepreneurial society promotes this driven economic growth by creating institutional environments that are favorable to entrepreneurship.

The quality of the idea, the way the business plan is carried out, the people behind it, the market's demand, and the availability of capital are just a few of the variables that might affect a start-up's success. The first stage is to develop a workable business concept that addresses a market demand or problem. The following step is to conduct market research to ascertain the potential need for the good or service once an idea has been established.

Next, the start-up should develop a business plan, including the product or service, target market, marketing strategy, financial predictions, and operational plan based on market research. Most businesses need funding to get started, which can be done via various resources, including crowdfunding, angel investors, and venture capital firms. After obtaining money, the firm can begin working on the product or service. Following the product or service creation, the start-up can launch, market to clients, and start selling. To remain competitive as the start-up expands, it must improve its business plan, scale operations, and develop new ideas. Of course, each start-up is different, and the precise procedures and schedule may change depending on the sector, type of product or service, and other elements.

As was mentioned before, finding the correct funding is one of the toughest challenges for new businesses. Finding investors can be challenging and time-consuming, and they are not guaranteed to back a particular company. Moreover, there needs to be a transparent business model or product strategy to ensure that many firms succeed. This means that for entrepreneurs, having a sound plan in place before establishing a business is essential. The difficulty of expanding their operations is another problem many entrepreneurs face. Keeping up with demand and managing expansion can be difficult when a firm thrives. If not handled properly, this could maintain resources and avoid problems with cash flow. Managing team dynamics is another issue that start-ups frequently face. At the early stages of a business, there are typically just a small number of participants with a shared vision. Keeping everyone on the team motivated and committed at this same level might be challenging as the company expands. Again, if not managed properly, this may result in arguments and even exits. An example of people recruiting is given by Indian Companies that have compelled the most significant number of people in Q4 2022 (Figure 7).

Company	No. Of People Recruited
Wipro	45,416
TCS	35,209
Infosys	21,933
Cognizant	12,200
Tech Mahindra	6,106
HCL Technology	2,223
L&T Technology	743

Figure 7, Ruby (2023), *Demandsage*

Although these difficulties and failures in the start-up sector occur often, they don't always have to be viewed negatively. It is possible to learn from these errors and move on with success by comprehending why certain start-ups fail. Any ambitious entrepreneur can realize their dream of becoming a business owner with careful preparation and execution.

A start-up's development, from conception to departure, is an ongoing process. Because so many variables are involved, it can be challenging to pinpoint precisely where you are in the start-up lifecycle. The length of each start-up phase will differ significantly based on how your business, your sector or industry, and your funding capacity are run. Knowing where you stand on the continuum is helpful for entrepreneurs, especially those running start-up businesses in their early stages. Your position can influence potential partners, employees, investors, and other parties' views of your growth and prospects. When a scalable idea gets money, a start-up enters this stage, which lasts until you land your first Series A investment round. Your position in this phase is described by several ambiguous phrases, including "seed," "pre-seed," "post-seed," "pre-A," "seed extensions," and others. These expressions only apply to certain moments throughout a frequently lengthy and challenging phase of traction and expansion. Early-stage starts with a potentially scalable concept for a good or service that targets an unprofitable market. In addition to yourself, your team may only consist of one or two other

individuals, and its structure may be vague. You and your team are laying the groundwork for a launch despite no formal structure or strong commitment to the idea or business. Recognize that your time, money, ideas, rent for physical facilities, store of business relationships, supplies, equipment, and participation in very early-stage start-ups, could all be in danger. Companies that can afford to pay market wages and rent typically differ from those just starting.

You should now clarify your vision and mission, set essential benchmarks, and create a plan for achieving these objectives. The company's core co-founders, who have complementary abilities, are dedicated to it, and you're laying the groundwork for creating your first product or service. An accelerator is a wise choice later in the early stage when you have built your product, a network, and some sales. If you have little company experience, a small network of business contacts, or you operate in an uncharted market or industry, accelerators can be helpful.

A start-up accelerator's main objective is to aid in accelerating your start-up's growth. It is a mentor-based program that offers intense direction, assistance, and structure for a predetermined amount of time, usually three months. Applicants to start-up accelerator programs are expected to have more than just an idea. In a perfect world, you would already have a product or a prototype. You will be exposed to various consultants and seasoned businesspeople who will assist you in developing your product, honing your business strategy, and - most significantly - building relationships with investors in exchange for 5-10% of your ownership. The objective is "demo day," you will pitch your concept to possible backers and other interested parties, such as the media.

Angel and venture capitalist investors want to be persuaded that you have a great product, a clear market niche, a business plan, and a capable team to carry it out because they are taking a significant risk. The early-stage of fundraising typically requires a lengthy evaluation of various financing possibilities due to the increased risk component. The early-stage is characterized above all by the fact that you are still gathering the evidence and performance metrics required to build a compelling pitch deck for seed money or Series A funding. The start-up phase of a venture-funded start-up lasts for an average of 18 to 24 months for each round, starting when you get your

first Serie A round. Establishing a fundraising foundation that can assist you in drawing in future investors is crucial for your first round. When a Series A investor thinks your business has a terrific product or service, a solid growth strategy, and the talent to scale, you move into this stage. Your business is currently undergoing a challenging transition from one that could rise to one that is now anticipated to meet milestones set out to investors. Despite having additional Series A funding rounds, the first round is frequently the most significant. Building out your personnel and infrastructure to support your expanding company is made possible by Series A investment. One main task during the Series A phase is setting up your sales function. The scaling process can be unpredictable, so staying flexible and ready to change course quickly in the face of setbacks or opportunities is critical. A founder will also pay attention to the big picture. It will be necessary to redistribute little responsibilities so you may concentrate on guiding the business through the growth stage.

A start-up in its late stages has reliable finance sources and is carrying out its business plan. The potential is everything when seeking Series A capital from investors. The focus right now is on performance. Traditional venture capitalists and family offices are the most common types of investors. Your business has proven its capacity to expand if your venture-funded stage is flourishing, and you can get Series A funding. This typically indicates that you have all the necessary sales, deployment, and support teams in place in the context of an organization. You may have engaged a CEO at this stage of the start-up process which is better suited to overseeing daily operations.

More staff have also been hired, and your business has solidified its place as a participant in the market. However, even when your business is up and running, it still needs fuel. Therefore, fundraising and employing staff should be your main priorities. Finally, it would be beneficial if you considered quitting your founding role in the business. At this point, a sale or an IPO are common ways for founders and their investors to exit the business. To establish your business, you put in a lot of effort. It could be time to appreciate what you've accomplished.

2.3. Start-ups in open innovation

Open innovation in start-ups is a primarily uncharted area, and hardly any studies concentrate on collaborative creativity between start-ups and giant corporations, as seen from the perspectives of the former. Open innovation research has focused mainly on large companies, while small and medium enterprises have received little attention. Start-ups are bound by their liability of newness and smallness and lack access to adequate resources. The scarcity of resources compels start-ups to look for external partners in various stages of developing and commercializing their ideas or technologies. Therefore, open innovation is even more critical for start-ups than for large companies. Start-ups must adopt open innovation strategies to avoid the risks of being inexperienced and tiny. However, the mechanism by which start-ups organize and manage open innovation still needs to be fully explored.

Start-up businesses and other players involved in innovation processes must comprehend how the network's structure and operations impact their operations and results. When discussing networks in the context of start-ups in open innovation, two key factors are pertinent:

1. The impact of quantitative/structural differences in the network on innovation processes and outcomes.
2. The impact of qualitative differences in a single organization's relations with the other actors on innovation processes and outcomes (Spender, Corvello, Grimaldi, Rippa, 2016).

Start-ups can use open innovation in different ways, and collaboration with large firms is one of the crucial modes for them to engage in open innovation. Unfortunately, partnerships between large firms and start-ups have usually been approached from the perspective of the large firm that needs external knowledge to strengthen its innovative performance. The licensing literature, the venturing corporate literature and the literature on R&D collaboration and technology acquisition all have a severe bias by

analyzing the collaboration from the large firm's perspective. Therefore, the open innovation literature is no exception yet. To craft successful partnerships between large companies and start-ups, it is necessary to understand the perspective of both types of organizations. Their goals and processes must be aligned, which is only possible when both partners understand the other's point of view. In too many cases, open innovation between large firms and start-ups ends nowhere because of unarticulated differences in goals and business processes. The effect of alliance terms on the innovation performance of start-ups is a pertinent question in this situation. While discontinuous (i.e., short-term) alliances with customers, suppliers, and competitors positively impact start-ups' capacity to produce incremental innovation, continuous (i.e., long-term) alliances with these parties positively impact start-ups' ability to make radical innovations.

By nature, start-ups rely more on external partners. However, there still needs to be an explanation of which mechanisms start-ups use to organize and manage collaboration successfully with external partners. Neyens et al. (2010) found that partnerships between start-ups and other businesses to combine their complementary abilities impact the performance of incremental and radical innovation. Start-ups are different from SMEs as the liability of newness also bounds them. However, they are similar to SMEs; they both face a scarcity of resources, usually labelled as the liability of smallness. Start-ups share many commonalities with SMEs regarding strengths and challenges, but their complexities are exacerbated due to their weakness of newness. Extant literature shows that open innovation is an important innovation tool for start-ups to overcome the scarcity of resources. The liability of smallness and novelty encourages small companies to innovate in collaboration with other firms. Small companies benefit more from open innovation than large companies due to simpler organizational processes and adaptability to changing business landscape. However, start-ups need help in successfully bringing innovation to the market. Start-ups differ significantly in innovation activities from established firms. The lack of complementary assets, funding constraints and increasingly competitive business environments prompt start-ups to seek external knowledge/resources. Nevertheless, open innovation creates a win-win

situation for start-ups and large companies. The large company also shares resources such as time and expertise, which is very valuable for the success of start-ups.

While corporations must innovate to remain ahead of competitors and disrupt and access new technologies, start-ups can profit from corporate investment, resources, and customer access. Start-ups can be trying to gain access to the markets of the corporate partner or convert the partner into a client. Additionally, having a business partner can impress investors. Faster innovation is a significant factor on the business side. Businesses often discover that start-ups outperform them in their markets and wish to hire them. They might desire to learn first-hand about cutting-edge technologies and emerging industries. They can also want to change their working style to become more agile.

Open innovation is rewarding for start-ups, but they face several barriers to reaping its benefits. The entrepreneur or CEO, hereafter referred to as a start-up manager, plays a crucial role in organizing and managing open innovation with large companies because corporations are arranged in a complex way. There are different layers of decision-makers, and it is challenging to access corporate resources for start-ups and small companies.

The research on open innovation focuses on two critical modes of open innovation – inbound and outbound open innovation. In inbound open innovation, external ideas or technology flows into an organization, while in outbound open innovation organization's internal ideas or technology are used by another organization that is better poised to develop further and commercialize it. Later, start-ups engage with several external partners to gain new ideas or technologies. In outbound open innovation, a start-up acts as a technology provider to a large company and becomes an essential source of innovation. Though the existing literature shows that start-ups can benefit from open innovation practices, some literature on inbound open innovation shows a negative effect in some cases mainly attributed to the reduced control over core competencies and weakened knowledge appropriability.

Acquiring start-ups is the logical extension of corporate venture capital (CVC) investments, which serves as a quick way to buy new technologies and solutions for

specific business problems or enter a new market. “Acqi-hiring”, a famous practice for acquiring a company to access its talent, is one of the essential objectives for buying start-ups. The idea of corporate venture capital is to give corporations easy access to new ideas coming from start-ups by financing them. Chesbrough (2002) defines corporate venture capital as the “investment of corporate funds directly in external start-up companies”. Further, this concept complements the corporation’s research and development activities. In the second quarter of 2016, more than 8 billion USD of corporate venture capital was spent within the US-software industry, followed by biotechnology with almost 1.7 billion USD. Therefore, the impact of this concept is visible. In terms of countries, the United States, Japan and Germany have the most CVC activities. A firm either invests in external start-ups because of strategic or financial purposes. On the one hand, corporate venture capital aims at establishing strategic relationships between start-ups and corporations while already investing at an early stage of the start-up phase – most frequently between the early and mid-stage. While some corporate venture capital activities aim at getting financial returns from the fulfilled investment.

However, for open innovation to succeed, connections between big and small businesses must be based on trust and produce win-win outcomes. Fortunately, many big companies effectively work with several small businesses to develop ground-breaking goods. Additionally, there are more and more chances for cooperation between big and small businesses. Shortening product lifecycles, rising global rivalry, and increased technological complexity are the underlying forces behind this trend toward open innovation. Many multinational corporations rely on internal and external information sources to generate new business. Even industry titans like P&G, Unilever, Philips, and Siemens, to mention a few, are relying more and more on the technology and knowledge of outside partners. Some examples of potential external sources of knowledge are universities, research facilities, a group of specialists, lead users, and knowledge brokers. Venture capital firms typically sponsor small (high-tech) businesses and are another intriguing source of outside expertise for big companies. Nowadays, more and more established corporations often work with these start-ups to develop new ventures

using their technologies. Large corporations, therefore, have a solid motivation to join these high-tech businesses as their preferred choice. In addition, established enterprises know how to resolve disputes and coordinate their corporate strategic goals with expanding new companies to achieve venture investors' financial goals. Corporate investors and venture capitalists rarely, if ever, have mutually beneficial interests, yet they still need to manage any possible conflicts. Corporations can gain a reputation as reliable investors, which enables them to draw the most significant technological enterprises to them.

The existing literature has frequently emphasized how partnerships between small businesses and established corporations enable both to gain significant advantages. Aggarwal and Wu (2018) review the literature on the collaborative relationships between start-ups and established businesses, highlighting the possibility of value creation through the fusion of start-ups' know-how and innovations with established companies' complementary knowledge assets. However, the notion that collaboration is advantageous for influential organizations and start-ups is disputed by certain scholars. In a meta-analysis of corporate venture capital, Huang and Madhavan (2020) discovered that corporate benefits outweigh venture benefits. According to Minsky (2019), some significant corporations establish "innovation theatres" to boost their reputation and attract fresh talent.

Several authors believe that benefits and challenges characterize the collaboration between corporations and start-ups. Several potential challenges for start-ups have been identified. The diversity between the partners can affect the likelihood of successful cooperation, and a negative experience can even impact the future innovativeness of start-ups. Working with large corporations requires a different cultural approach and different ways of organizing work based on hierarchies and bureaucracy, which start-ups need to be used to. Numerous factors internal to the start-up, such as competence, attitude, relationship, and resources, influence the success of the collaboration. Particularly between start-ups and major enterprises, the power disparity among partners can breed mistrust. Relevant is also whether the start-up is appropriate for the given project. Even though start-ups can contribute significantly to exploratory projects, only

a tiny percentage have the finances and abilities to scale up quickly and meet regular supply purchase requirements. Given the entrepreneurial nature of start-ups, the members of the entrepreneurial team's traits, such as self-efficacy, also play a crucial role.

The traits of significant companies, as perceived by start-ups, also influence the partners they choose for collaborative projects. Goncalves et al. (2020) researched how culture affects organizational agility and how it hinders or enables digital innovation in incumbents and start-ups. The most creative start-ups had a clannish and adhocratic culture and were willing to collaborate with established companies. However, these start-ups underlined the necessity for a win-win scenario. They hesitated to engage with incumbents who wanted to work with start-ups only to enhance their reputation.

To avoid future competition, an incumbent corporation may acquire an inventive target and stop the target's inventions from being developed. Such acquisitions are what we refer to as "killer acquisitions," as they eliminate potentially lucrative but probably competing innovations. If the new project overlaps with a product or project in the incumbent's portfolio, the acquirer has lower incentives to continue development than an entrepreneur. "The monopolist's disincentive created by his pre-invention monopoly profits" (Arrow, 1962) is a typical, well-known outcome. A killer purchase is one where the acquiring company's objective is "to discontinue the development of the targets' innovation projects and pre-empt future competition," according to Cunningham et al. (2018). This is, therefore, a theory of harm, as should be obvious.

This disincentive to innovate might be so significant that an established company may buy a cutting-edge start-up just to kill off the projects of the start-up, stopping the gale of creative destruction of new inventions. Notably, the killer acquisition motive must exist for some acquirer-target overlap. Therefore, it is common for competition agencies to be concerned about ensuring that such start-up businesses have a level playing field and the chance to compete on their own merits without the danger of exclusionary practices from dominant incumbents. However, their importance to merger control has historically been limited to their position as new participants. In this capacity, they could indicate to an agency that entry barriers are low or, in some situations, offer proof that

a relevant market was expected to become more competitive shortly. They hardly ever appeared as merging parties, though. At least once, they had the chance to grow into a more prominent firm, which in many markets took some time since firms needed to invest in physical infrastructure and high marginal costs. Moreover, they were thought to impose little competitive constraint as small firms with low turnover.

The theory of killer acquisitions found relevant comprehension in the pharmaceutical sector and the distribution of drugs. A killer acquirer or continuing acquirer will always be the incumbent with the product that is the least different from the entrepreneur's project among prospective incumbent acquirers when their levels of development differ from the entrepreneur's project argument. The decision to purchase a particular firm to dissolve it and the reduced incentive to develop acquired initiatives that erode the acquirer's current profits combine to form killer acquisitions. It is possible to foresee that (i) overlapping drug projects should be less likely to be developed after an acquisition; (ii) this difference in development choices between overlapping acquired drugs and their non-overlapping acquired or non-acquired counterparts should be more pronounced when (iii) future competition is low; (iv) acquisitions by incumbents should target entrepreneurial firms developing drug projects that overlap with the incumbent.

When it comes to the pharmaceutical industry, creating novel pharmaceutical products - often referred to as branded or patented medications - involves a standardized set of organized milestones before commercialization. Regarding what's essential, acquiring incumbents should buy target companies with similar pharmaceuticals. The tendency to frequently make overlapping purchases does not identify a strategic killer acquisition purpose. However, alternative corporate development and acquisition models cannot account for our acquisition and drug development findings. When the target's technology or project is still in its early stage, incumbents in the pharmaceutical business frequently execute acquisitions.

If killer acquisitions leave the ex-ante incentives to originate ventures untouched, the impact on consumer surplus is unmistakably negative. When such purchases are permitted, all incumbents- including the entrepreneur and the acquiring incumbent - benefit. However, consumers suffer from a lack of competition and the eradication of

cutting-edge new products. Additionally, purchases may influence the kind of innovation. Raising the level of existing competition not only has well-known immediate benefits for social welfare but also discourages incumbents from engaging in killer acquisitions of future competitors, increasing future competition and further discouraging killer acquisitions because killer acquisitions are less likely to occur when incumbents face significant existing competition. The effect of corporate acquisitions on innovation should be rigorously examined by antitrust laws in the future, especially when such mergers ostensibly stop the development of future competitive products and technologies.

3. Case study: Ventilators – Newport Medical Instruments / Covidien (2012)

3.1. Company description and status

Although innovation is essential for many businesses, it is crucial for the pharmaceutical and broader health-related industrial sectors.

Since the beginning, R&D innovation in the pharmaceutical industry has primarily been conducted internally, adhering to the closed innovation model. All intellectual property was created on-site and maintained within the boundaries of the business until the new goods were introduced to the market. The pharmaceutical industry has quickly moved toward adopting the open innovation model, intending to acquire or commercially exploit technologies and knowledge but also to increase the overall innovation potential of the company. Some pioneers began complementing their internal R&D efforts through collaborations in the 1990s. Due to increased complexity, new technologies, the availability of highly qualified experts outside the pharmaceutical companies, and increased pressure on time and cost, the pharmaceutical industry has been forced to access outside sources of innovation to realize the potential of open innovation fully.

Pharmaceutical corporations will move even more quickly toward open innovation due to the COVID-19 pandemic. The COVID-19 outbreak example demonstrated the importance of speed, open communication, and teamwork for addressing global difficulties, finding quick answers to complicated problems, and mitigating risk using intellectual property. This is demonstrated by the abundance of public and private funding for open innovation projects that address COVID-19.

It has become clear that the traditional approach to innovation in the pharmaceutical sector needs to be supplemented with a swift path to innovation that focuses on quickly getting in touch with start-ups and innovators and having the flexibility to reuse existing ideas, know-how, and technology. To develop vaccines and find therapies for COVID-19, the community of researchers and scientists, start-ups, and pharmaceutical corporations have collaborated openly and across disciplines. These relationships have been one of the critical success factors.

A group of American public health officials devised a proposal to solve one of the medical system's critical vulnerabilities - a lack of ventilators thirteen years ago. The breathing-assistance devices tended to be large, pricey, and scarce. So, the idea was to create a sizable fleet of low-cost portable machines that might be used in an emergency, such as a flu pandemic. Finances were budgeted. The contract was with the government. The work began. Then, everything abruptly turned off course. A multibillion-dollar medical equipment manufacturer purchased the modest California-based business contracted to create the new machines. In the end, the project generated no ventilators. That failure prevented hospitals, states, and the federal government from stocking up, delaying the creation of an inexpensive ventilator by at least five years. Finally, in 2014, the federal government began working with a new company whose ventilator was only recently licensed and whose products have yet to arrive.

The nation's emergency response stockpile is awaiting its first shipment as COVID-19 wreaks havoc on America's healthcare system. Since there aren't enough ventilators available, it has become urgent for doctors to decide who will and won't be allowed to breathe. The failed attempts to develop a new category of affordable, simple-to-use ventilators highlight the risks of contracting out important public-health projects to

private businesses, as their emphasis on maximizing profits is only sometimes consistent with the government's goal of crisis preparedness. The Aura project was launched after a string of almost-pandemics, including SARS, MERS, avian flu, and swine flu.

Rethinking their approach to the next public health emergency was the decision made by federal officials. The last line of defense for patients with respiratory failure was ventilators, but they also considered immunizations, antiviral medications, safety equipment, and protective gear. Full-service ventilators were present in the Strategic National Stockpile of the federal government but needed to be in the numbers required to combat a significant epidemic. As a result, the Biomedical Advanced Research and Development Authority was created by the Department of Health and Human Services in 2006 to prepare medical solutions to infectious diseases and chemical, biological, and nuclear assaults.

The research organization thought about increasing the number of ventilators throughout its first year of operation. In a moderate influenza pandemic, it was predicted that an additional 70,000 machines would be needed. The national stockpile's ventilators could have been better. Instead, they were large, expensive, and required extensive training. To create a list of specifications for a new generation of portable, simple-to-use ventilators, the research organization assembled a group of experts in November 2007. The government requested proposals in 2008 from businesses interested in creating ventilators. According to budget documents the Department of Health and Human Services sent to Congress in 2008, the objective was for the machines to be licensed by regulators for widespread deployment by 2010 or 2011. The government would then add ventilators to the national stockpile by purchasing up to 40,000. Each ventilator was supposed to cost less than \$3,000. The more machines the government could purchase, the lower the price.

Businesses offered prices for the Project Aura project. As a result, the research organisation decided against working with a well-known, prominent device manufacturer. Instead, a small business in Costa Mesa, California, Newport Medical Instruments, was selected. The H1N1 virus, which the Centers for Disease Control and Prevention (C.D.C.) estimated infected 60 million people and claimed 12,000 lives in

the United States in 2010, started to fall off a few months after the contract was formally given. According to the agreement, Newport was to earn \$6.1 million upfront, with the government promising to pay millions more when it acquired hundreds of machines to strengthen the stockpile. Newport's first position with the federal government was on Project Aura. According to employees and government officials interviewed, things progressed fast and without incident. The biomedical research agency's representatives would visit Newport's headquarters every three months. Mr. Crawford delivered monthly reports outlining the business's expenditures and development. In 2011, Newport sent three operational prototypes from its California facility to Washington for evaluation by federal officials. In testimony before Congress in April 2012, a senior Department of Health and Human Services representative stated that the program was scheduled to file for market approval in September 2013. The machines would then start producing after that.

3.2. Open innovation relevance in Newport Medical Instruments / Covidien

One business after another was merging with or acquiring other manufacturers in the rapidly consolidating medical equipment sector. As hospitals grew, manufacturers sought to position themselves as one-stop shops, which required a more comprehensive range of items. For example, Newport was agreed to be purchased by Covidien, a sizable producer of medical devices, for just over \$100 million in May 2012. Traditional ventilators were already offered by Covidien, a publicly traded corporation with sales of \$12 billion that year, but they made up a modest portion of its diverse commercial operations. In addition to Newport, Covidien acquired five additional medical device businesses in 2012. Executives from Newport and government representatives working on the ventilator contract claimed to have seen a change as soon as Covidien took over. Creating affordable portable ventilators wasn't a primary focus anymore.

Newport applied to the Food and Drug Administration in June 2012 for permission to commercialize the device. Still, two former federal officials claimed that Covidien had requested more money and a higher selling price for the ventilators. Instead, the government handed the business an additional \$1.4 million, a pittance for a company like Covidien. Government representatives and executives from competing ventilator firms expressed their suspicion that Covidien had acquired Newport to stop it from developing a less expensive device that would threaten Covidien's profits from its current ventilator business. A few Newport executives involved in the project were given new responsibilities. As a result, some people chose to leave the company.

The 2012 purchase of Newport Medical Instruments by Covidien for USD 108 million is a pertinent illustration of an alleged killer acquisition. Here, Covidien (annual revenue of \$12 billion) had a well-established business line marketing ventilators of the kind needed to treat COVID-19 virus patients as well as those infected with earlier flu viruses that had not yet reached pandemic phases, such as SARS, MERS, avian flu, and H1N1 (swine flu). Each ventilator sold by Covidien costs around USD 10,000. To develop and supply brand-new, reasonably priced mobile ventilators that the government might stockpile to handle any upcoming pandemic, Newport Medical Instruments was given a contract by the US government in 2010. Each of these costs \$3,000, and Newport was scheduled to submit a request for market approval in September 2013 before beginning production and delivering about 40 000 ventilators. However, the government evaluated progress in April 2012 after Newport had shipped three prototypes in 2011 and discovered they were on schedule. However, Covidien paid USD 108 million in May 2012 to buy Newport Medical Instruments. The government provided additional funding, but Covidien reassigned staff after the acquisition. In June 2014, after having yet to deliver any ventilators, the company informed the government that the contract was unprofitable and asked to be released from fulfilling it. In June 2012, Covidien applied for approval but raised the price.

To start over, the government gave Phillips a new contract worth USD 13.8 million. Phillips had successfully produced new ventilators, approved in July 2019; delivery of 10,000 ventilators was due in the middle of 2020. Unfortunately, COVID-2019 struck

the US in February 2020, leaving the government with only 12,700 ventilators, as opposed to the 40,00 that Newport was scheduled initially to provide many years earlier or the 70,00 that the government had intended to store to handle a moderate flu pandemic. Some have argued that this wasn't a killer acquisition because there were other market competitors, and the transaction value was low.² It is undeniably true that the acquisition had a low transaction value, similar to most of the acquisitions in the pharmaceutical industries Cunningham et al. (2018) analyzed. However, there were several more rivals, but they did not offer inexpensive substitutes to the USD 10,000 per unit price at which Covidien offered its goods. According to this, Newport's product was a maverick on the market. It has been argued that the portable ventilator under development was not a suitable replacement for Covidien's more expensive current devices. The World Health Organization information sheets that these ventilators are based on state that they "*provide long-term support for patients who do not require complex critical care ventilators.*" However, portable ventilators can be used in hospitals for invasive ventilation, as stated on the website of Covidien's new owner (Medtronic). In addition, the World Health Organization adds, "*They can be used for treating patients with conditions like pneumonia or during mass casualty events... and can be used for emergency care.*" This is no surprise, given that the US government funded their creation and agreed to buy them precisely to prepare for disasters and events that would result in many casualties, like COVID-19. Therefore, having access to such stocks at such a low cost would have been priceless during the current crisis and would undoubtedly have considerably decreased the enormous demand and high prices for access to the more expensive established ventilators made by Covidien. Additionally, it is asserted that there were non-anticompetitive justifications for the acquisition. However, an acquisition can only eliminate a product while attaining other objectives. Therefore, even if an acquisition does not eliminate all of a company's products from the market, it can still be considered an anticompetitive killer acquisition. More generally, it is asserted that the project was an implausible "moon-shot" despite being on track and getting Food and Drug Administration approval a month after the merger. The government hired Philips to take Newport's place, and they could produce a

ventilator for around the exact cost, so nothing about the project was inherently impossible. Therefore, even though Covidien may have preferred to cut its losses on the project, the point is that Newport would have been less likely to make the same decision in the absence of the merger, which would have reduced the number of patients in US hospitals who needed ventilation but were unable to receive it.

4. Policy Implications

In our economy, innovation is becoming more and more significant. It is crucial to enhancing our quality of life, creating better jobs, developing a greener society, and helping consumers and employees in the European Union. It is also essential to keep the European Union competitive in international markets. Innovation policy aims to establish a framework that facilitates the commercialization of ideas. It sits at the intersection of industrial, research, and technical development policy.

"The Union and the Member States shall ensure that the conditions necessary for the competitiveness of the Union's industry exist," according to Article 173 of the Treaty on the Functioning of the European Union (TFEU). The TFEU's Articles 179 to 190 govern the Union's space, research, and technology development (RTD) policies. The multiannual framework plan, which establishes the goals, priorities, and financial aid package, serves as the primary tool of RTD policy. Following standard legislative procedures, the European Parliament and the Council adopt the RTD framework programmes after consulting the European Economic and Social Committee.

It is well-acknowledged how important innovation policy is and how it is connected to other European Union policies, including employment, competitiveness, the environment, industry, and energy. Innovation's responsibility is to translate research findings into new and improved services and products to be competitive in the global market and enhance people's quality of life. In comparison to the United States (3.45% in 2020) and Japan (3.26% in 2020), the European Union spends less on research and

development (R&D) as a percentage of yearly GDP (2.3% in 2020). Additionally, there is a brain drain impact as many of the brightest academics and innovators in the European Union relocate to nations with better conditions. The European Union market is still fragmented and needs to encourage more innovation. The European Union created the idea of an "Innovation Union" to counteract these trends with the following objectives:

- Make the EU a world-class science performer.
- Remove obstacles to innovation – like expensive patenting, market fragmentation, slow standard-setting and skills shortages – which prevent ideas getting quickly to market.
- Revolutionise the way the public and private sectors work together, notably through the implementation of European innovation partnerships between the EU institutions, national and regional authorities and business (Pulluveer, 2022).

One of the seven centerpiece projects of the Europe 2020 strategy for a bright, sustainable, and inclusive economy was the Innovation Union. It was introduced by the Commission in October 2010 to enhance the environment and financial access for research and innovation in the EU so that creative ideas may be translated into goods and services that spur economic growth and employment. Furthermore, the Innovation Union sought to establish an accurate united European market for innovation that would draw forward-thinking enterprises and companies. As a result, several initiatives in patent protection, standardization, public procurement, and intelligent regulation have been implemented.

Earlier innovation strategies depended on big businesses to drive innovation in the EU. While large firms continue to play a significant role in innovation within the EU, they acknowledge that many more SMEs and other outside contributors are involved in their operations. Therefore, to foster an atmosphere of open innovation that is equally advantageous to SMEs, innovation policy must extend beyond these giant corporations'

confines and consider the roles of human capital, competition policy, financing, intellectual property, and public data.

Public policies on innovation should support and promote SMEs. As the surviving enterprises will represent new combinations of knowledge and new business models to commercialize that information, their vitality will inject a more excellent dynamic into the economy. These businesses will encourage more prominent firms to innovate more. They show huge companies that new methods of commercializing ideas are commercially viable, and their success forces established companies to face harsh realities that they must risk ignoring. Policymakers should make starting businesses easier and promote entrepreneurship in the European economy to promote open innovation. They must also encourage collaboration between SMEs and big companies to learn how technologies work and establish new technical ecosystems as system integrators.

The European Commission has launched the Startup Europe initiative to link high-tech companies, scale-ups, investors, accelerators, business networks, universities, and the media. It is supported by various EU-funded initiatives, including the Digital Innovation and Scale-up Initiative (DISC), Innovation Radar, and the EU Startup Nation Standard. It complies with the European Commission's small and medium-sized enterprise (SME) strategy.

The European Commission's new SME Strategy includes a new program called the EU Startup Nation Standard. European SMEs and startups must overcome several obstacles as they pursue their goals of obtaining market possibilities and increasing their income. Many EU nations currently adhere to best practices to aid startups in overcoming difficulties like venture formation and luring and retaining people.

To spread these strategies throughout the EU and make Europe the most alluring start-up and scale-up continent, the European Commission will create the EU Startup Nation Standard in 2020. This will specifically involve introducing a political effort requesting pledges from EU nations to apply such practices at local, regional, and national levels. The project will concentrate on making it simpler to start a business and expand internationally. Additionally, it will make it easier for people from other countries to

apply for visas and residency, raise the appeal of employee stock option grants, encourage startup creation and tech transfer from institutions, and improve access to financing for scaling up.

The European Commission's data-driven programme, the Innovation Radar, seeks to find high-potential innovations and innovators in research and innovation initiatives that the EU supports. Its objective is to make it possible for any citizen, state representative, expert, and businessperson to learn about the results of EU innovation funding.

5. Conclusion

The purpose of this dissertation was to shed light on the main determinants and consequences of open innovation. The analysis is brought forward by considering the impact of open innovation on the overall types of organizations. By exploring the relevant literature on the subject, we have concluded that the theories of open innovation and its impact are relevant to the nature and development of companies.

First of all, we saw, according to Chesbrough, how relevant the shift from closed to open innovation has been for firms and how this last one has spread out through the years. Secondly, our focus was shifted to assessing the role of open innovation inside the start-ups and their relationship with multinational corporations. By providing a comprehensive overview of the main definitions, measurements, and forms of start-ups, we established that open innovation is fundamental for this new type of firm. Open innovation encourages start-ups to innovate, grow, improve technologies and production and increase their competitiveness. Subsequently, once we acknowledged the role of open innovation, we analyzed a case study which is relevant in identifying the limits that start-ups can face through their relationship with other multinational organizations and the importance that dependence could have on them.

This work provides a comprehensive view, reconciling and clarifying the interplay between innovation, large corporations and start-ups. Indeed, departing from the fact

that innovation is a fundamental factor for firms in general, we established that it is also a primary factor for start-ups and multinational corporations to be independent and grow inside the market without limitations.

In conclusion, open innovation has become a powerful strategy for stimulating growth and innovation in today's changing business environment. It emphasizes the value of teamwork, knowledge sharing, and utilizing outside expertise to foster creativity and gain a competitive edge. Open innovation acknowledges that helpful information and resources can be accessed inside and outside a company. It encourages businesses to go out to external stakeholders, including consumers, suppliers, universities, research institutions, and even rivals, to connect with them actively. Organizations may access other viewpoints, increase their skills, and speed up innovation by utilizing a more extensive network of talent and ideas. Access to a massive pool of knowledge and skills is one of the main advantages of open innovation. Organizations can harness external partners' expertise, resources, and ideas through collaboration, lowering the risks and expenses of creating new products or entering new markets.

Additionally, this collaborative strategy stimulates learning, creativity, and ongoing growth. Open innovation implementation is complex, though. Organizations must manage intellectual property issues, create efficient cooperation processes, and handle tricky collaborations. As a result, it may be necessary to reinvent existing hierarchical systems and closed-door practices to enhance openness and cooperation.

Open innovation presents enormous possibilities for businesses looking to maintain their competitiveness and promote innovation in today's connected world. Companies can open up new opportunities, spur growth, and establish a sustained competitive advantage by accepting external collaboration, utilizing various knowledge sources, and developing an open culture.

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Open Innovation

L'open innovation, come concetto, è stato reso popolare e sviluppato da Henry Chesbrough professore e ricercatore nel campo della gestione della tecnologia e dell'innovazione. Chesbrough ha introdotto l'open innovation attraverso il suo libro "Open Innovation: The New Imperative for Creating and Profiting from Technology" pubblicato nel 2003.

Il concetto di open innovation di Chesbrough sfida il tradizionale modello di closed innovation, in cui le aziende si affidano principalmente alle attività interne di *research & development* (R&D) per sviluppare nuovi prodotti e tecnologie. Infatti, il professore ha sostenuto che le aziende dovrebbero sfruttare fonti esterne di innovazione e collaborare con partner esterni, inclusi clienti, fornitori, università ed altre organizzazioni, per accelerare il processo di innovazione e la creazione di valore.

I principi chiave dell'open innovation proposti da Chesbrough includono la conoscenza e le fonti tecnologiche esterne: si abbraccia l'idea che la conoscenza e la tecnologia sono preziose e che possono essere trovate al di fuori dei confini dell'organizzazione. Le aziende dovrebbero cercare attivamente ed accedere ad idee, tecnologie e competenze esterne: infatti, le stesse dovrebbero intraprendere azioni atte a stabilire partnership e collaborazioni strategiche con parti interessate esterne per sfruttare le loro competenze, risorse e capacità complementari. Ciò può includere progetti di ricerca congiunti, accordi di licenza, sforzi di co-sviluppo o persino l'apertura di tecnologie interne per uso esterno. Un terzo fattore definito dal ricercatore è l'apertura alle idee ed ai flussi di conoscenza: incoraggiare lo scambio di idee e conoscenze oltre i confini organizzativi. Ciò include sia il flusso di conoscenza in entrata (che porta la conoscenza esterna

all'interno dell'azienda) sia il flusso di conoscenza in uscita (consentendo la condivisione della conoscenza interna all'esterno). In particolare, l'integrazione di idee interne ed esterne combina ed integra efficacemente idee, tecnologie e capacità interne ed esterne per creare nuovi prodotti, servizi e modelli di business: ciò richiede la costruzione di meccanismi l'identificazione, l'assimilazione e l'implementazione della conoscenza esterna all'interno dell'organizzazione.

Infine, Chesbrough definisce nuovi modelli di business andando a ripensare i modelli tradizionali ed esplorando nuovi modi per acquisire valore dell'innovazione. La valorizzazione può infatti comportare la monetizzazione della proprietà intellettuale attraverso la concessione di licenze, la formazione di società spin-off o la creazione di nuove imprese basate su tecnologie di provenienza esterna.

Il concetto di open innovation di Chesbrough ha guadagnato un'attenzione significativa ed è stato abbracciato da molte organizzazioni in vari settori: ha influenzato il modo in cui le aziende affrontano l'innovazione ed ha portato alla nascita di pratiche di open innovation, come il crowdsourcing, la collaborazione open source e gli ecosistemi di innovazione. Il concetto incoraggia le organizzazioni a guardare oltre i propri confini ed attingere all'intelligenza collettiva di una rete più ampia per guidare l'innovazione e rimanere competitivi nel panorama aziendale che oggi è sempre più in rapida evoluzione.

L'innovazione è strettamente collegata ad una forma organizzativa di recente sviluppo che è la start-up. Una start-up è un'impresa commerciale o un'azienda di nuova costituzione che è tipicamente caratterizzata dalla sua natura innovativa, dall'elevato potenziale di crescita e dal perseguimento di modelli di business, prodotti o servizi dirompenti. Le start-up spesso operano in settori emergenti o in rapida evoluzione e mirano a soddisfare esigenze di mercato insoddisfatte o a creare nuovi mercati. Sebbene non esista una definizione universalmente accettata di start-up, queste caratteristiche generalmente catturano l'essenza di ciò che questa rappresenta. È importante notare che man mano che le start-up crescono e maturano, possono trasformarsi in aziende più consolidate o evolversi in diverse forme organizzative.

Le start-up possono trarre grandi vantaggi dall'abbracciare i principi e le pratiche dell'open innovation. Infatti, adottando gli approcci dell'open innovation, le start-up possono superare i limiti delle risorse, ottenere l'accesso a competenze diverse e accelerare i loro cicli di innovazione consentendo loro di attingere a risorse esterne e di sfruttare le conoscenze sviluppate da terzi per guidare la crescita e il vantaggio competitivo.

Lo sviluppo e la crescita delle start-up spesso si interseca con l'attività delle grandi multinazionali sempre orientate all'innovazione e allo sviluppo. In particolare, il rapporto tra start-up e multinazionali nel panorama dell'open innovation può essere reciprocamente vantaggioso e di impatto. Alcuni aspetti chiave di questa relazione sono la collaborazione e partnership – le multinazionali possono collaborare con la start-up attraverso partnership, joint venture o alleanze strategiche per promuovere l'open innovation. Le start-up portano al tavolo agilità, nuove idee e tecnologie dirompenti, mentre le multinazionali offrono risorse, competenze ed accesso al mercato. Tali collaborazioni possono portare allo sviluppo congiunto di nuovi prodotti o servizi, progetti di ricerca condivisi o joint venture per entrare in nuovi mercati.

Successivamente a quanto sopra può verificarsi un processo molto rilevante che è lo scouting e l'acquisizione di tecnologia da parte delle multinazionali, poiché queste spesso ricercano start-up innovative con tecnologie promettenti o modelli di business in linea con i loro obiettivi strategici per ottenere l'accesso a tecnologie all'avanguardia, proprietà intellettuale e talento imprenditoriale.

Le start-up, a loro volta, beneficiano delle risorse, della portata del mercato e del supporto delle multinazionali nell'aumentare le loro innovazioni. Molte multinazionali hanno istituito i propri incubatori o acceleratori di innovazione per alimentare e supportare le start-up. Questi programmi forniscono tutoraggio, finanziamenti, infrastrutture e accesso alle reti, consentendo alle start-up di sviluppare le proprie idee ed innovazioni. Le multinazionali traggono vantaggio dall'esposizione a nuove idee, talenti e potenziali partnership o acquisizioni future.

Nel complesso, il rapporto tra start-up e multinazionali nell'open innovation è caratterizzato da uno scambio simbiotico di risorse, competenze ed accesso al mercato.

Le multinazionali possono attingere all'agilità e alle capacità di innovazione delle start-up, mentre le start-up ottengono l'accesso a risorse, reti e tutoraggio che possono accelerare la loro crescita e aumentare le loro possibilità di successo.

Sebbene le multinazionali possano offrire numerosi vantaggi, possono anche porre sfide e potenziali rischi per le start-up. Il termine "*start-up killer*" si riferisce in genere ai fattori che possono portare al fallimento di una start-up che interagisce con delle multinazionali. Infatti, le multinazionali sono grandi aziende che operano in più paesi e che si sono affermate in vari mercati e per questo hanno un elevato potere di mercato tale da poter facilmente sopraffare una start-up nonostante questa tratti un'innovazione rilevante per il mercato stesso. Il caso studio presente in questo documento che coinvolge *Newport Medical Instruments / Covidien* evidenzia come una multinazionale possa sfruttare una start-up a seguito della sua acquisizione.

Nel caso delle start-up killer è fenomeno comune che dopo l'acquisizione di una start-up le multinazionali portino la stessa al fallimento per poter così eliminare possibilità di competizione futura sul mercato nazionale ed internazionale.

Le start-up crescono quindi in un ambiente ricco di sfide e di opportunità esterne ma anche intrinseche: la loro agilità, il loro approccio innovativo e nei nuovi mercati che si vengono a creare. Infatti, possono differenziarsi concentrandosi su specifici segmenti di clientela, sfruttando la tecnologia e sviluppando proposte di valore uniche. Come opportunità esterne le collaborazioni e le partnership con aziende esistenti possono essere vantaggiose, fornendo alle start-up l'accesso a risorse, competenze e canali di distribuzione.

In conclusione, le multinazionali possono rappresentare un vantaggio, ma anche un ostacolo per lo sviluppo e la crescita delle start-up; tuttavia, non è impossibile per le stesse navigare e prosperare nell'attuale panorama competitivo. Infatti, con un'attenta pianificazione, differenziazione, adattabilità e una chiara comprensione dei loro mercati di riferimento le start-up possono comunque costruire il proprio successo.