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Chair of Management

Management of Innovation: Cisco and its A&D strategy

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Introduction

Our surrounding environment is constantly evolving and changing. Every day, new technological advancements and scientific discoveries emerge, consumer tastes and preferences change, new markets are created, and new products are developed. Companies must innovate if they want to hold on with these new market conditions. Innovation is crucial for businesses to survive in the marketplace. It is an extraordinary tool that companies may use to grow, to stay ahead of their rivals, to beat the competition, to improve their profits, to maintain competitive advantage, and to drive economic growth. For these reasons, scholars, researchers, and economists have conducted many studies on the subject. Companies can innovate implementing different innovation strategies and each of them have distinct implications on the firms' performance.

In the first chapter of this thesis, innovation is broadly defined, and two main innovation theories developed by Schumpeter and Christensen are presented. In general, innovation is about doing things differently, such as changing somethings that already exists in a way that is new for the firm and the surrounding environment or producing new products able to disrupt existing offerings. Furthermore, the different sources and types of innovation are explored and examined.

The primary determinant of an innovation's success is the efficient management of the innovation process, from the generation of the idea to its commercialization. In the second chapter, this process is described and the closed and open innovation model, which have contributed to the development of numerous commercial successes, are deeply analyzed. These two innovation models differ on how ideas are developed and commercialized, under the traditional closed model, R&D activities occur only internally, while in the open innovation model valuable ideas and R&D activities are generated both internally and externally.

As assessed in the second chapter, firms can innovate through two different models. In the last chapter, the case of Cisco System is showed. The innovation strategy that it uses is examined and the chapter will demonstrate how Cisco's acquisition and development strategy contributed to it becoming one of the most innovate and disruptive companies in the world.

Chapter 1

Innovation

1.1 What does the word Innovation mean?

Innovation is one of the most complex and discussed topics in the fields of Business, Economics, and Management. Over the years, researchers, economists, authorities, and policymakers have conducted, examined, and evaluated studies on innovation. These studies can be classified into two categories depending on whether innovation is treated as a dependent or an independent variable. In the first class, we find studies that treat innovation as a dependent variable. Researchers have examined factors affecting innovation such as determinant or conditions of innovation. In the second category, we find studies that consider innovation as an independent variable, and examines the outcomes of innovation, such as how innovation affects efficiency, improves performance, enhances the quality of services, and even the legitimacy of organizations (Demircioglu et al., 2019).

The word innovation comes from the Latin word *innovationem*, noun of action from *innovare*, that means “to renew or change”, from *in* – “into” and *novus* – “new”¹. According to the etymology of the word, innovation is not only about making something new, but it is about changing something that already exists or changing the way we make decisions. It is about doing things differently.

Up until now, in all studies and literatures regarding innovation, researchers have given a magnitude of different definition for the word innovation. A main definition was given by Slatter, who states that innovation is a change or a process improvement in product or system such that it is new for the firm. He formally contraposed creativity to innovation: creativity creates something new and innovation will imply the use of it (Slatter in Tohibi et al, 2012). On the other hand, a thorough and multi-disciplinary definition of innovation has been given by Baregheh, Rowley and Sambrook (2009). They defined innovation as a multiple stage process where organizations transform ideas into new products, processes and services in order to remain competitive and differentiate themselves from other firms on the market. In addition to the previous arguments, Porter states that innovation is found whenever a company employs new technologies or new solutions of doing jobs. According to him, if a company wants to achieve a competitive advantage, innovation is the key to succeed. (Porter in Tohibi et al, 2012).

¹ Definition available from “Online Etymology Dictionary”: <https://www.etymonline.com/word/innovation>.

In Management and Economics studies, the most accepted and used definition of innovation is the one developed by the Austrian economist Joseph Schumpeter (1934). Schumpeter states that innovation is a “process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one” (Schumpeter, 1934). This process is known as “creative destruction”, a mechanism that through continuous product and process innovation replaces old production units with new ones.

Innovation does not only belong to the business world, it is present in everyday life. Innovation means taking the lead in new processes and events that can occur not only in business but also in everyday life. For this reason, it is necessary a unique definition that is adaptable in all areas in order to allow people to get better knowledge about what innovation really means and what they can associate it with (Stenberg, 2017). In addition, some scientists point out that without a clear and widely accepted definition for the word innovation, companies may find it hard to develop and implement successful innovation strategies (Baregheh et al, 2009).

1.1.1 Similar words, different meanings: Invention and Innovation

The words invention and innovation are often used interchangeably, but they have two distinct meanings. Invention is about creating something new that has never existed before. It does not have to satisfy any particular customer needs, it can be for economic or non-economic motives, without requiring the commercialization of the idea. Whereas, innovation is more about the introduction of new product, service or processes into the marketplace. Unfortunately, many inventions never result in innovation because they are never marketed. An invention turns into an innovation if it can be exploited to create value and change that benefits the customer. Contrarily, there are many innovations that do not require invention in terms of originality. Innovations in processes and services frequently require the use of established technology and techniques. In general, to come up with a new invention, people should have scientific skills. Whereas, for innovation people should have strategic, marketing, and technical skills.

The difference between invention and innovation is significantly important for what concerns the competitive and growth strategy of businesses. For example, if a company develops a new invention, it should pursue a competitive strategy focused on preventing rivals from joining the new market. On the other hand, in case of an innovation, the company would penetrate developed markets where the competition may be high, so it should follow a competitive strategy aimed at acquiring market shares and consolidating its position in the market.

(Dooley and O’Sullivan, 2009)

1.2 Where does Innovation come from?

“In business, innovation rarely springs from a flash of inspiration. It arises from a cold-eyed analysis of seven kinds of opportunities”.

(Peter Drucker, 1985)

When we think of innovation we automatically think to a stroke of genius. However, the majority of successful innovations come from a conscious and purposeful search for specific opportunities found only in certain scenarios. Drucker (1985) states that the majority of innovative ideas come from a methodical analysis of seven opportunity areas. Some of them may be found within particular companies or industries and others within broader social and demographic trends. The areas of opportunity that exists within a company or industry are: unexpected occurrences, incongruities, process needs, and industry and market changes. They are categorized as inside sources of innovation. Indeed, the ones laying outside a company in its social and intellectual environment are: demographic changes, changes in perception, and new knowledge. Even though they may differ in terms of risk, complexity and difficulty, it is true that these sources overlap, and there may be opportunities for innovation in more than one area at once. Drucker’s sources of innovation account for the great majority of all of the innovation opportunities.

Inside Sources

Unexpected Occurrences: the unexpected is the easiest and simplest source of innovation opportunity. The corporate environment is very dynamic and for this reason is full of surprises. Unexpected failures, as well as unexpected successes, or internal organizational events, can stimulate original thought and be the locus of inspiration for a new innovation. Unexpected events can have a significant impact and motivate a team to see things from a different and fresh perspective, and come out with new product or service. *(Does your business have any success/failure that merits further investigation?)*

Incongruities: When there is a discrepancy between our reality and our expectations, an innovation opportunity exists. A mismatch between what is and what is intended to be is called incongruity. Given that it contrasts what is with what everyone else thinks it should be, it may be a good source of original ideas. The most common form of incongruity is the discrepancy between perceived and actual customers’ expectations. *(Do you use your customers’ feedback to determine incongruity and create the opportunity for innovation?)*

Process needs: Weaknesses in organizational workflows, processes, and systems present practical opportunities for innovation. Innovation based on process needs is a task-oriented rather than situation-oriented. It aims at improving existing processes and at reinforcing the weak links. *(Are there any inefficiencies in the business processes?)*

Industry and Market changes: The business environment is not static, it is always evolving, and organizations need to adapt to these changes. Changes in the industry transform companies, but they can also encourage people to explore and develop new ideas. In general, the industry or market structure is constantly changing, potentially creating great opportunities for innovation, since those that notice these changes may recognize hidden opportunities for new products and services. *(Do you monitor market changes and exploit the chances they present?)*

Outside sources

Demographic changes: Demographic changes include movements in population, age structure, educational status, income and employment. They offer a variety of opportunities for innovation and are the most trustworthy predictors of future trends. Demographic changes affect the market as they determine the demand for products, the target market for those products, as well as the quantity of products being supplied. *(What is changed about our buyers? Our suppliers? Our users?)*

Changes in perception: The development of technology has had an impact on how people perceive the world. People's opinions regarding a particular good, brand, or even sector of the economy may change over time. Changes in perception are based on the mood rather than on the facts. It is all about the question: "Is the glass half full or half empty?", they refer to the same phenomenon, but they have different meanings. Changing a manager's perception of a glass from half full to half empty opens up big innovation opportunities. *(Do you observe variations in consumer perception to improve your products and services?)*

New Knowledge: On an annual basis new ideas are added to an existing base of knowledge, allowing rooms for new discoveries and developments. Knowledge has always been a source of innovation, there are certain breakthroughs that cannot be neglected, as technological and scientific ones. An organization as the possibility to apply new knowledge to improve customer service, to learn more about latest trends, customer expectations or to learn how to use a new technology. New knowledge, technologies and discoveries are sources that have the longest lead times to commercial development.

(Drucker, 1985)

1.2.1 Other drivers of Innovation

Drucker recognizes that innovation comes from seven areas of opportunity, that can be categorized into inside and outside sources. In general, there are various factors that can encourage an organization to innovate. Within these drivers we can find emerging technologies, competitor actions, new ideas from customers, strategic partners, employees, and emerging changes in the external environment.

Emerging technologies can be the basis for innovative products, processes, and services that can revolutionize the fortunes of an organization. In the past, emerging technology were mainly the result of organizations R&D investments; however, in today's environment the sources of emerging technology are mainly developed externally. Organizations invest more resources in scanning the environment for potential technological opportunities rather than develop them internally.

Another driver of innovation can be monitor competitors and other organizations actions. When deciding which projects and initiatives to undertake, rivals might serve as a benchmark. Their products may have already been adopted by the market and this reduces the risk of failure.

Recently, with increased market segmentation and technological complexity, companies are involving as many stakeholders as they can in their innovation processes. The engagement of stakeholders may improve a company's scanning capabilities and can enable it to gather more accurate information about market demands. Moreover, engaging customers, suppliers, employees, and other stakeholders can bring to the forefront opportunities that otherwise might not have been seen. In addition, changes in the external environment can be another driver of innovation. Environmental changes can occur due to competitors' actions or due to macroeconomic shifts, such as political, economic, cultural, or technological environment. Organizations must innovate their offerings, processes and services in order to successfully realign with the new and ever-changing business environment.

(Dooley and O'Sullivan, 2009)

1.3 Where to innovate: product, process or organizational methods

The term innovation is usually associated to products. In general, when people think about innovation they think about a physical product, such as a new car or a new television with improved functionality. However, it is possible to identify different types of innovation activities, including product, process and organizational.

Product innovation is the introduction of a good or service that is new or improved with respect to its previous version. It is about innovate in “What” a business produces. The ultimate objective of this kind of innovation is to improve the lives of consumers by finding an innovative solution to a problem that they did not even know they had before. Product innovation benefits both businesses and consumers in various ways. Firm profitability increases, as buyers tends to pay a higher price for new or updated products that better satisfy their needs. The introduction into the market of the Apple iPhone has been one of the most notable examples of product innovation in recent years. It completely changed the way people use electronic devices to interact with one another. As a result, Apple and other smartphone producers who have adopted this innovation have experienced incredible success. However, it is not always the case that product innovation leads to this type of success. Businesses incur the risk that the market won’t accept the changes they have made to their product and fail to recover their initial investment to develop the product.

Process innovation is the implementation of a new or significantly improved production or delivery method. It is innovation in “how” a business create, deliver, and support a product or service. It can help a firm to create a competitive advantage, to reduce its costs and improve its efficiency. Process innovation can include changes in the equipment and technology used in manufacturing, improvement in supply chain and delivery system, or improvement in methods used for accounting and customer service. Henry Ford's creation of the first moving assembly line is among the most well-known examples of process innovation.

Another form of innovation is organizational innovation. It is the implementation of a new organizational strategy that will in some way alter a company’s operational procedures, as well as the way its workplace is organized and its relationship with external stakeholders. The aim of this type of innovation is to increase a company’s performance by reducing its costs, increasing employee productivity by raising workplace satisfaction, or lowering supply costs. Samsung CEO Jong-Yong Yun introduced one of the most remarkable organizational innovation of the recent years. It opened design centers around the world with the aim to give his creative employees direct access to top management and space to develop new products.

1.4 Schumpeter's Innovation Theory

Joseph Schumpeter is considered to be one of the greatest economists of the first half of the 20th century. He participated in the most important economic debates at the time.

The concept of innovation and entrepreneurship are Schumpeter's most distinctive contributions to economics, for this reason he is also known as the prophet of innovation (Hanush, 2007). The role of innovation and entrepreneurship in economic growth is one of the most common themes in Schumpeter's works. Although the use of the term "innovation" was only reported in the late 1880s, Schumpeter was the first to clearly define it.

According to Schumpeter, the causative factor of economic change is innovation, that is defined as "doing things differently" in the realm of economic life. Innovation arises from the activity of a particular set of individuals called entrepreneurs, that have two key characteristics. First, they have the ability to appreciate the possibility of an innovation; second they must have the quality of leadership, overcoming the psychological and social resistances which stand in the way of doing new things (Sweezy, 1943). The entrepreneur's main function is to allocate existing resources to new uses and combination (Schumpeter, 1934).

In his works, "The theory of economic development" and in "Capitalism, Socialism and Democracy", Schumpeter defined development as an historical process of structural changes, driven by innovation. He identifies five different types of innovation (Schumpeter, 1934):

1. the introduction of new good – that is one with which consumers are not yet familiar – or of a new quality of a good;
2. the introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned;
3. the opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before;
4. the conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
5. the carrying out of the new organization of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position.

This list of definition has been cited many times by economists, historians, and others studying innovation. Some elements of the list may now seem trivial, it is because they have become conventional wisdom, but certainly were not when Schumpeter edited them.

Schumpeter argued that anyone seeking profits must innovate and that innovation is a fundamental driver of competitiveness and economic dynamics. Innovation refers to any new activity that an entrepreneur undertakes to reduce the overall cost of production or increase the demand for his products. The entrepreneur could earn economic profits by introducing an innovation that is successful either in reducing the overall cost of production or increasing the demand for his product. From this definition we can divide innovation into two categories. The first category includes all those activities aimed at reducing the overall cost of production such as the introduction for a new production method or innovative methods of organizing the industry. The second category includes activities aimed at increasing the demand for the product, such as the creation of a new market, the finding of new sources of raw materials or the introduction of a new design of the product.

According to Schumpeter, innovation is a "process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (Schumpeter, 1942). Schumpeter, in his masterpiece "Capitalism, Socialism and Democracy", developed the concept "creative destruction" to describe this process of industrial mutation. Through this mechanism new innovations replace existing ones that over time are rendered obsolete. The success of Netflix is an excellent example of "creative destruction" innovation. Netflix started by giving people the opportunity to order DVDs online and then by taking advantage of the latest technology. It developed the first online streaming service, completely revolutionizing the media industry. This new innovation gave customers the opportunity to stream videos online at any time and comfortably from home. As a consequence, the original DVD rental services, such as Blockbuster, have been replaced by online streaming platform such as Hulu and Amazon Prime.

The process of "creative destruction" is fundamental both in the macroeconomic and microeconomic level. At the macroeconomic level, it allows for long run growth, economic fluctuations, structural adjustment and the functioning of factor markets. At the microeconomic level, the process of creating and destroying production arrangements requires complex strategic, managerial and technological considerations. It is considered the essence of capitalism, static capitalism is a contradiction in terms. Capitalism is always evolving, with new markets and new products entering the sphere. The new consumers' goods, the new methods of

production or transportation, the new markets, the new forms of industrial organization set and keep the capitalist engine in motion (Schumpeter, 1942).

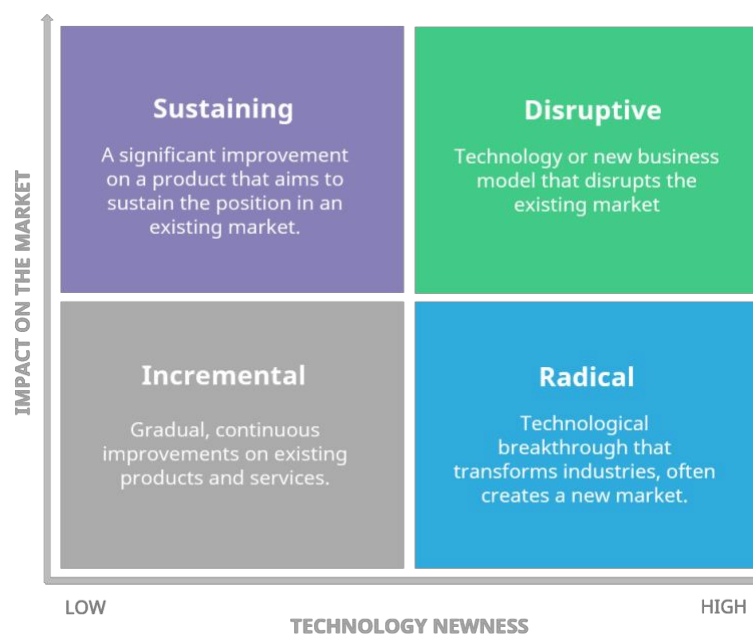
Innovation is the “creative destruction” that drives economic growth, while the entrepreneur performs the function of the change creator. Entrepreneurship is innovation and the actualization of innovation.

Despite its popularity, Schumpeter’s innovation theory has been criticized by many economists on different ground. Firstly, the innovation theory does not take into consideration the element of uncertainty as a significant determinant of profit. As professor Knight pointed out, entrepreneurs can make profit without innovation if they can predict the future with reasonable certainty, as long as changes in the demand and supply conditions are concerned. In addition to innovations, there are many other factors which gives rise to profit, for example the existence of a monopoly. Schumpeter states (1934) that “the entrepreneur is never the risk bearer. The one who gives credit comes to grief if the undertaking fails”. This means that profit is not considered as the reward for risk taking, however, it is not correct. In the modern industrial organization, it is the entrepreneur and not the capitalist who bear the entire risk of business. (Brouwer, 2003)

1.5 The Innovation matrix

Innovation is a very complex topic in the field of economics and business studies. As I reported in the first paragraph (1.1) economist gave different definition for the word innovation and classifies it according to different dimensions. Figure 1.1 is a representation of the most common accepted innovation matrix that categorizes innovation according to two dimensions: the technology it uses and the impact that it has on the market. In this matrix are reported four types of innovation: sustaining, incremental, radical and disruptive.

Figure 1.1: The Innovation Matrix



Source: "Types of Innovation – The Ultimate guide with definitions and examples", Viima (online). Available from: <https://www.viima.com/blog/types-of-innovation>

Sustaining Innovation

Sustaining innovation is a significant improvement on a product that aims to sustain and consolidate the position of a firm in an existing market. Similarly to incremental innovation, products are made better, through the improvement of their performance and characteristics. Generally, the improved version of the product is more expensive than the one previously available, allowing a company to make a higher profit. Sustaining innovation does not create new value network for customers, all the improvements are made to meet the needs of more demanding customers and to sustain the company's position in the premium segment of the market. Christensen (1997) defined sustaining innovation as "the incremental year by year

improvements that all good companies grind out. Other sustaining innovations are breakthrough, leapfrog-beyond-the-competition products. It does not matter how technologically difficult the innovation is, however: the established competitors almost always win the battles of sustaining technology. Because this strategy entails making a better product that they can sell for higher profit margins to their best customers, the established competitors have powerful motivations to fight sustaining battles. And they have the resources to win”.

Incremental innovation

Incremental innovation does not create new markets and often does not adopt entirely new technologies. It is about continuous and gradual improvements in existing products or services in the current market. With incremental innovations, products can be made smaller, more comfortable, easier to use or more attractive without changing the essence of it, services can be made more efficient or more accessible. All these improvements are made to fulfil customers' needs that change constantly. Moreover, incremental innovation can allow a firm to provide products and deliver services with the same functionalities and values at a lower cost, attracting a larger, mainstream market. Consumers are already familiar with the product characteristics and functionalities, so the process of launching and selling incremental innovation is often straightforward. Although, there are two main risks with incremental innovation. First, there is the risk of making products that are too sophisticated that can be sold only to more demanding customer segments. Second, the market may change at some point in time because of disruption and incremental innovation is not going to be enough to keep up with the external changing environment.

Radical innovation

It is uncommon that companies adopt radical innovation, it has similarities to disruptive innovation but it simultaneously uses a revolutionary technology and it often creates a new market. Revolutionary technologies transform the market, they do not aim at improving products' characteristics, they completely change or create a new product or service. Innovations such as computer and the internet can be classified as radical innovations, they have transformed the way the entire world functions and communicate.

Radical innovation solves global problems and addresses the needs in a completely new ways than what we are used to and even provides solutions to needs and problems we did not know we had, completely transforming the market, or even the entire economy.

Disruptive Innovation

A disruptive innovation is the launch of goods or services into an established market that has superior or better characteristics than the existing one. Generally, these new products appear, especially in the beginning, to be inferior to the solution that already exists, but after few iterations they outperform the existing models, displacing the market leaders and transforming the industry.

1.5.1 Christensen's disruptive Innovation theory

Clayton Christensen first described the “disruptive innovation theory” in his book “The Innovator’s Dilemma” (1997). According to Christensen, a firm that enters a market with a new product or service can challenge an established business by initially entering at the bottom of the market and then continuing to move up market, sometimes substituting established competitors. He used this theory to describe how disruptive innovations can create new markets or reshape existing markets by delivering a new, more accessible and affordable product available to a greater number of consumers. The central prediction of the disruptive innovation theory is that the speed with which companies innovate is higher than the speed with which customers’ needs evolve. The disruptive innovation sometimes causes established firm to exit the market, displace products, redefine and deliver value in new ways. Sometimes companies produce products and services way too expensive and sophisticated for their customer’s target range. The reason for this behavior is that well trained managers are out there trying to aim at higher profit margins forwarding higher quality products to most demanding customers in the marketplace. Unfortunately, by pursuing these profits goals, companies may end up going over the top when confronted with less demanding customers, who look for basic products at reasonable prices.

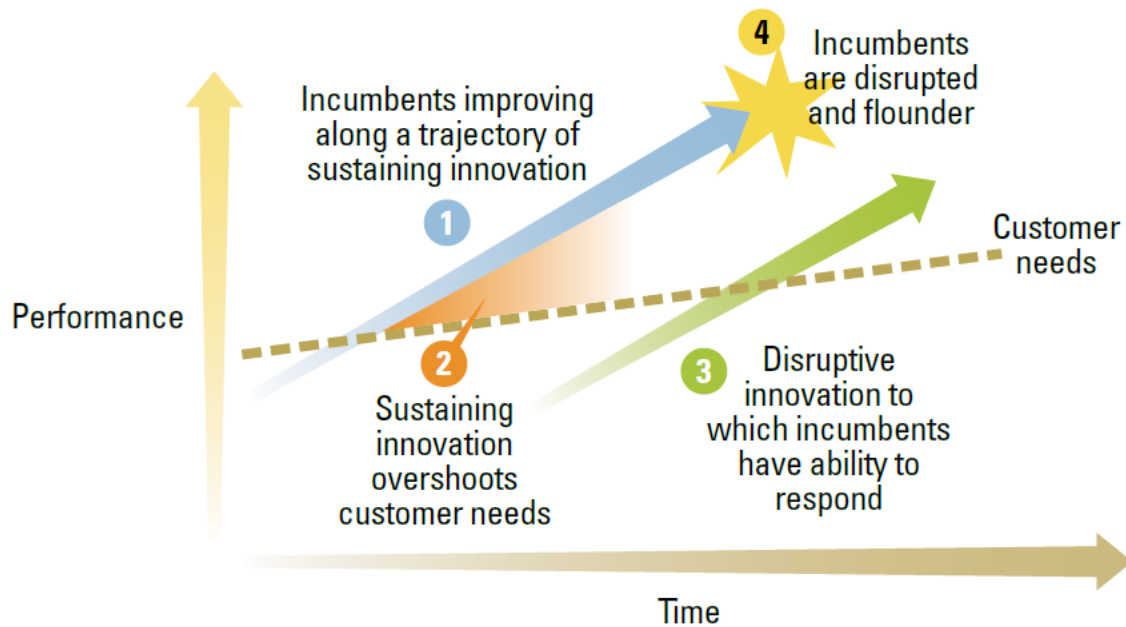
There are four key elements of the theory of disruption:

1. Incumbents in a market are improving along a trajectory of sustaining innovation;
2. Sustaining innovation overshoots customer needs;
3. Incumbents have the capability to respond but fail to exploit it;
4. Incumbents end up floundering as a result of the disruption.

These elements are represented in figure 1.2, that depicts the two different types of improvements trajectories. The company improvement trajectories show how products and

services get better over time. The customer demand trajectory shows the performance they can use or absorb.

Figure 1.2: Four elements of the theory of disruptive innovation



Source: “How useful is the Theory of Disruptive Innovation?” by Andrew A. King and Baljir Baartartogtokh. MIT Sloan Management Review, Fall 2015.

- (1) Christensen recognizes that in every market there is a distinctly different trajectory of improvement that innovating companies follow as they introduce new and improved products. The incumbent firms’ trajectory results from “sustaining innovations”, they are improvements on characteristics that customers valued the most in the past. At this stage, incumbents are focused on more demanding and sophisticated customers at the higher tiers of the market. These consumers are willing to pay higher prices for better products, allowing firms to increase their profit margins.
- (2) Firms innovate faster than people’s lives change, causing sustaining innovation to overshoot customer needs at any given tier of the market. Companies end up producing products with superior performance characteristics that consumers hardly know how to use and exploit. To explain this phenomena, Christensen utilizes an example from the 1983 computer industry, “when people first started using personal computers for word processing, typists often had to stop their fingers to let the Intel chip inside catch up... but today’s processors

offer much more speed than mainstream customers can use”. By doing so, companies open the door for disruptive developments at the bottom of the market. Disruptive innovations, initially, are inferior to existing offerings in terms of dimensions that mainstream customers value the most. However, they are cheaper, simpler to use and more accessible than products offered by incumbents firms creating space at the bottom of the market for new disruptive competitors to emerge.

- (3) Incumbent firms have the capability needed to succeed, but the management board is unable to use them to contrast potential disruptors. This happen because managers allocate resources to fully support sustaining innovations because they underestimate the potential threat.
- (4) The disruptive innovation sometimes causes established firms to exit the market, displace products, redefine and deliver value in new ways.

(King and Baatartogtokh, 2015)

1.6 Why is Innovation important for businesses?

Our surrounding environment is subject to continuous changes and mutations. New technological and scientific discoveries emerge every day, consumers change their tastes and preferences, new markets are created, and new products developed. In order to hold on with these new market conditions, companies must innovate. The phrase “adapt or die” is one that we’ve all heard, and it stands true for businesses to achieve success in today’s modern world. Companies cannot survive in the marketplace if they do not embrace innovation and change. There are a lot of examples of companies that failed in their own markets because they were unable to comply with the new market conditions. Kodak, a company that before 2012 dominated the photography film industry, it is not operating anymore because it was unable to conform with the digital camera. Similarly, even if Nokia was one of the first company to develop a smartphone, it failed to innovate the phone’s software, crucial both for the right functioning of the device and for user experience. Indeed, Nokia has now been outperformed by other giant companies like Apple and Samsung.

There are various reasons why innovation is important for a business. Specifically, innovation is important because it helps companies to grow, to be more profitable and cost-effective, to differentiate themselves in their competitive market, to drive economic growth, to maintain competitive advantage, as well as for its long term survival in the marketplace. A company can grow very quickly by rethinking its product, business model, and by introducing a new innovative product that may create a new market. (Schumpeter, 1934; Abernathy and Clark, 1984; Artz et al, 2010; Sardana, 2016; Henderson, 2018; Dagan et al 2021; Purcell, 2021) According to a survey taken by McKinsey, innovation comes out to be critical to the organization growth. In fact, 84% of CEOs interviewed, believe that the future success of their businesses depends on innovation. However, the survey showed that even if most companies understand the importance of innovation, they are ineffective in terms of execution. Only 6% of CEOs interviews are satisfied with their company’s innovation performance.

Innovation is also beneficial for a business because it can increase its productivity. Innovations in production processes reduce the costs of production, by decreasing the number of inputs needed in the production process or by decreasing manufacturing time. At the same time, this improves the company’s profit.

The majority of industries are saturated with numerous rivals providing comparable goods or services. Innovation can be exploited by a business to differentiate from its rivals. From the definition of the word innovation it can be derived that it is about doing something differently from everyone else operating in the same sphere. Companies can continue to innovate until

there are no more comparable products available in the market, and this can give them some degree of market power. The aim of each company is to deliver value to customers: doing it differently from other players way may help business to build a strong brand identity. Moreover, innovation in business processes can save the company time, money and resources, giving it a competitive advantage over other companies stuck in their old systems.

Furthermore, innovation allows for adaptability. As I mentioned earlier, the world around us is in continuous change, and if a business wants to remain relevant and profitable, it needs to adapt to the new realities that come up every day. If we take into consideration the recent COVID-19 pandemic situation, we can see how it disrupted the business world. Routine operation, such as in presence universities lectures were rendered obsolete over the course of few months. Universities had to adapt quickly, to offer a new educational system based on e-learning, and online lectures and exams. Innovation is the key to adapt and overcome the challenges of change. Although, many businesses still sustain negative results from this world shift because they've stuck to the status quo.

Additionally, innovation is one of the most important components of long-term economic growth. According to a paper about "Innovation and Economic growth", by professor Abramovitz (1950), there are two ways in which an economy's output can be increased. First you can increase the number of inputs that go into the productive process, or second, you can think of new ways in which you can get more output from the same number of inputs, that is essentially what innovation is (come up with new ideas and technologies that increase productivity and generate greater output and value with the same input). It turned out that 85% of the growth in output was explained by innovation and the 15% by the actual growth in the output of the economy. Overall, the development and application of new ideas and technologies bring benefits to consumers and businesses. The growth in productivity leads to an increase in workers' wages, who having more money available can spend more on goods and services. At the same time, businesses become more profitable, and hence they can invest more and hire additional employees.

Another study carried out by Abernathy and Clark (1984) takes into consideration the competitive implications of innovation. They proposed a framework, called "the transilience map", to examine the relationships among innovation, competition and the evolution of industries. It is based on the concept of transilience, defined as the capacity of an innovation to influence the established systems of production and marketing. They used examples from the US auto industry to explain the concept, and the results show that different types of innovation have different competitive implications.

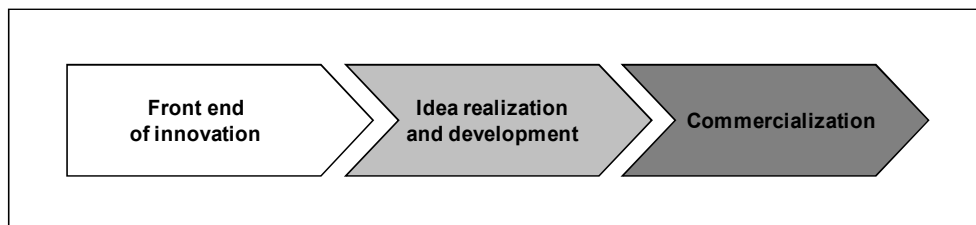
Chapter 2

How new ideas are generated and commercialized: Closed and Open Innovation

2.1 The Innovation process

Efficient management of the innovation process, from the generation of an idea to its commercialization, is the key determinant of an innovation's success (Van der Panne et al, 2003). This has been confirmed by Booz Allen Hamilton (2006), who found that a common denominator among successful innovators is "a rigorous process for managing innovation, including a disciplined, stage-by-stage approval process combined with regular measurement of every critical factor, ranging from time and money spent to the success of new products in the market." In numerous papers on innovation, scholars have proposed different models to structure and implement a successful innovation process. Models range from simple linear models to more complex and interactive ones, they have evolved along with the business environment. The simplest and most widely accepted divides the innovation process into three phases: the front end of innovation, idea realization and development, and commercialization (Figure 2.1).

Figure 2.1: Main phases of the Innovation process

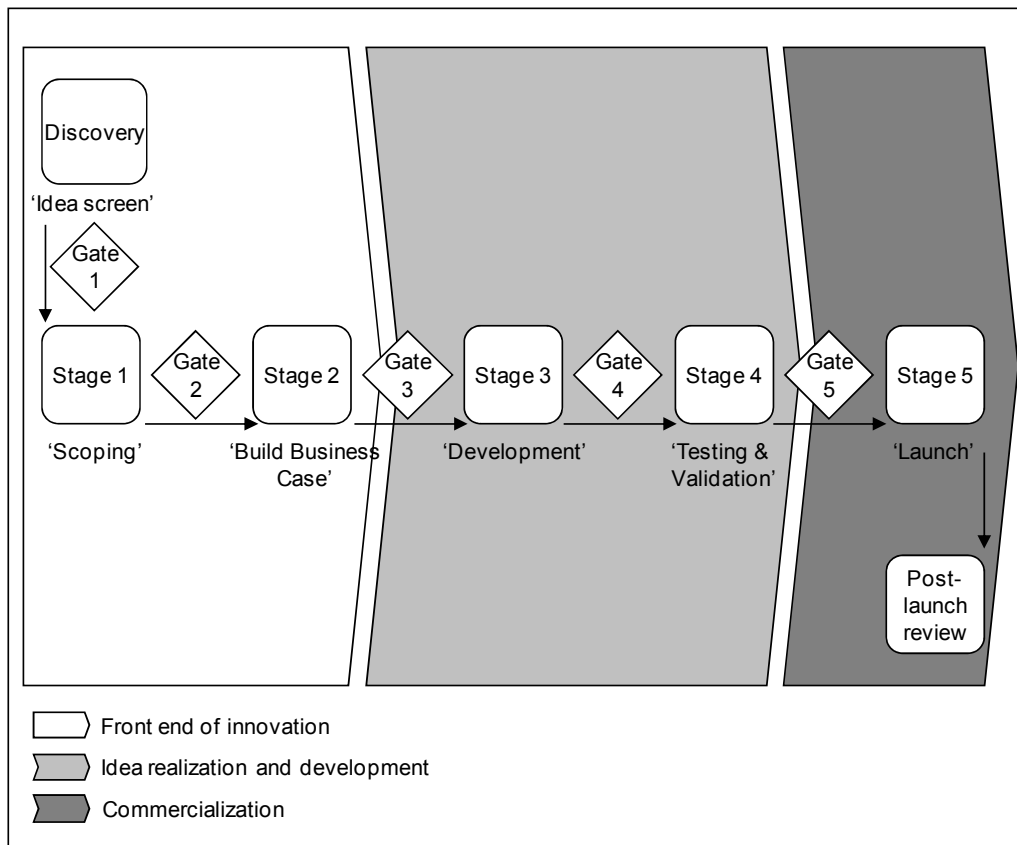


Source: "Open and Closed Innovation. Different cultures for different strategies" by Herzog in Gabler research, 2nd ed, 2011.

The first phase is the front end of innovation. It includes all activities aimed at generating and selecting new ideas and opportunities, as well as at evaluating the viability of those, in terms of both the firm's technology and market demands. Once ideas are selected, the second phase of the innovation process starts. In this phase, ideas are realized and developed. The last step involves all activities linked with the commercialization of the innovation, such as the market diffusion of the development, and the planning of the broad-based utilization. (Herzog, 2008)

Within the numerous frameworks proposed to structure the innovation process, Cooper's stage-gate (1990), also referred to as the waterfall process, is perhaps the one that has drawn the most attention from academics and practitioners. Since it first appeared in literature, it has been implemented by many firms worldwide, such as Polaroid, Procter & Gamble, Shell, and Carlsberg (Cooper, 2001). The stage-gate process divides the innovation process into stages with defined gates acting as decision points. The process ends with a post-launch review phase. In each stage, there are specific, multifunction, and cross-functional activities that must be completed. Each stage is designed to collect the data that are required to move the project to the next decision point. Moreover, every stage serves multiple purposes, there is no longer a distinction between the development and the commercialization phase. These activities are carried out in parallel by employees from the different company departments. The choice about moving on to the next stage of the innovation process is made at a gate, which acts as a checkpoint for a go-or-kill decision. Gates are fundamental to controlling the quality of the innovation and choosing the next play. There are as many gates as stages, and companies usually adopt a five-stage-gate process, as the one reported in figure 2.2. In the first gate, ideas are screened, and here their attractiveness and technical feasibility are evaluated. Stage 1, named "scoping", includes activities aimed at determining market potential and size, and at assessing the technical viability of developing and manufacturing the proposed product. The project then moves to gate 2, where a more accurate screening occurs. If the decision is "go", in stage 2, managers start drafting the business case, which better defines the product and verifies the attractiveness of the project before large investments take place in the following stage. Stage 2 is the last checkpoint before the development of the product starts. Development starts at stage 3, despite its emphasis on technical development, it entails also marketing and manufacturing activities. For instance, as the product develops, ongoing customer feedback and market analysis are sought and implemented in the process. Concurrently, budgets, financial and legal studies are updated, and market launch programs and operational plans are shaped. The post-development review occurs at gate 4, and then if approved the project moves to stage 4, where it is tested and validated. Gate 5 is the last gate at which the project may be abandoned, and it concerns the pre-commercialization business analysis. If the project passes this checkpoint, the final stage begins, which involves putting the marketing launch, production or operations plan in motion. After the product launch, a post-implementation review phase starts, and it is used to determine its strengths and weaknesses. From this stage, the business should learn what it can do better for the upcoming initiatives.

Figure 2.2: Main phases of the innovation process and Cooper's Stage-Gate process



Source: "Open and Closed Innovation. Different cultures for different strategies" by Herzog in Gabler research, 2nd ed, 2011.

Another well-known innovation process based on a system thinking approach, is the creative factory systems model, developed by Galanakis (2006). In this model, the firm is the originator and promoter of innovations in the market, then there are the industrial sector and the nation. Three main processes made up the overall model: knowledge creation, new product development, and product success in the market. The latter depends on the product's functional characteristics and the company's organizational capabilities to position it effectively in the market at a reasonable price and quality. This process is influenced both by internal factors of the firm, such as its corporate strategy or organizational structure, and external factors, including regulations, demand conditions, or national infrastructure.

After the new logic of Open Innovation, innovation models evolved to include also the management of external sources of knowledge and external paths to market. Innovation processes shifted from simple linear to more complex integrated ones.

2.2 The Closed Innovation model

The closed innovation model has contributed to the creation of several accomplishments and numerous commercial successes for most of the 20th century. This concept was first studied and analyzed by Henry Chesbrough (2003), professor and executive director at the Center for Open Innovation at the University of California, Berkeley. The closed innovation model is based on internal research and development (R&D), a key strategic asset essential as a barrier to entry by competitors in many markets (Chesbrough, 2003b). Through the aforementioned strategy, Thomas Edison managed to create instruments such as the electric light bulb and the phonograph. Companies like DuPont built central research centers to find and commercialize a variety of new products for the chemical sector, such as the synthetic fibers nylon, Kevlar, and Lycra. Another example of the effectiveness of this strategy is given by the impressive phenomena discovered by Bell Labs researchers, which were then leveraged to create several ground-breaking products, such as transistors and lasers (Chesbrough, 2003b).

The period between the end of World War II and the mid-1980s was the era of closed innovation based on internal R&D. At this time, there was little external expertise available to advance the industry. Many highly respected leaders in science believed that their talents and knowledge could not be applied to solve commercial problems. They were mastering enormous intellectual breakthroughs in understanding the physical world, and so they were uninterested in applying those findings to real-world issues for commercial purposes. Even if universities and other research institutions were producing a lot of promising knowledge, expanding businesses could not rely on this expertise. Universities spent all of their financial resources to support and carry out “pure scientific” trials and initiatives. Similarly, governments' involvement in the research system was minimal. As they were not directly involved in sponsoring research to produce new discoveries, but only in the development of patent systems to protect the new findings. Therefore, it can be concluded that universities and governments were not responsible for the technical advances of this period. The primary source of research funding for the commercial use of science was the industry itself. The principal location of this research activity was in the industry R&D laboratories. (Chesbrough, 2003a)

According to the closed innovation approach, a company's success depended on its size as well. The largest the company was, the more financial resources it had available to be invested in research projects. Furthermore, the largest companies accessed the most cutting-edge technologies, which enabled them to produce the highest profits of any company in the sector. The strong devotion to internal R&D was viewed as a barrier to entry by rivals businesses: any company that wanted to enter the industry would have to make similar large, long-term

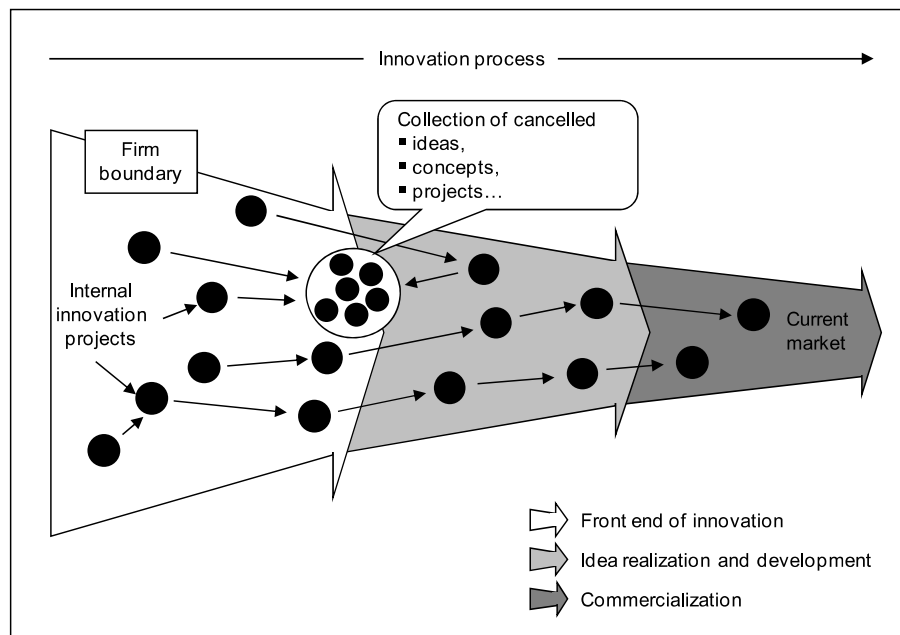
investments to create its own lab if it wanted to profitably compete. The large investments in R&D contributed to the creation of many corporate labs, such as Bell Laboratories and General Electric, Xerox PARC, and the T.J Watson Laboratories at IBM. These internal laboratories produced significant commercial scientific discoveries that allow the proprietary firms to hold a virtual monopoly in their industry.

Generally, the closed innovation model is the paradigm where the process leading to innovation is completely internalized. The company creates and develops its ideas internally and keeps them within the company boundaries until the new product is marketed. The entire innovation process, from the generation of the idea to the marketing and distribution, takes place completely within the organization, under closed centralized, and internal R&D. (Herzog, 2008) Everything coming from outside is considered suspicious and not reliable. This model assumes that the firm should rely on its internal core competencies for its essential technologies. If a technology is not the result of internal research and development, the company cannot be sure of its quality, performance, and availability of it. Additionally, all intellectual property rights, technology, and machinery belong to the company and remain under its control. This innovation process mandates that ownership of the intellectual property and internal control are essential for achieving successful innovation (Chesbrough, 2003a). Under this approach to innovation, there exists a need for extensive vertical integration. All the supply chain, from manufacturing to sales and distribution, must be owned by the company. (Herzog, 2008)

The closed innovation process is reported in figure 2.3. The firm boundaries are marked by solid lines. On the left, ideas flow into the firm, then they are developed using only internal resources and competencies, and on the right, they leave for the market. During the research process, ideas are tested, scanned, and filtered. Only the ones that pass this process are transferred into the development stage and then commercialized. (Herzog, 2008) There are many ideas, represented by the black circles, and all of them are available inside the boundaries of the firm. There is no other path for ideas to come into the firm, nor is there any other path for products and services to leave the firm. Projects are commercialized via the firm's own distribution channels. This guarantees that the system is closed, there are no losses, and the company's R&D system is sustained over time. The company captures the value of the new creation entirely by itself, reinvesting the proceeds to finance new research, which in turn will lead to future profitable products (Chesbrough, 2003a). The ideas that are rejected during the research process are stored and collected in an internal database. They remain unused unless the innovation teams decide to pick them up, at a late date, for further studying. Such an inward-looking innovation approach live many promising business ideas and technologies unexplored.

According to Wolpert (2002), this happens because firms fear losing their intellectual property to other organizations, only a few firms are able to recognize the potential of every new ideas; or have the necessary resources to exploit them.

Figure 2.3: The Closed Innovation model



Source: “Open and Closed Innovation. Different cultures for different strategies” by Herzog in Gabler research, 2nd ed, 2011.

Some implicit rules are linked to the implementation of a successfully closed innovation process. First, the firm should attract and hire highly educated and trained individuals, to create a research community where creativity and innovative thinking are stimulated. Companies should recruit these individuals by offering them attractive salaries, freedom to choose the projects they work on, and publish their results. Second, internal control and ownership of intellectual property are fundamental to make sure a firm is the first to market the idea. Being the first allows the firm to win the competition. Third, a firm needs to be aware that it would be involved in a wide range of topics, from the research of the materials to the creation and delivery of the final product. Profiting from innovative efforts requires a firm to discover, develop, and market everything itself. Lastly, firms should protect their intellectual property to prevent other firms from profiting from the firm’s ideas and technologies. (Chesbrough, 2003a/b)

Overall, the closed innovation process can be divided into two different stages: research and development. Research is about the exploration of new horizons, often punctuated by

breakthroughs that result in interesting new discoveries. The research machine is driven by highly trained scientists and engineers, that can monitor significant research advancements in their specific professional areas and then apply them to the company's business. The research function is structured as a cost center, its financial goal each year is to stay within budget. Contrarily, development uses the result of research as input into its own process. The development process produces goods and services that embody the research ideas to launch them on the market. It involves a more predictable time horizon than that of the research process, as it is about setting and achieving schedule targets and budgets to transform discoveries into new products and services. The development function is structured as a profit center, with its profit and loss (P&L) statement. Managers of this division want to exploit the new research inputs with minimal additional expense, so as not to hurt the business's P&L. Only research inputs considered fully understood and ready to be converted into new products are taken into consideration. There is a budgetary gap between research and development because of their competing goals. The goal of the research cost center is to continuously move on to new ideas, concepts, and projects, whereas the development profit center wants more work done on the current research idea before taking over its further fundings.

The main differences between the research and development process are summarized in table 2.1.

Table 2.1: Differences between research and development process

<i>Research Organization</i>	<i>Development Organization</i>
• Cost center	• Profit center
• Discovery: Why?	• Execution: How?
• Hard to predict	• Hit targets
• Hard to schedule	• Hit schedules
• Create possibilities	• Minimize risk
• Identify problems and how to think about them	• Solve problems within constraints

Source: "Open Innovation. The new imperative for creating and profiting from technology" by Chesbrough, 2003.

2.3 The Open Innovation model

For many years, the logic of closed innovation was considered the right approach to generating and marketing new ideas. Although, at the end of the 20th century several factors contributed to the erosion of the foundations of the closed innovation model and opened the way to a new and revolutionary innovation model: the Open Innovation model. Chesbrough (2003a) identifies four erosion factors: the increasing availability and mobility of skilled workers, the venture capital market, the external options for ideas sitting on the shelf, and the increasing capability of external suppliers. The increased mobility of highly trained workers made it difficult for companies to control their proprietary knowledge. One company could profit from the training and experience of another company by hiring away some of the latter company's workers. In this way, new companies could access useful knowledge that previously they could not. Another factor that contributed to the erosion of closed innovation was the growing availability of private venture capital, which exposed companies that made significant investments to internal R&D at risk. The personnel from the companies' research labs could be lured away by attractive risk/reward compensation schemes to join new start-up firms, financed by venture capital. This type of start-up would generally not reinvest in new research, but instead, it would look outside for another technology to commercialize, breaking down the closed innovation cycle. Additionally, venture capital helped to finance start-ups and their efforts to market ideas that have escaped from the corporate research labs, further signing the end of the closed system. The term Open Innovation was first coined by Chesbrough (2003), and it means that valuable ideas can come from inside or outside the company and can go to market through internal and external paths. External ideas and paths to market are placed on the same degree of importance as that reserved for internal ones during the Closed Innovation era.

The definition of open innovation has evolved over time. The Chesbrough definition given in 2003 was changed by the latter, three years later, to stress the intentionality of the knowledge flows into and out of the firm. He states that Open Innovation is "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough, 2006). Most recently, Chesbrough and Borgers (2014) defined open innovation 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". Nowadays, Open Innovation has become a popular area of innovation research, extended to a wide set of fields, such as small and medium-sized enterprises (SMEs), new units of analysis, different high and low-tech industries, and not-for-profit organizations and public policy.

The open innovation process assumes that companies need to integrate internal research with external ideas and then distribute those ideas both within their own business and through other companies' businesses. The process is reported in figure 2.4, and it is divided into three stages: the front end of innovation (research), idea realization and development, and commercialization. In this approach to innovation, the boundaries between a firm and its surrounding landscape are more porous, and the solid line of the closed innovation model is transformed into a semi-permeable membrane. Innovation initiatives can generate from the expertise, capabilities, and support of other businesses or research labs. Moreover, new technologies can enter the innovation process at various stages. They can penetrate the firm's boundary and be used in the research process.

In the first phase of the open innovation model, ideas are generated, examined, and filtered. Unlike the closed innovation model, this one relies on a widespread knowledge environment, in almost every fields. Access to outside knowledge was very difficult and expensive up until the early 1990s. However, with the spread of the low-cost internet connection, together with the development of open access scientific journals, public databases, and other public information sources, this has changed. The locus of innovation has left the walls of the largest firm's R&D labs and is now spread out among various startups, universities, research alliances, and other external groups. This does not imply that companies should stop conducting internal R&D. On the contrary, it implies that internal research should also take into consideration the wide range of activities outside the firm. Open innovation changed the rule of the research function. Researchers working for firms following an open innovation strategy have to identify, understand and select external knowledge, as well as leverage internal one.

Additionally, ideas that are rejected during the research process are made accessible to the external environment. This is to avoid promising projects remaining unexplored and locked inside the organization. For example, Apple Computer exploited the graphical user interface (GUI), developed by Xerox by never commercialized by itself, in its Macintosh. Other companies like P&G, offered ideas generated internally in their labs to outside firms, if not exploited within a certain time. (Chesbrough, 2003)

In the idea realization and development phase, new ideas and technologies can be developed and taken to market using various instruments, such as venture investment, technology acquisition, joint R&D agreements or technology in-licensing (see Table 2.2). Joint R&D agreements allow firms to collaborate and cooperate on the development of specific technologies, processes or products with universities, other businesses, and research institutes. Moreover, technology in-licensing is used as a strategy to accelerate the development of goods.

It is the transfer of intellectual property (IP) and know-how from a licensor, the firm selling the technology, to a licensee, the firm that in-licenses the technology. The licensee has the obligation to pay a fee to the licensor, and this gives him the right to use the technology for a specific time period, but it does not give him any decision-making power. The main benefits of licensing technology over developing it internally are ease and rapid access to the technology itself, lower development costs, fewer technology risks, and a high degree of reversibility. Technologies needed in the development process can also be acquired from the surrounding environment. Through the acquisition, a firm can hierarchically control the target's technology, personnel, and other assets purchased. Nevertheless, the acquisition is the toll that required the highest level of financial and managerial engagement, since both firms are closely interrelated. Hence, acquisitions are mostly irrevocable. Intellectual property is treated in the open innovation model as a new class of assets. It can help the firm to generate additional revenue and to point the way towards entry into new businesses and new business models.

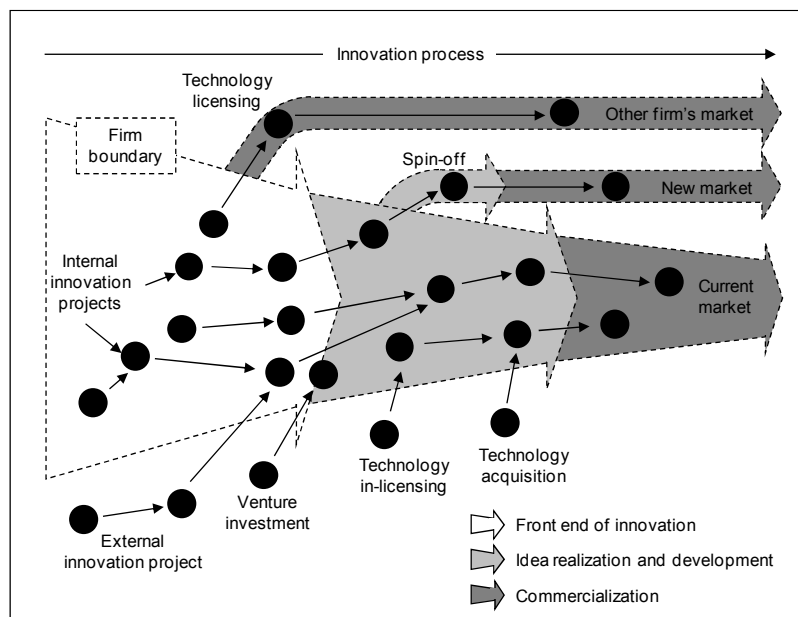
Table 2.2: Open Innovation: different forms of technology sourcing

Technology sourcing method	Typical duration	Advantages (rationale)	Disadvantages
Internal R&D	Long term	<ul style="list-style-type: none"> ▪ Build absorptive capacity ▪ Exclusiveness of technology/ knowledge exploitation 	<ul style="list-style-type: none"> ▪ Usually no longer sufficient to keep pace with increasing speed and complexity of technological developments in high-technology industries ▪ High commitment ▪ Low/ medium reversibility
Licensing	Fixed term	<ul style="list-style-type: none"> ▪ Fast technology access ▪ Lower development cost ▪ Less technology and market risks ▪ Low commitment and high reversibility 	<ul style="list-style-type: none"> ▪ Loss of control of decision-making because of contract constraints ▪ Competitive advantage usually not realizable unless exclusive license
Joint R&D agreements	Medium/ long term	<ul style="list-style-type: none"> ▪ Explore emerging technologies ▪ Define and establish standards ▪ Access to public funding ▪ Reduce risk (horizontal and lateral collaboration) ▪ Exploit established technologies ▪ Develop system solutions (vertical collaboration) 	<ul style="list-style-type: none"> ▪ Limited flow of technological knowledge ▪ Knowledge leakage/ spillovers ▪ Opportunism
Corporate venture capital	Flexible	<ul style="list-style-type: none"> ▪ Window on technology ▪ Option to defer high commitment of resources ▪ High reversibility 	<ul style="list-style-type: none"> ▪ Information asymmetries between new venture and investing firm ▪ Modest control over development of technology
Joint ventures	Long term	<ul style="list-style-type: none"> ▪ Technology convergence ▪ Define and establish standards ▪ Smoother information flows ▪ Coordination and control ▪ Exclusivity of technology ownership 	<ul style="list-style-type: none"> ▪ Organizational risk ▪ High commitment ▪ Low/ medium reversibility
Acquisitions	Long term	<ul style="list-style-type: none"> ▪ Hierarchical control over new technology/ knowledge basis ▪ Short-cut to new technologies 	<ul style="list-style-type: none"> ▪ Highest degree of commitment ▪ Low reversibility

Source: "Open and Closed Innovation. Different cultures for different strategies" by Herzog in Gabler research, 2nd ed, 2011.

Finally, in the commercialization phase, firms can capture value from the innovation in many different ways, such as through out-licensing the technology or the company's own marketing and sales channels. In addition, the project can go to market via a spin-off venture company and enter a company's new market segment. Therefore, even the commercialization of the innovation project can occur through both internal and external pathways, underling the openness of the entire process.

Figure 2.4: The Open Innovation model



Source: "Open and Closed Innovation. Different cultures for different strategies" by Herzog in Gabler research, 2nd ed, 2011.

Chesbrough recognizes that there are some implicit rules that apply to the implementation of a successful open innovation process. First of all, firms do not need to hire all the smart workers, but rather collaborate with them inside and outside the firm. Second, in order to succeed, a firm does not need to come up with the most ideas or the best one. Instead, a firm wins the competition by effectively exploiting both internal and external knowledge, and combining that knowledge to produce new innovative products. Third, IP management needs to be proactive, allowing other firms to use the firm's IP, and licensing other firms' IP whenever it advances the innovation process.

Open innovation is core to increasing a company's innovativeness and reducing the time to market the innovation. Procter and Gamble, declared that through the introduction of the open

innovation approach into the organization, it was able to increase the efficiency of its R&D by 60% and its production rate by 50% (Chesbrough, 2003c).

Overall, the open innovation approach emphasizes the importance of opening the companies' boundaries to the external environment, ideas, technologies and knowledge, but still highlights the importance that internal innovation activities have.

The Open Innovation model assumes that knowledge is widely distributed. Ideas that once only sprouted in huge corporations may now emerge from different settings, including Silicon Valley high-tech start-ups, academic institutions or spin-offs from well-established organizations. As previously mentioned, open innovation is built on two distinct flow patterns. On the one hand, open innovation underlines how crucial it is to use outside technologies to enhance internal innovation initiatives. On the other hand, unless a firm decides to market the innovation via its own distribution channels, it should be commercialized via external pathways. In both flow patterns, ideas, projects, and technologies pass through the semi-permeable corporate membrane. In the closed innovation model, the company that gets an innovation to the market first will win. Whereas, in the open innovation model, building a better business model is better than getting to market first. The business model describes how value can be created from innovations and which elements have to be sourced internally or externally.

Many organizations used this model to win the competition and stay abreast of their rivals. For instance, Cisco Systems managed to stay ahead of Lucent Technology, and often outperform the company in the market. At the time, the two companies were competing in the same telecommunication market, but they were innovating using two different strategies. Lucent, which inherited shares of Bell Laboratories, was primarily focused on internal R&D activities. Indeed, Cisco's strategy was based on the acquisition, from outside, of any technology the company needed in its research and development process. In this way, even if Cisco did not conduct much in-house research, it was able to keep up with the R&D output of what is arguably the best industrial R&D organization in the world.

In the previous sections, I analyzed the open and closed innovation models. The main difference between the two relies on how ideas are developed and commercialized. As already mentioned, under the traditional closed model, R&D activities occur only internally, while in the open innovation model valuable R&D activities are generated both internally and externally. Table 2.3 below summarizes the main characteristics of the two models.

Table 2.3: Main characteristics of closed and open innovation

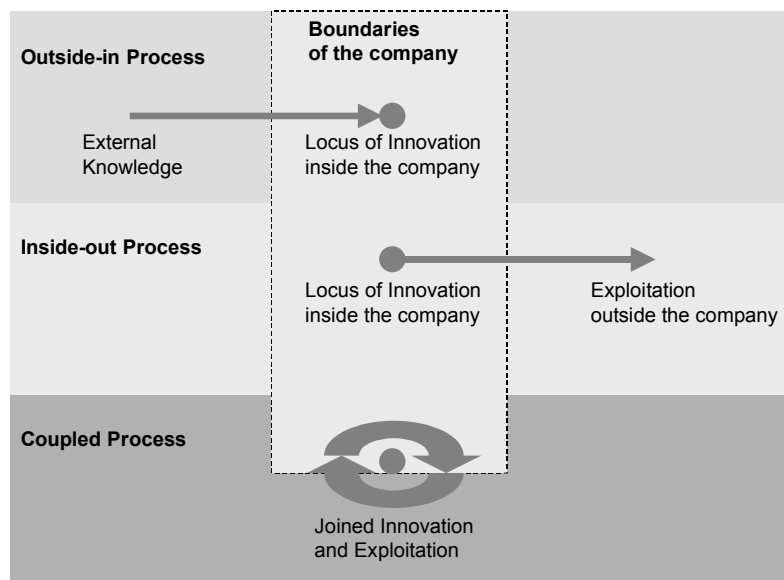
Closed Innovation	Open Innovation
<ul style="list-style-type: none"> ▪ R&D activities are discovered, developed and delivered internally ▪ Knowledge sharing only takes places within the company ▪ Restricted knowledge environment ▪ The company that first gets the innovation to market win ▪ The company employs all the smart people working in its field ▪ To be successful the company has to create the most and the best ideas ▪ The company has to control its intellectual property so that competitors do not profit from its own ideas 	<ul style="list-style-type: none"> ▪ Valuable R&D activities are generated both internally and externally ▪ Inflow and outflow of knowledge to accelerate innovation ▪ Extensive knowledge environment ▪ Building a better business model is better than getting to market first ▪ The company has to work with smart people inside and outside the company itself ▪ To be successful the company has to make the best use of internal and external ideas ▪ The company has to profit from the use of its intellectual property from others, as well as it should buy other's intellectual property

Source: self-elaboration

2.4 Three different types of Open Innovation: Outside-in, Inside-out, and Coupled process

Gassman and Enkel (2004) carried out a study to examine how 124 companies were innovating. Based on this research, they identified that companies employ mainly three open innovation processes: outside-in process, inside out process and coupled process. They also found out that not all businesses use the same core open innovation process or had all three processes integrated to the same degree. Businesses usually implement one primary process, while incorporating some elements of the others. The three different open innovation processes are summarized in figure 2.5.

Figure 2.5: Different types of open innovation processes



Source: Gassmann, O., and Enkel, E., 2004. "Towards a theory of Open innovation: three core process archetypes". ResearchGate.

The outside-in process denotes the practice of enriching the company's own knowledge base through the integration of suppliers, customers, and other external sources. External knowledge sourcing can increase a company's innovativeness. When a company decides to adopt the outside-in method as its primary open innovation strategy, it chooses to invest in co-operation with suppliers and customers and to integrate the external knowledge gained. This can be accomplished, for instance, by integrating customers and suppliers, setting up listening posts at innovation clusters, purchasing intellectual property or investing in global knowledge creation.

Collaborating with external partners can give firms easier access to valuable external ideas, skills, and knowledge (Wang et al, 2015).

Suppliers can increase the success of the buyer's product and projects by contributing with their ability to innovate and develop new products. The integration of suppliers into a firm's innovation process allows to promptly identify and solve technical problems, to improve product attributes or to access to additional or new process technologies. For example, Magna Steyr is one of the key suppliers to the automotive industry, and it is part of the innovation process of most automotive OEMs in Europe. Companies like BMW, Saab and Volkswagen, benefits from Magna Steyr's growing expertise, resulting after each new project with a rival. With the construction of the new Saab convertible, Magna Steyr demonstrated that its skill has grown to the point where it can now manufacture entire vehicles rather than just individual components. Another example of suppliers' involvement in a firm innovation process can be found in DaimlerChrysler "Score" project: suppliers who found innovative ideas and suggest improvements have the chance to become DaimlerChrysler long-term partners, and to receive a percentage of what the company saved in R&D.

Customers integration in product development is very important, it allows company to deduct their needs before customers are even aware of them. Consumers are no more passive recipients of the product but are now co-creators of values: they are a source of competence. As an example, the Creative Center, established by Bayer Polymers, searches for and connects with key customers in order to integrate their knowledge and demands into future research scenarios. Even Proctor & Gamble intensively uses its customers' knowledge for innovation. In 2002, customers initiated 10% of the company's innovations.

The companies that use the outside-in approach recognize that the locus of knowledge creation does not necessarily equal the locus of innovation. A high knowledge intensity can additionally be identified as a key characteristic of companies specializing in the outside-in process. Their need for knowledge cannot be satisfied by using their internal abilities only.

On the contrary, the inside-out process refers to profiting from bringing ideas and technologies to market through channels that lie outside the firm's boundaries. The main reason why companies choose the inside-out process as their primary focus is to bring ideas to market more quickly.

The companies that implement this type of process, shift the locus of exploitation outside their own boundaries. They no longer confine themselves to the markets they serve directly. Instead, they also participate in other market segments by licensing out their intellectual property or technology, profiting from licensing fees, joint ventures, and spin-offs. These different sources

of income create more overall revenue from the innovation. Therefore, the inside-out process in open innovation can significantly increase a company's revenue. Additionally, firms can profit by marketing the same idea in different industries. The pharmaceutical industry can be taken as a great example to explain this phenomenon: companies like Pfizer, Roche or Novartis Pharma, are known for developing substances that were initially developed to treat one condition but become more well known or similarly effective when used to treat other conditions. For example, Viagra was initially developed to control blood pressure, but it is now also used as a sexual aid. A positive effect of the inside-out process is the creation of spillovers, innovation that can be commercialized successfully in other industries as well.

Outsourcing can be used not only to commercialize ideas outside one's own industry or market, but also to transfer knowledge and ideas to the external environment. It involves market-based knowledge acquisition and technology licensing from third parties. Technology can be licensed also to industries belonging to different markets, allowing the innovative firm to earn exceptional profit. A recent example of this is Schindler, a dominant company in the elevator market, it developed aramid cables to replace elevators' steel cables. The patents for non-elevator applications have been sold for \$6 million and thus financed the whole R&D project.

The inside-out process is mainly chosen by basic research-driven companies, such as IBM, with a wide range of applications. These companies choose this process to reduce the fixed costs associated with R&D and to share the risk of innovation failure. Pharmaceutical companies like Novartis and Hoffmann LaRoche do that by outsourcing parts of the development process.

The desire to set new technological standards is another reason why companies like Cisco decide to outsource their technology or to participate with their knowledge in the value chain of other firms.

The coupled process is a combination of the outside-in and the inside-out process, in which companies co-operate to jointly develop and commercialize innovation. In order to efficiently and effectively combine these two processes together, businesses must collaborate with each other in strategic networks. Successful collaboration requires a give and take of knowledge. For this reason, it is essential to merge the outside-in, to take external knowledge, with inside-out processes, to give knowledge to the external environment. An intensive exchange of knowledge and a process of mutual learning are the key characteristics of this process. Moreover, to work in cooperative innovation processes, companies must have the ability to both incorporate external expertise into their own knowledge and externalize it in order to facilitate the partner to learn. In fact, the success of a coupled process is determined by a company's ability to find and integrate the right and appropriate partners who, with their competencies, capabilities, and

knowledge, can allow a firm to obtain a competitive advantage and improve its competitive position.

Co-operation is the core to pursuing a successful open innovation strategy based on a coupled process. It is the joint development of knowledge through long-term relationships with strategic partners, including suppliers, customers, competitors, as well as universities and research institutes. Companies can establish relationships with other partners using different instruments, such as alliances and joint ventures. An alliance is an arrangement between two firms to work together on a mutually beneficial project, and each party maintains its independence. Their resources are not merged, firms agree only to share intellectual property, technology or expertise. Indeed, a joint venture is a business contract in which companies agree to pool their resources to accomplish a given objective. Each firm brings specific capabilities to the joint venture that the other firm does not have. In doing so, they create a separate business entity, and this type of agreement is generally more complex and binding than a strategic alliance. The cooperation of companies with other partners such as universities has led to the creation of impressive innovations. As an example, through its collaboration with Cambridge University, Hitachi's Cambridge Laboratory (HCL) discovered the "Fento-Second Ultra-Fast Quantum Device". This device is used for both high-end telecommunication and ultra-fast computing. Furthermore, cooperation can improve a firm competitive position and reduce its risks, but it does not always lead to a reduction in development time (Kirchmann, 1994).

The goals of the majority of businesses that concentrate on the coupling of outside-in and inside-out processes are to set standards or a dominant design for their products. Additionally, this process is also chosen by companies that produce complementary products. They usually work with partners in strategic alliances to ensure that the new technology will be implemented in the products that the partners produce.

After their careful analysis of all companies in their database, Gassmann and Enkel (2004) concluded that the future of innovation is not about focusing on outsourcing all internal innovation activities, but rather about adopting a flexible innovation strategy. It should include activities to connect external sources to the internal innovation process, as well as the commercialization of intellectual property or the scanning and integration of new technologies. In addition, they identified that companies focusing on each different process have different characteristics. Table 2.4 below reports the key characteristics of the companies implementing the different processes.

Table 2.4: Company and innovation process characteristics

	Company characteristics	Process characteristics
Outside-in process	<ul style="list-style-type: none"> ▪ low tech industry for similar technology acquisition ▪ act as knowledge brokers and/or knowledge creators ▪ highly modular products ▪ high knowledge intensity 	<ul style="list-style-type: none"> ▪ earlier supplier integration ▪ customer co-development ▪ external knowledge and integration ▪ in-licensing and buying patents
Inside-out process	<ul style="list-style-type: none"> ▪ research driven company ▪ objectives like decreasing the fixed costs of R&D, branding, setting standards via spill-overs 	<ul style="list-style-type: none"> ▪ bringing ideas to market ▪ out-licensing and/or selling IP ▪ multiplying technology through different applications
Coupled process	<ul style="list-style-type: none"> ▪ standard setting (pure dominant design) ▪ increasing returns (mobile industry through multiplying technology) ▪ alliance with complementary partners ▪ complementary products with critical interfaces ▪ relational view of the fit 	<ul style="list-style-type: none"> ▪ combining outside-in and inside-out processes ▪ integrating external knowledge and competencies and externalizing own knowledge and competencies

Source: self-elaboration. Adapted from Table 1, 2, 3 by Gassmann and Henkel In: "Towards a theory of Open innovation: three core process archetypes". ResearchGate.

2.4.1 Technology Sourcing through Acquisition

It is widely acknowledged, both in corporate practice and theory, that innovation is essential to the long-term survival and growth of the firm. As previously discussed, firms can decide to implement a closed innovation strategy or an open one. When designing and implementing an innovation strategy, firms should address three central questions: "What", "Where", and "How" to innovate. The answer to the last question refers to "How" to adopt the technologies needed to fulfill and develop the functions and requirements of the innovation. Technology may be created within the company or acquired from external sources. The latter method is a cornerstone of the Open Innovation approach. In recent years, more and more dominant organizations, like Cisco, Microsoft, and big pharmaceutical companies, are adopting acquisition strategies to source external technology and capabilities. (Desyllas and Hughes, 2008)

Technology sourcing can be implemented through acquisitions or strategic alliances, such as licensing, R&D agreements, and joint ventures. Acquisition is the term used to describe the

process by which a firm purchases most or all of the target firm's technological capabilities, and gain full control of them. (Herzog, 2008) According to Steensma and Corley (2001), the acquiring firm can exert hierarchical control over the target's technology, personnel, and other assets. This form of the outside-in process requires the highest level of financial and managerial commitment since both firms are closely linked. Acquisitions are generally long-term and characterized by a low degree of reversibility (Steensma and Corley, 2001). There are several reasons why firms may decide to acquire resources from the external environment rather than develop them internally. First, firms may not have the right expertise, knowledge, or learning skills to develop new technologies internally. Second, technology sourcing enables to break down time constraints. Third, it may not be convenient to transfer intangible assets, such as knowledge, without buying the entire company, because the transfer will require the involvement of numerous target firm employees (Karim, 2004). Furthermore, if a firm is behind in technological advancements, it can buy smaller firms and their promising technologies as a means of avoiding falling behind the competition. However, whenever firms have financial resource constraints, they may be limited in their ability to rely on external technologies to support their innovation activities.

In addition, the acquisition of technology from outside the firm's boundaries is possible only if it is made available by other organizations in the market. In other words, another organization needs to commercialize its technology outside its borders, in an open and interrelated business environment.

A study by Karim and Mitchel carried out in 2004, stresses the importance of both acquisition and internal development as sources of value and innovation for a firm. The reconfiguration of acquired units and their resources is often necessary to accomplish innovative objectives and to create new value from them. Internal development and acquisition should work synergistically, allowing the acquired units to be fully integrated into the innovation process, rather than limiting their operations to their initial destination, to entirely exploit their potential. There are different ways in which an acquired unit can be reconfigured, for example, it can be dissolved, and its resources used by internal units for new innovative activities. Contrarily, an acquired component may also be combined with one or more other acquired units, which may help to gain scale or to develop new resources crucial for the innovation process.

Cisco System is an example of a firm that used open innovation through acquisitions and exploited it to remain competitive in the market.

Chapter 3

Cisco and its A&D strategy

3.1 Company overview: history, mission, vision, and value proposition

Cisco System, Inc. is one of the world's leading networking companies with more than 71,000 employees worldwide. Since its foundation, it is a pioneer in technological innovation. It is a multinational company that designs, manufactures, and delivers cutting-edge Internet-Protocol networking and telecommunications hardware and software. The company's core development areas are routing, switching, home networking, security, and storage. In its 38 years of activity, Cisco experienced a lot of growth and expansion and acquired more than 200 start-ups and companies. The cybersecurity division of Cisco is its fastest-growing business unit. By bundling together its security products with its networking hardware and software, it has been able to gain a competitive advantage over stand-alone security firms.

Cisco Systems, Inc. was founded in December 1984 by two Stanford University computer scientists: Leonard Bosack and Sandy Lerner. The company's name derives from San Francisco, the city where Stanford University is located, and the logo derives from the two towers of the Golden Gate Bridge.

Cisco's primary product from the beginning was the internetworking router, a hardware device incorporating software that automatically selects the most effective route for data to flow between networks. In 1986, Cisco commercialized its first product, the AGS (Advance Gateway Server), a router for the TCP/IP (Transmission Control Protocol/Internet Protocol), becoming the first company to commercially provide a multiprotocol router. A year later, even if the company had only eight employees, it was selling \$250,000 worth of routers per month. Cisco went public on February 16, 1990, and was listed on the NASDAQ Stock Exchange. The company's market capitalization at that time was \$224 million. In the early 1990s, the company grew rapidly. This happened because it expanded its product offerings, and it began acquiring other companies. Between 1993 and 1994, it acquired several Ethernet switching companies, such as Kalpana, Grand Junction, and above all, Mario Mazzola's Crescendo Communications, which together formed the Catalyst business unit. The acquisition of Crescendo, in 1993, opened the door for Cisco to the switching market. At the height of the dot-com boom, in late March 2000, Cisco had a market valuation of more than US\$500 billion, making it the most valuable company in the world. It was still one of the most valued companies as of July 2014, with a market capitalization of over US\$129 billion. From the early 2000s, Cisco started to

launch different products, including the ISR (Integrated Service Router), CSR-1 system, and the Nexus 7000, while at the same time it continued its acquisition campaign, gaining access to new markets. As the Internet Protocol (IP) become widely adopted, in the early 2000s, the multi-protocol routing's significance diminished. Cisco answered the challenge with homegrown ASICs and fast processing cards for GSR routers and Catalyst 6500 switches. In 2004, Cisco began transitioning to new, high-end hardware, the CRS-1, and software architecture IOS-XR. Between 2006 and 2014, Cisco continued to expand its extensive enterprise-focused routing, switching, and security portfolio. Moreover, in the same period, it penetrated the cloud and software markets.

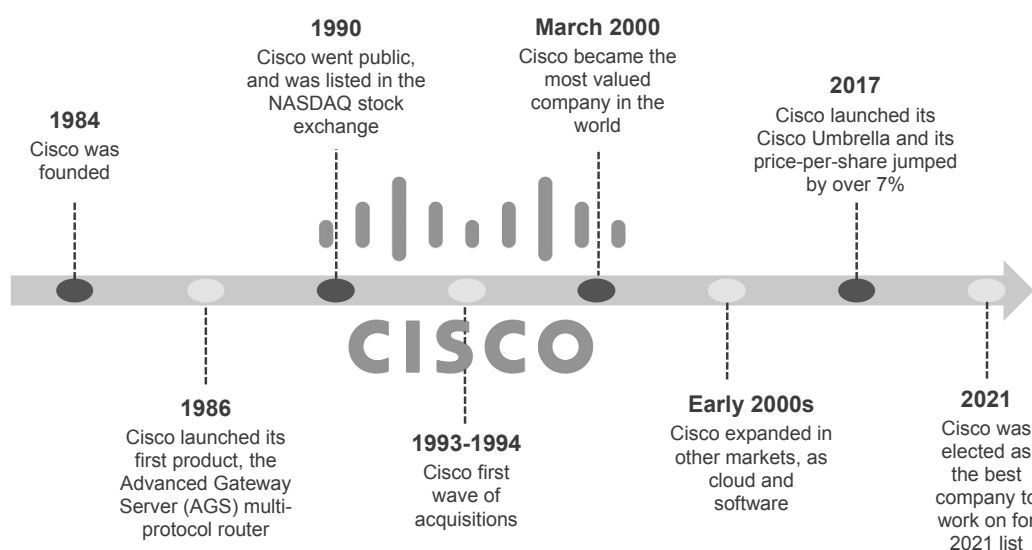
At the end of 2013, Cisco reported low revenue due to declined sales in emerging markets, brought on by economic instability and by fears of the National Security Agency planting backdoors in its products.

Cisco Umbrella, a cloud-based secure internet gateway, was launched in 2017 to provide safe internet access to users who do not use their corporate networks or VPNs to connect to remote data centers. This year has been significantly important since Cisco's price-per-share value increased by more than 7%.

Cisco's acquisition strategy has never ended, between 2014 and 2021, it incorporated promising companies like CloudCherry, Perspica, Slido, and the last Opsani, made on January 2022.

Lastly, in April 2021, it was ranked top on Fortune Magazine as the best company to work on for the 2021 list. As of December 2021, it has a market capitalization of US\$240.48 billion.

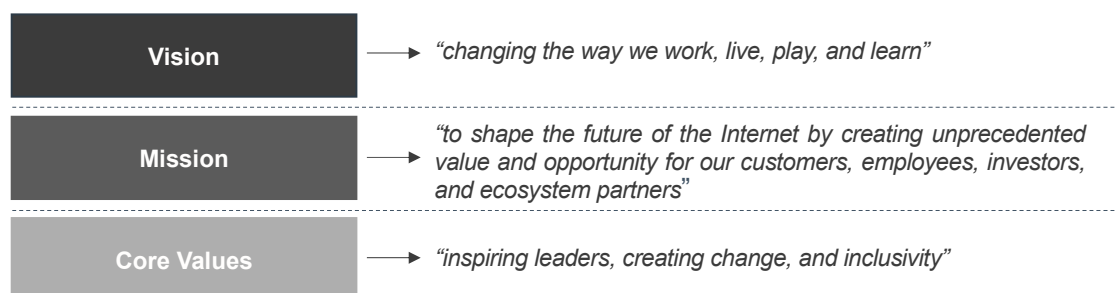
Figure 3.1: History of Cisco System, Inc.



Source: self-elaboration

Cisco has always been a leading company in its markets. The success of this firm can be directly linked to the strengths of its mission, vision, and core values. The vision statement of a company gives the image of what a company desires to achieve, it sets a defined direction for the planning and execution of corporate-level strategies. Cisco's vision statement is "changing the way we work, live, play, and learn". The statement underlines Cisco's desire to have an impact on people's life and communities by changing the way they execute many everyday activities. It is possible to distinguish two key elements in Cisco's vision statement: being an agent of change, and a global horizon. The first element in this vision statement has contributed, over the years, to build Cisco's reputation. By producing secure routers, improved wireless technologies, online-learning services, and other networking products, is changing the way the internet is used for ordinary activities. Instead, the second element ensures that Cisco operates as a dynamic and globally dominant entity. Once the vision statement has been developed, a company should formulate the mission statement. It highlights the specific tactical methods that the company exploits to advance its business position towards the established vision. Cisco's mission statement is "to shape the future of the Internet by creating unprecedented value and opportunity for our customers, employees, investors, and ecosystem partners". The first part is related to its business purpose: connectivity and communication. In the second part Cisco demonstrates that it wants to create a positive and long-run impact on the life of all its stakeholders in a new and unexpected way. Cisco's core values are "inspiring leaders, creating change, and inclusivity". The element of "change" is part of the company DNA, as also part of the mission and vision statement. The value of "inspiring leaders" is fundamental since the company has created an environment that fosters talent and encourages its employees to become leaders. Finally, "inclusivity" is a value that ensures that people of all genders, races, and nationalities contribute equally to the advancement of change.

Figure 3.2: Vision, Mission, and Core values



Source: self-elaboration

Analyzing Cisco's annual report for 2021, it is possible to demystify its strategy. Its mission is to shape the future of the internet by inspiring new possibilities for customers by helping address their security needs and empower their teams. Cisco believes that its customers are now searching for solutions that are data-driven and provide business value through automation, security, and analytics across private, hybrid, and multi-cloud environments. Therefore, its strategy focuses on helping customers connect, secure, and automate in order to accelerate their digital agility in a cloud-first world. The company is now focusing on six strategic pillars, shown in figure 3.3, to execute its strategy and address its customers' priorities. While executing its strategy, Cisco remains committed to its purpose: to power an inclusive future for all.

Figure 3.3: Cisco's strategic pillars

<p>Secure, Agile Networks</p> <p>Build networking solutions with built-in simplicity, security, agility, and automation that can be consumed as a service</p>	<p>Hybrid Work</p> <p>Deliver highly secure access, a safer workplace, and collaboration experiences for the Hybrid workforce</p>	<p>Optimize Application Experiences</p> <p>Enable greater speed, agility, and scale of cloud-native applications.</p>
<p>End-to-End security</p> <p>Build simple, integrated, and high-efficacy end-to-end security solutions, delivered on-premises or in the cloud</p>	<p>Internet for the future</p> <p>Transform connectivity by efficiently meeting the ever-growing demand for low latency and higher speeds</p>	<p>Capabilities at the Edge</p> <p>Develop new capabilities for a distributed world while enhancing the developer experience and extending enterprise and carrier networks</p>

Source: self-elaboration. Adapted from Cisco Annual report 2021, page 6.

Cisco is also committed to creating sustainable solutions to address environmental issues. For example, it reached 100% renewable energy in the U.S., and it is taking other actions to reduce carbon emissions. For the near future, it is committed to reaching net zero across all scopes of greenhouse gas emissions by 2040.

The fiscal year 2021 was characterized by tremendous global uncertainties, such as the COVID-19 pandemic that completely changed the way people lived and worked, and climate change issues. Despite the complexity of these challenges, Cisco's revenues increased from US\$49.3 billion in 2020 to US\$49.8 billion in 2021. In 2021, its software revenue was US\$15 billion of its total revenue, making it one of the largest software companies in the world. In addition, Cisco used 36% of its cash available for acquisition activities.

3.2 Cisco's five-way strategy for Innovation

Cisco is considered one of the most innovative companies in the world. Over the years, the company has introduced several disruptive products, such as the AGS Multi-protocol Router or the Integrated Services Routers (ISR), that have allowed it to dominate the networking technologies sector. Innovation is defined by Cisco as creating something significantly new, better, and of value. It is not just an idea, but the ability to bring it to life. To exploit the full potential of an innovation, Cisco has developed a multi-faceted and structured innovation strategy. Cisco's innovation engine is composed of five pillars: build, buy, partner, invest, and co-develop. (Figure 3.4)

The first pillar, build, is the core of any innovation culture. Cisco first and foremost must develop products and create its own IP, if it wants to secure its market-leading position. Cisco has more than 25,000 engineers employed, and it has invested about US\$6.3 billion a year in Research & Development. This amount of R&D expenditure demonstrates the importance Cisco places on the development of new and innovative products. The company tries to encourage innovation by implementing different practices. One of these includes having 35% of its engineers working in an agile development environment, and on small and dynamic teams. Another practice used by Cisco to foster innovation is funding "Alpha" projects, which enables the development of innovative and disruptive new technologies. As a result of the heavy investments in the "build" pillar, Cisco's research centers were able to generate more than 19,000 patents globally.

The second part of Cisco's innovation strategy is about acquisitions. Buy is Cisco's fundamental innovation strategic tool. The company recognizes that not all products can be developed using only internal capabilities, resources, and technologies. External sources are essential to accelerate the movement of products to the market, improve the company's net profit margin, increase product offerings, and allow the company to grow. Since 1993, Cisco has made about 238 acquisitions till August 2022. As Cisco's Chief Strategy Officer, Hilton Romanski, argued in 2017, acquisitions helped the company to maintain market leadership in the routing and security market, as well as to enter new markets, and to drive business growth. In addition, he argued that all the company's stakeholders (shareholders, customers, partners and employees) benefit from acquisitions because they are a powerful, strategic tool to properly execute Cisco's strategy. Acquisitions are drivers of internal innovation at Cisco. People who join Cisco through acquisitions are an integral part of the company. They account for 20 percent of the whole company and 20 percent of the leadership. Additionally, three years after joining the Cisco team, about 80 percent of acquired team members are still working there, highlighting

the fact that innovation in Cisco never stops. It continues even after an acquisition has been made through further acquisitions and internal development. The integration of this milestone into Cisco's innovation strategy encompasses its willingness to engage with the broader set of innovators, entrepreneurs, leaders, and talent outside the company. This open approach enables the company to rapidly adapt to changing market conditions and bring the best possible capabilities into the company.

Cisco largely relies on developing products with technology and service partners, as part of its innovation strategy. The company's dominance in networking is directly responsible for this. Cisco relies upon numerous partnerships, which cover a wide range of businesses. There are 41,889 partners serving Cisco worldwide, including IBM, Logicalis S.A., NTT, Orange Business Services, and Telecom Italia SPA. They are integrators, providers, developers or advisors. Developers, for example, build tailored software and hardware solutions on top of Cisco technology, and advisors guide businesses while they try to solve complex business challenges. In 2020, partnerships amounted to US\$42 billion of Cisco's annual revenues, equal to almost 85 percent of the company's total revenues. Cisco innovates by aligning its technologies, architectures, and R&D engineering with partners to create unique and tailored solutions that provide customers with real business outcomes. Additionally, the relationship with external parties allows the company to get the right experts, drive growth, and anticipate short and long-term customer needs.

Janey Hoe, the vice president of Cisco investments, states that "investing isn't something we do "when we feel like it". It's part of the company, and it's strategic", and that "every venture takes Cisco one step further into building an inclusive future through innovation". This opens the door to the third pillar of Cisco's innovation strategy: invest. Cisco invests around \$100 million annually, and its investment portfolio includes more than 100 companies located around the world. The company has also funded more than 50 different venture capital investments. This aspect of Cisco's innovation strategy can allow the company to capture undiscovered innovation opportunities with lower risk than that associated with acquisitions or partnerships. The company resources and assets remain separate and independent from the investment.

Cisco participates in co-development projects engaging with over 300,000 developers, as part of its innovation strategy. Among Cisco's co-development practices there is the Entrepreneurs in Residence Program (EIR). The EIR is a six-month incubation program for early-stage, product-focused entrepreneurs, working on ideas that Cisco believes can make the world a better place. Cisco finds promising start-ups, partners and co-operates with them to expand their business into something bigger, in the hope of discovering disruptive technologies that can help

Cisco and the industry to innovate and grow. Sometimes, these start-ups are acquired by Cisco. In addition to EIR programs, Cisco has 12 Innovation centers, which accelerate opportunities, deepen relationships, and foster innovation. One of these co-innovation centers is in Milan and it focuses on finding solutions to the most pressing society cybersecurity challenges. Co-innovation centers have dedicated spaces for developers and researchers, workshops for developing and testing innovative solutions, and areas that will be devoted to thematic forums. Innovations centers bring together partners, local start-ups, developers, academics from universities, and customers, all under one roof. Their primary goal is to create a diverse, dynamic and competitive environment where knowledge can be shared and used to develop solutions for digital transformation that can positively impact its customers.

Furthermore, Cisco's innovation engine is powered up also by employees. Cisco established innovation programs open to employees from different departments and of all levels to incentivize them to collaborate on the development of new ideas and solutions. "Innovate Everywhere" is one of these programs, where employees participate by bringing their own ideas. The company selects the most interesting and gives them the resources needed to develop them. This source of innovation idea is very important, as argued by Alex Goryachev, senior director of Cisco's innovation strategy and programs. Employees' ideas may involve new business processes that create efficiencies and save money, or a better way of communicating with customers that improve service.

Figure 3.4 Cisco's Innovation Engine



7
Source: self-elaborated

Cisco's innovation strategy has an extremely open footprint. Researchers, universities, venture capital, partners, clients, employees, and other businesses are an essential part of its innovation process. As shown by the five pillars of its innovation strategy, the company innovates in different ways. By building products and solutions, partnering with innovative companies, acquiring new technologies and businesses, or co-innovating with external parties. Cisco was able to recognize the benefits of opening its boundaries to the external environment and successfully implement an open innovation strategy. Open innovation enables Cisco to stay abreast of and shape the next big change that is going to impact the company and the industry. The primary open innovation process that it uses is the coupled one (see Chapter 2.4). It is a combination of the outside-in and inside-out process. Cisco collaborates with other parties in strategic networks, such as in hubs, or innovation centers, in order to connect the company's resources and expertise with up-to-date external knowledge and ideas. The outside-in process is mainly implemented through acquisitions of external technologies or start-ups. Conversely, the inside-out is implemented through the licensing of patented internal technologies, knowledge, and discoveries. Open innovation is part of Cisco's DNA, as Goryachev argued, ideas can generate from anywhere, inside or even outside the organization. Moreover, innovation is about people, it is an ongoing mindset and the essence of an organization, not just a project with a beginning and an end.

The recent Covid-19 pandemic has completely changed the way people live and work. Cisco was able to capture this opportunity by promoting new innovations, enabling it to remain one of the most innovative companies in the world. It is now engaged in a project called "Hybrid Work" to help businesses transition to a completely new work experience based on digitalization and flexible remote work. The new model of hybrid work empowers people to work on-site, offsite, and move between locations. Businesses must change the way they use or rely on technologies for hybrid work to be successful. Connecting people and devices across different locations require extensive wireless connections, increased network strength and resiliency, and security. Cisco is the company with the best knowledge and capabilities to fulfill these requirements. It was able to capture this opportunity and is now developing and already providing new networking technologies that can help business rapidly scale their digital operations and connect for the work-from-anywhere approach. Among the new wireless networking and access innovations developed by Cisco in 2022, there are: Wi-Fi 6E, which addresses the most demanding hybrid business environment; Cisco Private 5G, a wireless experience that is simple to start, intuitive to operate, and trusted for digital transitions; Catalyst

9000X switches, which provides speed, bandwidth capacity, and scale to support 100G/400G network access.

Cisco is bringing innovation also to the university system. Its latest collaboration with Luiss University enables it to continue teaching even during the pandemic period. Cisco Webex platform allowed Luiss professors to develop new ways of assessing students through online learning and exams. Specifically, the digital teaching platform delivered 17,000 hours of online classes, involving 500 lectures and 10,000 students in the first four months of adoption. It also enables the University to securely administer 2,100 online exams.

3.3 Innovation through Acquisition and Development

Acquisition is one of the five pillars of Cisco's innovation strategy and an integral part of its corporate strategy. In 1993, Cisco made its first acquisition of Crescendo, a switch producer, and it now has an acquisition portfolio of more than 238 companies, high-tech start-ups, and new technologies. Most of these acquisitions are small companies owning highly innovative technologies at the end of their phase of exploration (research) and at the beginning of their exploitation (production and commercialization) phase. After their acquisition, Cisco integrates these technologies into its development and production processes to develop and then commercialize its products. For example, in 2008 Cisco bought Accompany, a company that provides AI-driven relationship intelligence platform. This acquisition enables Cisco to provide new innovative collaboration platforms and systems for all users. The tools provided by this company allow Cisco collaboration platforms, including Webex meetings, to include and share data among users. Among Cisco's larger acquisitions we find Scientific-Atlanta for US\$6.9 billion, WebEx for US\$3.2 billion, and NDS Group for US\$5.0 billion. Some of these companies were operating in the same market as Cisco's offerings and they serve as complements to increase its market power in those areas. Others provided new ways of competing in markets where Cisco was already established. From 1987 to 2000, Cisco experienced an annual growth in revenues and profits of over 30 percent, mainly caused by the massive acquisition policy implemented in that period. What is important to note about this period is Cisco's huge investments in internal R&D, accounting for about 17.6 percent of total sales. This emphasizes the fact that an Acquisition and Development strategy (A&D) does not replace R&D, on the contrary, when a firm acquires a new product line or technology, it still necessary to continue R&D to fully exploit its potential. In 2021, Cisco annual research and development expenses were US\$6.549 billion a 3.18% increase from the previous year. Cisco's strategy of acquisition contributed to the development of the new managerial concept of Acquisitions and Development (A&D), and to bring the more traditional concept of Research and Development (R&D) to the background. A shift that signed the passage from a closed innovation model where only the firms' capabilities were considered valuable, to an open one where external capabilities, knowledge and competencies are considered essential drivers of innovation and company's growth.

The acquisition and integration of acquired business units are the key drivers of Cisco's growth over the years. It is this strategy that has allowed Cisco, more than any other technology companies in history, to build its dominant market position and grow from a small router manufacturer to a global networking provider. Acquisitions enable business benefits from

economies of scale and scope, provide unique resources and technologies, and support strategic renewal. For these reasons, acquiring other firms is part of many organizations' corporate strategies. However, not all organizations are able to generate financial value from acquisitions and exploit the proceeds to grow the business. This mainly occur because the integration of acquired business is challenging and complex. In order to succeed in the integration process firms must have specific skills, such as organizational, communication and collaborative. (Toppenberg et al., 2015). Cisco owns all these attributes and for this reason was able to exploit acquisition's potential in its innovation strategy.

Cisco has a predefined acquisition process that can be divided into four-phases (Figure 3.5): pre-acquisition preparation, acquisition selections, acquisition integration, and post-integration management (Toppenberg et al., 2015). The first phase starts before a potential target is identified. Making the acquirer "ready to acquire" is the challenge associated with this phase. The pre-acquisition preparation may last a couple of years and it includes the development of the specific capabilities required to support acquisitions. In the second phase, Acquisition selection, Cisco evaluates and then selects what company to acquire. When evaluating different companies Cisco follows several criteria. First of all, it evaluates if the potential business units can create short-term as well as long-term value for Cisco and the acquired company. For example, if a company has a complementary technology that fills in a need in Cisco's core product space or has a technology that can be delivered through Cisco's existing distribution channels. Second, it also assesses whether the acquisition will benefit stakeholders, employees, customers, and business partners in the long run. Third, acquiring units should share a common vision and culture with Cisco. This includes having a similar understanding of the market and a similar risk-taking approach. Cisco prefers more adventurous and risks takers companies because it believes they can explore a wider range of opportunities. In addition, the acquisition team assesses the extent to which the employees at the top and the lower level can be integrated into Cisco. Lastly, geographic proximity is important, if the newly acquired firm is located close to Cisco, collaboration, integration, and control will be easier. What comes out when examining these criteria for when and what to acquire is that the price of the acquisition is less important than the social, cultural, and organizational vision of the acquiring company. This is rooted inside the Cisco model that every company that they acquire becomes part of Cisco. It recognizes that each acquisition has a path-dependent trajectory: the value of the acquisition can be realized only after considering the social and cultural issues. (Kenney, 2002)

Once the firm has selected the right target to acquire, it identifies threats to and opportunities for post-acquisition and estimates its potential value. Acquisition Integration involves

integrating the acquisition into the company. To fully realize the benefits of scale, scope, resource addition and strategic renewal, Cisco has implemented a well-defined integration approach that can be applied for each new acquisition, and across the different divisions of the company. This approach is made of the following components (Cisco):

- formalized and centralized integration management through an appointed Cisco Business Development Group;
- cross-functional teams for each acquisition that manage, control, and plan activities across Cisco;
- standard metrics, tools, methods, and processes that can be repeatedly applied to new integration efforts, adapting them to the unique issues and parameters of each deal;
- guidelines for combining the integration of acquisitions with other concurrent strategic changes, such as divisional consolidations, divestitures, or acquisitions by Cisco divisions.

Moreover, the integration team uses many of Cisco's tools, such as WebEx online meetings and Cisco MeetingPlace conference calls, to enhance communication and collaboration among the different teams and departments.

The last stage is post-integration Management, in which Cisco should address and try to solve the organizational inefficiencies that may appear during the integration process, to avoid them accumulate and threatening the firm's growth strategy.

Figure 3.5: Cisco's acquisition process



Source: self-elaboration

Market acceleration, market expansion, and new market entry are the three categories into which Cisco divides its acquisitions. Different types of assets, including excellent talent and technology, new products and solutions, or new commercialization and business models strategy, may be brought by Cisco. Specifically, Cisco looks for acquisitions that have the potential to reach billion-dollar markets. In the last few years, the goal of Cisco's acquisitions has been to improve capabilities in the following areas: 5G wireless, data center/hyper-converged infrastructure, artificial intelligence, and security. As an example, in 2019, Cisco acquired Acacia Communications Inc. for US\$ 2.6 billion to prepare for 5G and surge in data. The acquisition gave the company optical component technology. (Nickolas, 2020) Overall, Cisco pursues the acquisition strategy to increase market power, develop new capabilities, reshape the firm's competitive scope, increase diversification, and reduce time to market by acquiring technologies from the external environment.

The challenges faced by Cisco are to identify the technological needs of its clients, find and purchase companies that develop technological innovations that meet these needs, integrate and commercialize in the existing offerings the acquired technology (Ferrary, 2011).

In Cisco A&D strategy one of the key elements is the retention of acquired employees. Cisco believes that success is hugely determined by retention. As John Chambers, ex-CEO of Cisco stated: "when we acquire a company, we aren't simply acquiring its current products, we're acquiring the next generation of products through its people". Knowledge, competencies, and capabilities may be embodied directly in people, not in the product itself. Employing engineers and other parties that developed the current version of the product or technology is the key to developing future generations and coming out with new disruptive innovations. Therefore, they are core for internal development. In 2007, talented people who joined Cisco through acquisitions accounted for 20 percent of the whole company and 20 percent of the leadership. Cisco's innovation machine never stops, when it enters a new market through acquisitions, it continues to innovate the technology acquired through internal development.

Overall, Cisco is one of the major companies that contributed to the development of the open innovation model. It opened its boundaries to external knowledge and opportunities, acquiring from the external environment whatever technology it needed to develop its initial ideas (see Chapter 2.4.1). The success of this strategy can be assessed by comparing Cisco's performance with one of its main competitors at the time of its foundation: Lucent Technology. The two companies were competing in the same telecommunication industry; however, Lucent innovated through internal R&D while Cisco used an A&D strategy. Michel Ferrary, a professor at the University of Geneva, in 2011 carried out a study comparing Lucent

Technologies and Cisco Systems over twenty years. The study shows that through an A&D strategy a company can have easier access to emerging new technologies and exploit them to be more innovative than other firms in the market. It also shows that this strategy can allow the firm to gain a superior competitive advantage. Cisco's competitive advantage is linked to its specialization in the exploitation of technological innovations. This is what allowed it to stay abreast of and outperform Lucent Technology.

In addition, the dynamics of the open innovation system are strengthened by the A&D strategy among large firms. This type of strategy increases the incentives of the other parties and organizations in the network to explore new knowledge and generate innovations.

Conclusion

Innovation is one of the most complex and discussed topics in the fields of Management, Economics, and Business studies. Over the years, scholars such as Slatter, Porter, and others have proposed a magnitude of different definitions for the word innovation. The most generally accepted and used definition of innovation has been developed by Schumpeter. According to him, it is a process of industrial mutation, also known as “creative destruction”, in which new product and process innovations replace existing one that over time are rendered obsolete. Schumpeter argues that anyone seeking profits must innovate and that innovation is a fundamental driver of competitiveness and economic dynamics. Despite its popularity, Schumpeter’s innovation theory has been criticized by many economists, including Knight. It is possible to have innovations in products, processes or organizational methods and they can be categorized according to two dimensions. This categorization suggests that innovations can be sustaining, disruptive, incremental or radical. The disruptive innovation theory has been developed by Christensen.

It is widely recognized that if companies do not embrace innovation and change, they will not be able to survive in the market, as occurred to Nokia and Kodak. Additionally, innovation is fundamental to the organizational growth, as showed by a survey taken by McKinsey, and to drive economic growth.

A well-managed and structured innovation process is the key determinant of an innovation’s success. Generally, it is divided into front end of innovation, idea realization and development, and commercialization. However, the one that has drawn the most attention from academics and practitioners is the Cooper’s stage gate process.

Ideas can be developed and commercialized through closed or open innovation. Chesbrough has been the first one to define and analyze these two approaches. The closed innovation model is the oldest one, in which the process leading to innovation is completely internalized, it occurs only within the company’s boundaries. On the contrary, in the open innovation model firms open their boundaries to external knowledge, technologies and paths to market. This model has been developed at the end of the 20th century, when several factors contributed to the erosion of the foundations of the closed innovation model. Furthermore, a study undertaken by Gassman and Enkel demonstrates that there are different types of open innovation processes: outside-in, inside out, and coupled.

One of the cornerstones of the Open Innovation approach is the acquisition of technologies, needed in the development process, from external sources. Cisco is an example of a company

financial value from almost all units it acquires. Cisco demonstrated that a well-structured integration and internal development strategy are essential to reach this goal.

Overall, an A&D strategy can help firms be more innovative than others in the market and gain a superior competitive advantage, as demonstrated by Cisco case. Acquisitions of technologies directly from outside the company can reduce time to market, improve the quality of the products, and help firm beat the competition.

Nowadays, as the world around us is subject to continuous changes and transitions, external sources of knowledge and technologies are crucial to capture new opportunities and develop the next generation of offerings.

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