INNOVATION AND KNOWLEDGE AT FIRM-LEVEL

CASE STUDY

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INTRODUCTION

Innovation is everywhere. Innovation is discussed in the scientific and technical literature, in social sciences like history, sociology and economics, and also in humanities and arts. Innovation is also a key word in the current popular imaginary, in the medias and in public policy. Briefly stated, innovation has become a central concept in modern society and a phenomenon to be studied and understood.

In a dynamic world characterized by an intensive use of new technologies, in which everything is changing and affecting all societies and firms, boundaries have become more flexible. This has made firms to face new challenges and to change their traditional points of view: they had to find different competitive advantages in order to compete and achieve any goals. In this sense, innovation and knowledge managements have played a central role in order to maintain competitiveness and obtain certain advantages. Firms have begun to change their traditional manufacturing system and they have rapidly adopted new managements and new ways of producing, due to the social and economic changes. This has led to a world in which creativity and innovation define the superiority of firms, thanks to competitive advantages that allow companies to survive and, above all, make a difference within the society. This is why creating or enhancing new products, processes, new ways of doing marketing and organizational performances have become the principal objectives for firms in order to have social and economic benefits. All these innovations have also led companies to shift their efforts towards the utilization of their existing knowledge and the acquisition of the external one, as well as the diffusion of information. Human resources and their skills have become a strategic advantage and they are playing a central role in the firm level.

In this project, I have proposed an analysis of the innovation and knowledge concepts, together with the absorptive capacity concepts at firm-level and then, I have analyzed a particular case study about the firm, ActualTec, Innovación Tecnológica, S.L., in which I did my internship, being an Erasmus student of the Universitat Jaume I. The main aim of this work is to analyze the innovation and the use of knowledge and their relationship within this firm. To do so, I will firstly offer a theoretical framework of these two concepts and their historical evolution. Secondly, I will analyze their relationship using the concept of absorptive capacity and then I will focus on the case study. In this second chapter, I will show the external environment in which the firm is located and then I will analyze the case-study of the firm itself. Here, I will show the results of the interview that I did to the CEOs of the firm. Lastly, I will explain my conclusions drawn from the entire project as well as some recommendations.

CHAPTER 1. THEORETICAL FRAMEWORK

In this chapter, I am going to analyze the concepts of innovation, knowledge and their relationship that are the emblem of the current modern society. I am going to focus on the concepts, histories, aspects, classification of types and the respective objectives of the rmanagements at firm-level.

1.1. Innovation

Nowadays firms have to face increasing levels of competence and changing environments, as well as higher levels of uncertainty and threats. This is why during the decades it has been essential for firms to emerge among the competitors with one or more factors that could distinguish them between the other companies. Internal and external resources have become essential and fundamental in order to face any challenge in a world that has become more and more competitive and changing. All this has led to place innovation as a key factor and a key driven force in order to gain long term advantages and gain competitiveness, thanks to firms' capacity to change in a more rapidly and easier way and to be more flexible in front of sudden business environmental changes.

As some scholars stated (Peteraf, 1993; Cockburn, Henderson, and Stern, 2000), technological innovation represents modern corporation's endeavor to develop and accumulate knowledge and has long been recognized as a key factor in corporate competitive advantages.

1.1.1. Innovation: its concept

We are currently living in a dynamic world in which innovation and entrepreneurship are occupying a central role in the development of economic growth.

According to Joseph Alois Schumpeter, one of the greatest economists of the first half of the twentieth century and one of the first scholars who have used the term "innovation", 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).

In the classical interpretation technical change is defined as "an historic and irreversible change in the method of production of things" and "creative destruction" (Schumpeter, 1934).

According to this definition innovation in practice can be implemented as:

- implementation of goods (products) that are new to consumers, or higher quality than their previous counterparts;

- implementation of production methods that are new to specific industries and economic activities in which they are used;
- implementation of new forms of competition that leads to structural changes in the industries of their implementation;
- opening of new market;
- use of new sources of raw materials.

In line with Schumpeterian concept, innovation is related to changes - radical (large-scale) or incremental (small) - that have a significant impact on the structure of companies or market segments. In this approach, new production methods are not necessarily based on new scientific discoveries. Because innovation is associated with the process of manufacturing of the product and its use, the contents of this concept in international development is based on different principles and each cluster has its specific characteristics (Linton, 2002).

The basic definition of innovation is established by the Organization for Economic Cooperation and Development (OECD). The most popular definition of the term innovation is given in the third edition of the Oslo Manual (2005) which defines innovation as “the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations”. (OECD, 2005, p.46).
The definition is linked to the market through “implementation” which is defined as follows: “a common feature of an innovation is that it must have been implemented. A new or improved product is implemented when it is introduced on the market. New processes, marketing methods or organizational methods are implemented when they are brought into actual use in the firm’s operations”. (Gault, 2016, p.4).

The definitions cover innovation which can be good or bad, pro-poor or anti-poor, sustainable or not. It only requires that the product be introduced on the market.
Earlier, the definition of innovation was: “Of all those scientific, technical, commercial and financial steps necessary for the successful development and marketing of new or improved manufactured products, the commercial use of new or improved processes or equipment or the introduction of a new approach to a Social service. R&D is only one of these steps” (OECD, 1981).
In these two definitions we can notice an evolution of the definition of the term under consideration. First of all, in the ‘80s the focus was on steps of innovation while during recent times the definition has focused much more on the implementation of the innovation, in order to distinguish innovation from other changes. Furthermore, having

analyzed the two OECD definitions, we can also distinguish two conceptual aspects of innovation: (Gopalakrishnan and Damanpour, 1997; Cooper, 1998):

- innovation is considered as a process that encourages changes
- innovation is considered as an event, object, or a discrete product, characterized by novelty (arising from human creativity)

So, as we can notice the term innovation can have different meanings and these ones can be separated one from another, generating a multiple definition of the term. In fact, in recent years there has been an effort made by experts in order to give a more detailed definition. For instance, Godin (2008) defined "innovation" in 12 concepts divided into four groups, as follows:

A: Innovation as a process of doing something new:

- innovation as discovery
- innovation as invention
- innovation as imitation

B: innovation as human abilities to creative activity:

- innovation as immagination
- innovation as ingenuity
- innovation as creativity

C: innovation as change in all spheres of life:

- innovation as organizational change, political change and technological change
- innovation as cultural change
- innovation as social change

D: innovation as commercialization of new product (Ram, Cui and Wu, 2010):

- innovation as something new
- innovation as a process ("… the generation, acceptance, and implementation of new ideas, processes, products, or services … for the first time within an organization setting" (Aiken and Hage, 1971, pp. 63-82);
- innovation as a value driver ("Innovation through infusion of new products and services, and provide impetus to emerging economies by opening up opportunities of international trade" (Wang & Kafouros, 2009, pp. 606);
- innovation as a conduit of change
- innovation as an invention

During the years and even before the Godin's explanation, a great deal of experts and scholars gave their opinion about the term innovation.

In particular, about the last definition of Godin's 12 concepts ("innovation as invention") scholars prefer to distinguish between the two concepts: Innovation vs invention. In scientific literature, the difference between innovation and invention was developed by Schumpeter. According to Schumpeter, invention is "the act of intellectual creativity" while invention is "without importance to economic analysis" (Schumpeter, 1939, p.105), in the sense that innovation is the act of applying or implementing in an efficient and practice way an invention or an idea.

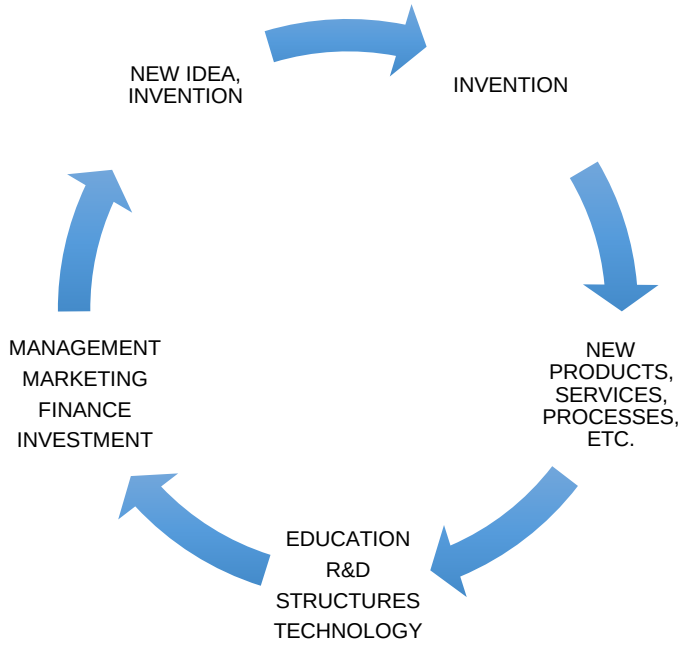
In recent years, in scientific literature, O'Sullivan and Dooley (2009) have distinguished innovation from invention as follows: "innovation is more than the creation of something novel; innovation also includes exploitation for benefit by adding value to customers"; while "invention need not fulfill any useful customer need and need not include the exploitation of the concept of the marketplace". (O'Sullivan and Dooley, 2009). Analyzing the quotations, we can consider that invention is the ability to generate a new idea and the ability to patent it, while innovation refers to implement that idea in a concrete context.

In fact, also Godin (2008) give three hypotheses in its work, in order to guide a genealogical history of innovation as category. The first hypotheses starts with the idea that innovation is about novelty. The second hypotheses refer to the fact that innovation is the consequence of three concepts: Imitation → Invention → Innovation (Godin, 2008). Through Western history, imitation and invention have been in contrast because on one hand imitation means copy an idea from another person while invention is the very creation of a new idea. As Godin said, in the twentieth century, the idea of innovation has been considered as a process: that is, imitation and invention are to sequential steps that lead to innovation. So, the difference between invention and innovation was resolved by the fact that innovation means invention, and invention is a fundamental step in order to innovate. However, this sequential process suggests that invention is not enough: the creation of an idea is not enough in order to implement it. We need "innovation" in order to implement an idea. Finally, the third hypotheses are about the fact that innovation is considered as a break with the past.

So, we can conclude that on one hand an invention becomes an innovation when used and adopted or in an economic view, invention becomes an innovation when commercialized. An innovation is an extension of an invention. In fact, for instance, if an inventor discovers a new thing but he is unable to implement it or produce it, the "new thing" will just remain stacked in a theoretical idea. Furthermore, while inventions can be carried out anywhere, for example in universities and institutes of researches,

innovations occur mostly within firms, although they may occur also in order organizations and in an individual way. In order to innovate, a company needs primary to combine a series of elements that are fundamental in order to implement a new idea. For instance, the main aspects that are important to take into account are: capabilities, skills, resources and last but not least knowledge, that I will present later in the work. In fact, one of the major characteristics of innovation is that innovation is a continuous process, that includes every single part of a firm and everything can affect each part.

Figure 1. Innovation process



Source: own elaboration.

After this analysis we can say that innovation is truly a confusing buzzword. Every business leader agrees that it is important, indeed fundamental in a company's strategy, but nobody can quite seem to agree on what it is and what it means. This is why there are multiple definitions of the term "innovation". However, more definitions are recollected in Annex 1 "Other definitions of innovation", in which I have selected among many the ones that are most complete, given their accuracy.

In most of the definitions exposed in Annex 1 "Other definitions of innovations", key words are: ideas, process, new products, services, processes, add value to customers. In fact, it is widely accepted that the term innovation principally refers to the concept of creating and generating new ideas and the process of implementing them to products, services, processes, organizations, systems and social interactions, in order to obtain

an efficient, profitable and strategic advantage. So, the term innovation can be summarized like this:

INNOVATION= PROCESS OF GENERATING NEW IDEAS + SUCCESSFULL EXPLOTATION, TRANSFORMATION AND IMPLEMENTATION OF THEM WITHIN THE ORGANIZATION

INNOVATION= STRATEGIC ADVANTAGE

In order to make a more concrete idea of how innovation currently is seen, I searched more information on the online blog: Idea to Value, the community for creativity and innovation, in which I found a survey in particular the one called "What is innovation, 15 innovation experts give us their definition" (2018), done by Nick Skillicorn, Chef Editor, Founder and CEO at Improvides Innovation Consulting and published in the above-mentioned online blog.

The survey was carried out by interviewing fifteen innovation experts, that means author of books on innovation methodologies, case studies and thought leadership. In Annex 2, "What is innovation?", there will be a general analysis of what the experts answered, in order to find the most common themes and to define the most effective definition of the aim of the study. In the following lines, I will give the general result of the survey, together with the last definition of innovation.

The survey consists of the following three questions:

Q1. What is your definition of "innovation"?

Q2. What mistakes do companies often make when they talk about innovation?

Q3. What simple thing can a company to change their conversation/perspective about innovation?

1.1.1.1. Analysis of the innovation definition from annex 2

As we can see from all of the answers in the Annex 2 "What is innovation?", every expert has his own view on what innovation is and how companies can improve it. After going through all of the answers, it has become clear that it is impossible to define innovation in a singular phrase or definition, as it will vary based on the circumstances and the experience of each company, but there are definitely some underlying themes, recurring in each definition.

According to the creator of the article, the most cited aspect of innovation is the following:

Image 1. General analysis of innovation definition

Source: Skillicorn, N. Article What is Innovation? 15 innovation experts give us their definitions, 2016.

And the ultimate innovation definition would be: "Executing an idea which addresses a specific challenge and achieves value for both the company and customer" (Skillicorn, N. What is innovation?, 15 innovation experts give us their definitions, 2016).

1.2. Development of the innovation concept in the historical perspective

A detailed analysis of the evolution of the concept of the term innovation in an historical point of view can be found in Godin (2008). Based on his analysis we can see the development of the term from the 1890's to 2000's.

Pre 20th century

According to Godin (2008) innovation had no relationship with creativity or originality. Innovation was about imposing a forced change to an established situation and most of the times faced resistance especially from the church and the society. Innovation was seen as something negative due to the fact that scientists and science innovators were seen as heretics.

The first classification of innovation or technical changes was made by Schumpeter in 1912 and the first appearance of innovation as a social experiment concepts was in the sociology field (Chapin, 1917).

20th century

During the years, Godin shows that there had been a gradual shift towards a more positive conception of the term. In fact, theories of innovation began to appear in many fields of science, explaining the revolutionary changes in all spheres of life (economics, politics, law, science, education and religion). The first theories were developed in the field of sociology. During the decades, the term innovation was considered in many different ways, shown in Annex 3 “Other innovation conceptions”.

Undoubtley, we can say that during the course of the 20th century the basis of the term innovation and its definition was established by scholars and experts, thanks also to the social, economic and cultural changes that were affecting all spheres of life in this reference period. Furthermore, during the years 80’s and 90’s we can see the very first creation of innovation institutes, such as Science and Technology Policy Research Unit (SPRU, UK, 1966) and later on in Spain the Institute for Perspective Technological Studies (IPTS, Spain, 1994). In this year the predominant use of the term innovation was its technological field and scientific concept. In the 20th century, the Oslo Manual for “innovation measurement” made its first appearance (OECD, 1992).

21st century

During this period, the term innovation became more and more a buzzword. Every change was considered as innovation, used also in a no-scientific rationale. Innovation was not anymore, a pure scientific concept but it became a useful word in order to understand business success or failures and a slogan for marketing campaigns. Apart from the original use of the term that was still developed, other complementary concepts evolved, such as the financial innovation concepts, the eco-innovative concepts and many more. This happened because the 21st century society was characterized by many changes in all spheres of life and that was reflected on the evolution of the concepts, like:

1. Shift from the closed science model to the open science model, in the sense that now audiences with different levels of education and knowledge can discuss about innovation, due to the fact that problems of innovation are not anymore just for scientific conferences;
2. Change in innovation models: the innovation models shifted from the macro level to the company level, due to the fact that there are fundamental models and strong mathematical tools, but there is also a lack of data that should be

introduced into the models. There were new innovation models, like the disruptive innovation theory or the value chain evolution theory by Christensen and Raynor (2003) or the strategic innovation process model (Afuah, 2002).

3. Shift in innovation policy: policies require new concepts, new understanding and new models due to the fact that the old established concepts innovation is not applicable anymore. There has been the creation of new concepts of innovation, such as the eco-innovation, sustainable evolution or friendly environment evolution, due to the fact that for climate changes the logic of process/product innovation cannot be used.

The trends in the evolution of innovation concepts show that there is a continuous change in the nature of innovation and, for this reason, new innovation concepts need to be integrated in the well-structured system and the challenge would be to develop and define innovation into an understandable set of definitions, concepts and types and innovation needs to be considered as an investment and a change in the long-term horizon.

1.3. Aspects of innovation

In this section I will analyze 6 aspects of the term innovation, according to Ahmed and Shepherd's (2010) statements. In their book "Innovation management: context, strategies, systems and processes" (2010), they define the following six aspects of the term:

- creation (invention)
- diffusion and learning
- event
- change (incremental or radical)
- process (at firm level)
- context (region, nature, etc.)

The two scholars gave also the focus of the definition of the aspects that are summarized in the following table (Table 1):

Table 1. Aspects of innovation

Aspect of innovation	→	Focus of definition
1. Creation	→	Use of resources (people, time and money) in order to develop a new thing (idea, process, service, product, etc.)
2. Diffusion and learning	→	On acquiring, supporting or using a product, service or ideas
3. Event	→	Discrete event, such as the development of a single product, service or idea
4. Change (incremental or radical)	→	Enacting of change. Some innovations are considered as adjustments while other innovations are considered as radicals
5. Process (at firm level)	→	Innovation is not a single act, but it is considered as a process or a series of activities that are carried out in order lead the production
6. Context	→	The focus is on institutional frameworks, socio-

Source: own elaboration adapted from Kotsemir, M. Abroskin, A.*, 2013, Innovation concepts and typology – An evolutionary discussion.*

In conclusion, as we can see from the analysis, the aspects before-mentioned can be summarized as follows:

- innovation is the creation of something new (product, service, process, idea or decision)
- innovation supposes the use of resources in order to develop something new
- innovation is the diffusion of something new
- innovation is an event
- innovation is an idea of something new
- innovation is a process of doing and change
- innovation is an instrument that can create something new
- innovation is a context, an environment for doing and create something new
- innovation supposes human resources and abilities in order to doing something new

From these definitions, we can consider the term “novelty” (new) as the principal and most important element of an innovation. In fact, even the term novelty can be classified by types and categories (Oslo Manual, The measurement of scientific and technological activates, 2005), as explained in the following table (Table 2):

Table 2: Novelty categories

Field of novelty	***Example***
• *Product innovations*	• *New materials* • *New functional parts* • *New intermediate products* • *New Technologies* • *New functions*
• *Process innovations*	• *New production techniques* • *New organizational features (new Technologies)* • *New professional software*
• *Terms of market*	• *New only to the firm* • *New to the industry in the country* • *New to the market of the firm* • *New to the world*

Source: Own elaboration.

1.4. Classification of innovation types and innovation management

"Innovation management is the successful introduction of something new: it is the embodiment and synthesis of knowledge in original, relevant, valued new products, processes, or services” (Luecke and Katz, 2003, p.2).

All firms need to be innovative, as innovation is the strategic advantage that can provide firms future revenue streams. Currently, the reality is that above all small and medium-sized companies have difficulties to understand what innovation means and supposes,

how innovation can be managed and that innovation is not just for high technological activities.

The aim of this section is analyze the different types of innovation, as they are important in order to know the existing possibilities to innovate at a firm level and to know the difficulties any firms can come across, in a more concrete way, besides every theoretical definition. It is important to remember that innovation is not a destination, but a process, so every individual, any company or any industry can be innovative, in their particular way.

Innovation varies in scope, time and organizational and social impact, and we have to remember that innovation is not a specific science, so any innovation can be positioned in different categories.

1.4.1 Four main types of innovation

The Oslo Manual (Guidelines for collecting and interpreting innovation data, 3rd edition, 2005), defines four types of innovation: **product innovation, process innovation, marketing innovation and organizational innovation.**

1. **Product innovation:** "it is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics" (OECD, Eurostat 2005: para. 156).

In this case, in the Oslo Manual, the term "introduced" means introduced on the market. Another definition could be: "a product innovation is a product, made available to potential users, that is new or significantly changed with respect to its characteristics or intended uses" (Gault, 2016, p.11).

A product innovation is a new technology or combination of technologies introduced commercially to meet a user or a market need. Products innovations can use new knowledge or technologies or can be based on new uses or combinations of existing knowledge or technologies. The terms include both the introduction of new goods and services and significant improvements in the functional characteristics of existing goods and services. Significant improvements to existing products can occur through changes in materials, components or other characteristics in order to enhance performance.

Product innovation in services can include significant improvements in how they are provided (for example, speed or efficiency), the addition of new functions to existing services or the introduction of new services that can enhance their performance and raise the quality of them.

Successively, design is an integral part of the development and implementation of product innovation (OECD Oslo Manual, Guidelines for collecting and interpreting innovation data, 2005).

It is useful to distinguish different types of product innovations, based on the strategy of a firm. A firm can choose from different types of maximization:

1. **Performance-maximization:** at one time a firm can be the first one to introduce a technically advanced product. In this case a company is expected to be rapid and margins to be large; products should be emphasized as well as their performance;
2. **Sales-maximization:** a firm can decide to watch others innovate but be flexible and prepared to quickly adapt and introduce new changes and variations and features to its current products. In this case, we might expect a higher degree of competition based on product differentiation; the result often is a product variation or new components;
3. **Cost-maximization:** a firm can decide to enter a market later in a product life cycle with less expensive versions. In this case process and product are involved as a system and innovation is incremental, that means that it is not a radical innovation that can produce significant changes.

For sure, during its lifetime a firm can decide from the before-mentioned strategies and change from one to another, depending on its particular situation in a reference period.

Examples of product innovation: new solar photovoltaic integrated roofing system, GPS (Global Position System) navigational system, other improvements for cars, the first microprocessors and digital cameras (using new technologies), the first portable MP3 player (combining new technologies with existing technologies), as well as a new detergent using an existing chemical composition that was previously used for other aims and the use of breathable fabrics in clothing (use of new materials improving the performance of a product).

Examples of services innovation: Internet Banking services, home pick-up and drop-off services.

2. **Process innovation:** "it is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, technology, equipment and/or software" (OECD/Eurostat 2005: para. 163).

Process innovation can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products (OECD, Oslo Manual Guidelines for collecting and interpreting innovation data, 2005).

A production process is the system of process equipment, software used, work force, tasks, work, information flows and it combines inputs to produce outputs. Then there is the activity to deliver the final products (outputs) to the market (customers and potential customers) but it can be independent from the production process or it can be integrated with it. The innovation can be in one of them or both and it can also involve the organizational and marketing activities.

The basic underlying idea is that as a production process develops over time toward levels of improved out productivity, it does so with an evolutionary pattern: for instance, it can improve its capital investments and the use of it, it can improve labor productivity through a major specialization, the materials can be of a much higher quality and the flows of them can be more efficient, etc. If a firm continues to develop incremental changes toward higher levels of productivity, a cumulative effect is achieved that can significantly alter the overall nature of the process. An innovative process will vary significantly within the firm's environment and its strategy for competition and growth, and also with the state of the development of process and the level of technology used by the firm and its competitors. In fact, we can say that there is a mutual relationship between innovation, development of process and competitive strategy of a company.

As said so, process innovation is the application or the introduction of a new technology or method for doing a product, that helps a company or an organization to remain competitive and meet customers' demands and needs. Process innovation mainly happen when a firm tries to solve an existing problem or preforms an existing business process in a different way (that can be radical or incremental, as explained before) that will generate higher benefits to those who perform and rely on the process. Organization today often use their knowledge and information technology systems in order to innovate. A process innovation requires a longer planning time and support from high-

level management; it requires also higher degree of cultural and structural change. Process innovation can bring benefits from internal customers, such as employees or the organization itself, to external customers including stakeholders, business partners and actual clients. It is a change that can provide and create value added. Process innovation can also affect product quality and service provided.

The innovation process is assisted by a variety of sources of information: internal sources (within the firm), external market sources, educational and research institutions, and generally available information.

The implementation of new or significantly improved information and communication technology (known as well as ICT) is a process innovation, and it is intended to improve the efficiency and the quality of a reference process or activity.

Examples of process innovation: implementation of new automation equipment on a production line or the implementation of computer-assisted design for product development, the implementation of a new reservation system in a travel agency. Due to the fact that I previously mentioned the delivery innovation, a new delivery method could be the introduction of a bar-coded or active RFID (Radio Frequency Identification) goods-tracking system.

3. **Marketing innovation:** "it is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing" (OECD/Eurostat 2005: para. 169).

As said in the Oslo Manual, marketing is a mean of making aware and persuading potential users in order to buy and use a product of the institutional unit. Marketing innovations are aimed at opening up new markets, or newly positioning a firm's product on a market, or better addressing to costumers and potential customers, in order to increase a company's sales and incomes. Innovate in a marketing field means use a marketing method that the firm never used before. It must be a new strategy or even a totally new marketing concept and a marketing innovation can be implemented and adopted for both new and existing products and services.

For example, we can distinguish four types of marketing innovation based on the marketing mix (product, placement, promotion and price) of a firm's product:

- **Innovation in product design**

- **Innovation in product placement**
- **Innovation in promotion**
- **Innovation in pricing strategies**

- **Product design:** marketing innovation in product design can refer to changes in product forms and appearance that do not differ and alter the product's basic characteristics. Some examples are: changes in packaging of the product, significant change in the design of a furniture line, significant change in the form, appearance or taste in the case of food or beverages products, and also the introduction of a new flavor in order to get another target segment. Other examples include the change in the packaging of a new bottle design in order to give the product a distinctive look and appearance referred to a new customer segment or a new market segment.
- **Product placement:** in this case, marketing innovation involves a new channel of sales (methods to sell goods and services to customers). Some concrete examples are: the newly introduction of a franchising system, exclusive retailing or a product licensing, as well as the use of a new concept for the presentation of a product.
- **Product promotion:** marketing innovation involves the use of a new method for promoting a good or a service. Some examples are: the use of a new or different media (the first use of social media, the use of celebrities' endorsements, or the product placement in television). Other examples include the introduction of a new brand symbol which is referred to place the product or service in a new market or give the product a new image, the introduction of a personalized information system.
- **Price:** innovation in pricing includes the new strategies of establish prices (pricing strategies). Examples are the first use of a new method of establish prices and varying them also according to demand, or specific price for personalized products.

4. **Organizational innovation:** "it is the implementation of a new organizational method in the firm's business practices, workplace or external relations" (OECD/Eurostat 2005, para. 177).

Organizational innovation is intended to increase a company's performance by reducing costs of transaction and administrative costs. It includes also the improvement in the workplace satisfaction (that will also enhance the labor productivity and the lifestyle

quality of workers) and the reduction of costs of supplies. The innovation resides in the fact that an organizational innovation means use a new practice that has not been used before within the firm and it is the result of strategic decisions.

Some examples are: the implementation of new practices for organizing routines and conduct of work such as new method of improving learning and knowledge within the firm, new practices for codifying knowledge (for instance, by establishing databases) in order to make information easier accessible to everyone within the company, the introduction of new education systems and training systems (in order to improve worker retention) or the adoption of new management systems (for instance, supply-chain management, lean production, quality management, etc.).

Currently, during the last year, innovations in workplace organization have been a crucial point in most of the companies worldwide. Innovation in the practice of human resources involves the adoption ad implementation of new methods of distributing responsibilities, works and decisions among the workers, taking into account their personal abilities and competences. An example of this type of innovation is the implementation of new methods that give employees the opportunity to have a greater autonomy in decision making and in sharing their ideas, in order to improve satisfaction. Respecting the fact that nowadays workers are not anymore considered as ‘machines” that have to achieve firm’s goals, there has been more and more introduction of new methods in order to improve their satisfaction and to make them being an important and strategic part within the firm. For instance, an example of an organizational innovation could be the implementation of Morgan Stanley 360 system of evaluating every employee and head of the firm, by doing different and anonymous surveys, aimed to improve workers’ satisfaction and participation within the firms, such as their efficiency in doing their jobs.

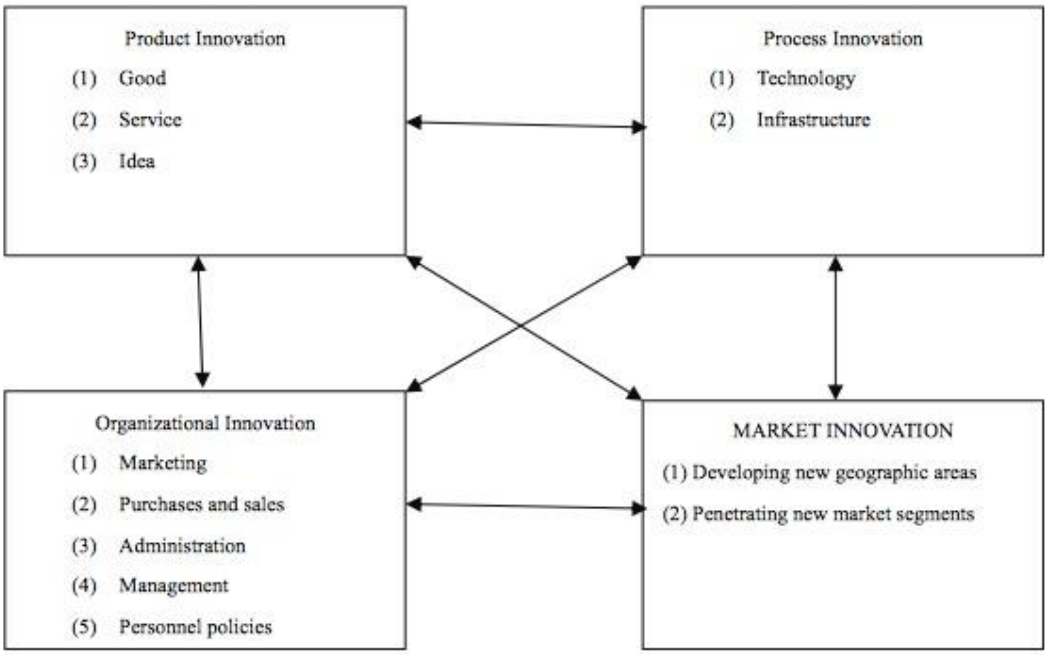
Organizational innovations also include a firm’s external relations, implementing new ways of establishing relations with other firms or public institutions, such as the implementation of new types of collaboration or new methods of integration with suppliers.

In conclusion, we can agree to the fact that any firm, any organization can be innovative and innovate in one of more than one of the before-mentioned fields at the same time. For instance, a firm that introduces a new product which also requires the development of a new product is both a product and process inventor. The same happens if a firm innovates in the marketing methods at the same time with a new organizational method or when a firm adopts for the first time a new organizational method in the course of the

implementation of a new process technology. It is important that a company tries to innovate following its strategy and being coherent with the culture of the organization.

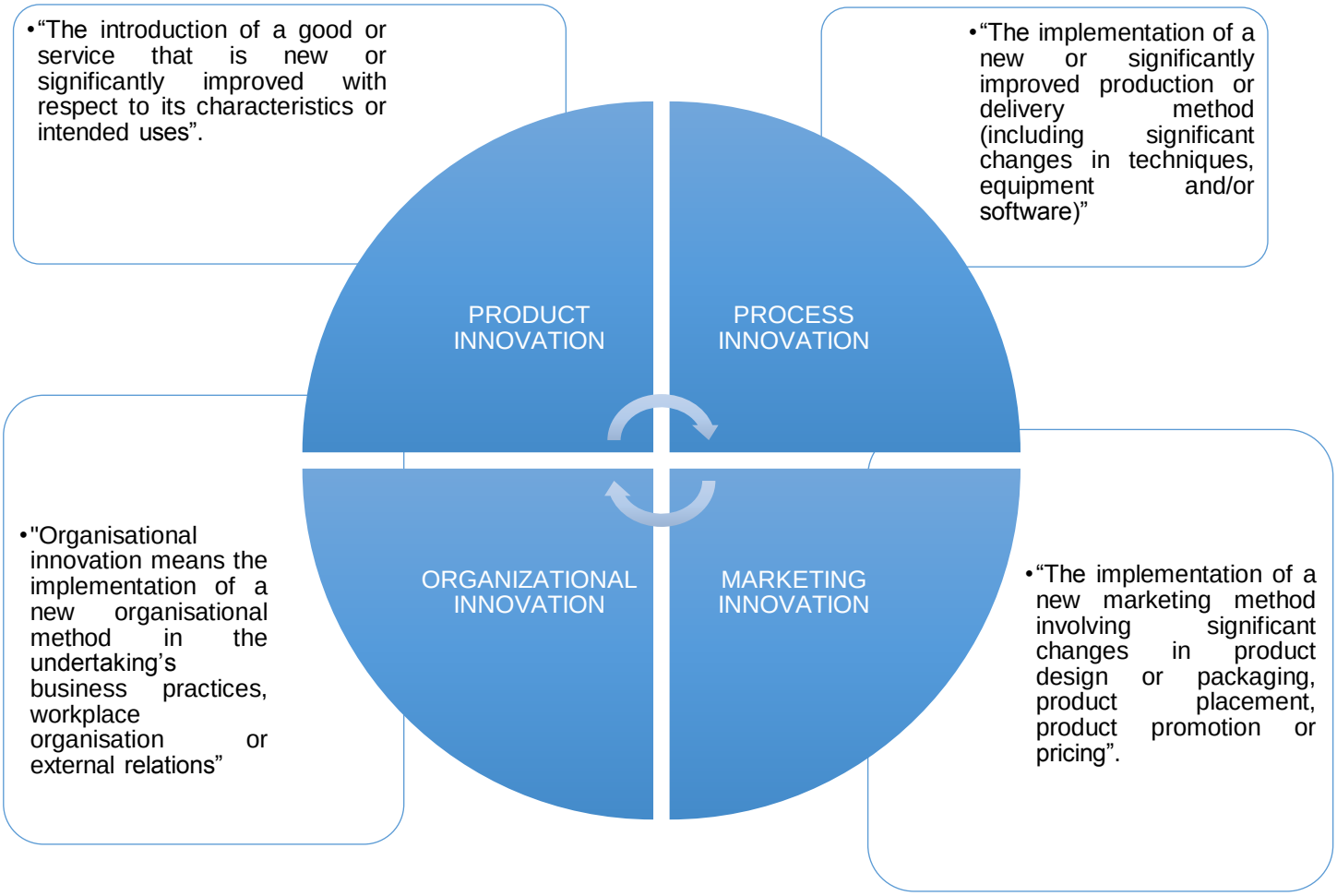
In general the concept of innovation is reflected in the thinking of Lundvall (1992, p. 8), who sees innovation as '... on-going processes of learning, searching and exploring, which result in new products, new techniques, new forms of organization and new markets'.

Figure 2. Domains of the concept of innovation



Source: Marques, 2014

Figure 3. Types of innovation



Source: Own elaboration.

Table 3. Distinctive characteristics of innovation typologies in the OECD methodology

PRODUCT INNOVATION	•Significant improvements in the technical specifications, components and materials
PROCESS INNOVATION	•Significant changes in technology, production equipment and software
MARKETING INNOVATION	•Increasing in the degree of consumer satisfaction, creating new markets or new, favourable market position for production companies in order to increase sales
ORGANIZATIONAL INNOVATION	•Implementation of business practices in the organization of workplace or in the external relations previously used by the company that represents the result of the implementation of strategic decision

Source: own elaboration adapted from OECD Oslo Manual, 3rd edition (2005).

The link between innovation and economic change is of central interest. In fact, through innovation, new knowledge is created and diffused, expanding the economy's potential to develop something new, whether a product, a process, a service or a method, which will give concrete benefit both to the firm and the environment that surround it. Such improvements depend not only on technological knowledge but also on other forms of knowledge that are used within a firm or an organization in order to develop a product, process, marketing and organizational innovations.

The minimum requirement for a change in a firm's products or functions to be considered an innovation is that it is new or is a significant improvement to the firm. More generally, innovations can be distinguished by whether they are new to the firm, new to the market or new to the world. Not all changes can be considered innovations. Innovation in firms refers to planned changes in firm's activities and these changes are characterized by the following features (Oslo Manual, The Measurement of Scientific and Technological Activities, 2005, para. 101):

i. Innovation is associated with uncertainty: it is not known beforehand what the result of an innovation and its impact will be;
ii. Innovation involves investments: investments could be relevant, and they can include the acquisition of fixed and intangible assets;
iii. Innovation is subject to spillovers: companies can benefit from knowledge spillovers or from the use of the original innovation;
iv. Innovation includes the use of new knowledge or a new use or combination of existing knowledge: new knowledge can entirely be generated by the innovating firm or it can be acquired from the external (for instance, purchase of new technology). In both cases of the use of new knowledge or the acquisition of knowledge external requires innovative efforts. As I will explain later, firms can invest in creative activities that will develop innovations and knowledge in house, or they can buy innovation created by other firms or institutions as a part of a diffusion process of information. The specific innovation activities that firms can use in order to develop or acquire innovations and knowledge are R&D and the other non-R&D activities that I mentioned before (product, processes, marketing and organization).
v. Innovation aims at gaining a competitive advantage: as I mentioned in the previous sections, innovations bring the possibility to be different from the competitors and differentiate below a certain aspect that will provide a strategic advantage or simply maintain competitiveness. Firms can gain competitive advantage by:
    a. Shifting from the demand curve of the product by increasing product quality, offering new products (goods and services) or by opening itself to new markets or customers segments;
    b. Shifting the cost demand by reducing unit cost of production, purchasing, distribution or transaction;
    c. Improving the abilities that firms have to innovate by investing more in R&D, or in creative activities or increasing the ability to develop new products or processes or the ability to generate new knowledge that will be used only within the firm and that could be sold one day to other firms.

1.4.2. Incremental, radical and breakthrough innovation

Now, we know that innovation can affect a firm's product, process, service, marketing decisions and organizational issues. However, if a firm wants to innovate, manage a

business successfully is not sufficient, because the innovator need to learn every day and have the knowledge of an effective innovation.

An innovating can also be:

- **Radical**
- **Incremental**
- **Breakthrough**

Table 4. Radical, incremental and breakthrough innovation

RADICAL INNOVATION	It involves introducing new products or services that develop into major new business or that cause significant change within a firm or an industry and that trend to create new addes value. Examples: nanking business -> ATM machines, plastic card
INCREMENTAL INNOVATION	• It includes the modification, refinement, consolidation, simplification and improvement of exiisting products, services, processes and production and delivery activities. • Examples: annual improvements of automobiles that provide significant benefits for the safety, comforts and efficiency of characteristics; in services: Sainsbury's has evolved its delivery service so that online clients can receive their products more quickly.
BREAKTHROUGH INNOVATION	• It is a rare events, arising froms cientific insights. It is named in this way because it refers to events that people did not beleve could be possible. Breakthroughs create something new or satisfy undiscovered needs. They can launch new industries or completely transform existing ones. "Disruptive innovation" • Ëxamples: the first EARS laser printer made by Xerox

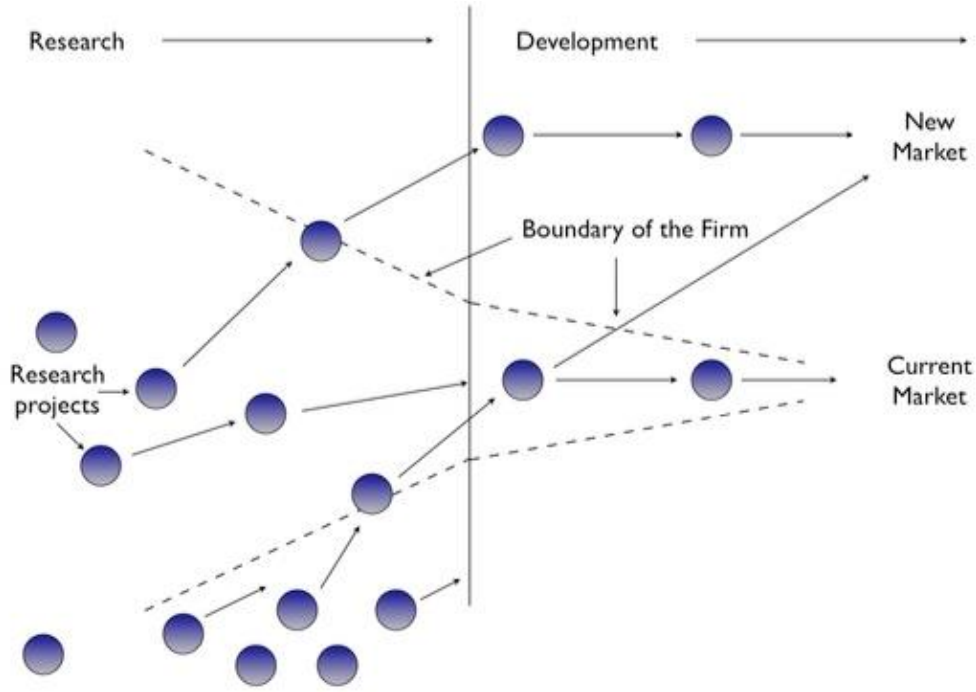
Source: own elaboration.

1.4.3. Open vs closed innovation

Innovation in firms can be open or closed, depending on the innovation strategy that a firm would like to adopt.

- **OPEN INNOVATION**

Figure 4. Open innovation inflows and outflows of knowledge across boundaries of firm



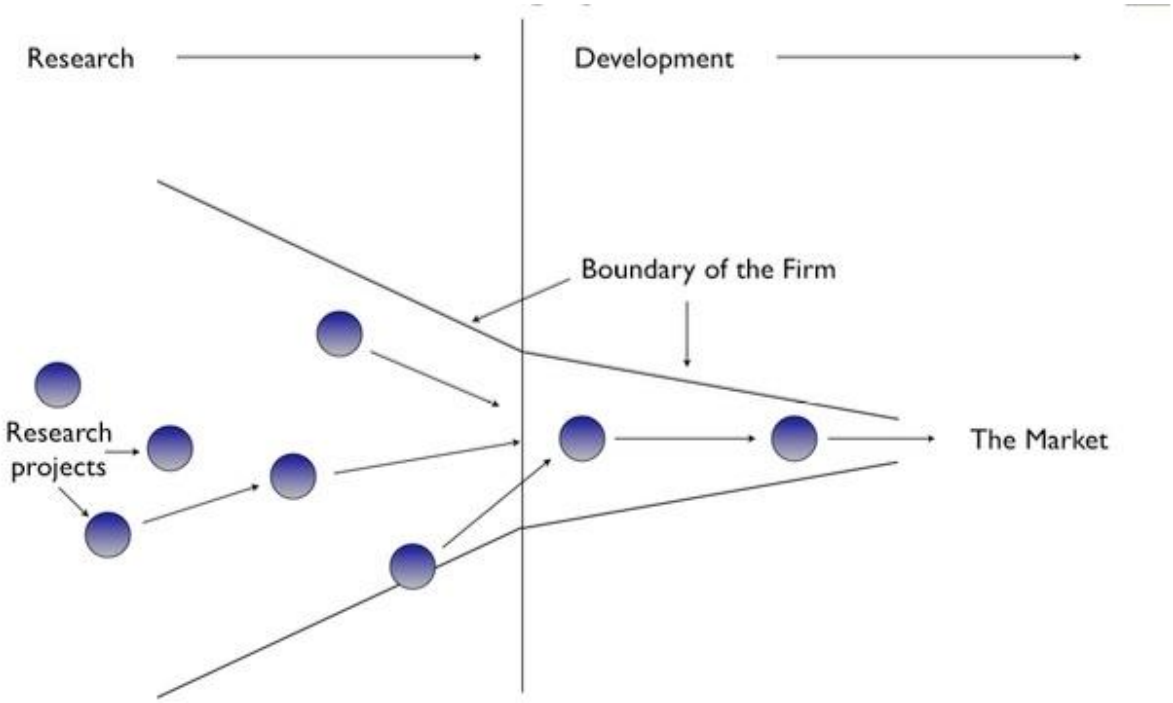
Source: R. B. Dasher, Stanford University (2009).

Chesbrough (2006, p.2) originally defined open innovation as: "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology".

Open innovation has been proposed as a new paradigm for the management of innovation and it consists of strategies by which firms can acquire technologies they need and exploit the developed ones. Thanks to the open innovation, firms can get their technology and information from multiple available sources. It enables organizations to function in a new way, that empowers communities to face challenges and improve their organizations. Open innovation describes a phenomenon where people share their ideas and work efficiently together through open and transparent network in which they also share relevant information for commercial or social purposes. The idea at the basis of this concept is that opening to new people, ideas, information can enhance the firms' performance and can facilize and simplify the innovation process, thanks to a much more available information. In fact, when the partner opportunity set is open, the improvement in performance is due to less sever divergence costs.

- **CLOSED INNOVATION**

Figure 5. Closed innovation system: everything done inside the firm



Source: R. B. Dasher, Stanford University (2009).

As for the concept of open innovation, closed innovation was described by H. Chesbrough in 2006. The paradigm of closed innovation says that successful innovation requires control and supervision and ownership of the intellectual property of a firm in a self-sufficient way, that is internal control and management of knowledge and ideas. Roots of closed innovation go back to the beginning of the 20th century when universities and governments were not involved in the science application. The 20th century, in particular the period between the World War II and the mid-1980's was the era of closed innovation and internal information, knowledge and R&D, due to the fact that internal R&D was seen as a strong barrier for potential competitors, even though large investments had to be made in order to compete.

During the 21st century there was a shift from the closed innovation to open innovation and it was formally described. As a result, it was found that if a firm is seeking to increase customer loyalty and attracting new customers, it needs to increase customers involvement in R&D activities. Moreover, the creation of networking processes increased more and more the openness of firms. The recent era of open innovation started when practioners realized that firms that wished to commercialize their own ideas as well as buy other firms' innovation should seek new ways to bring their in-house ideas to market. Furthermore, open source and open innovation allow companies to change their boundaries from solid to semi-permeable in order to enable innovation to rapidly and

easily shift between the internal and external environment. Open source is the most preeminent example of the revolutionizing of the conventional innovation process: the idea behind this concept is the co-operative software creation that allows firms to have freely available information. Famous examples are: Linux, Apache or Freemail.

The differences between open and closed innovation are summarized in the following table (Table 5):

Table 5. Difference between open and closed innovation

OPEN INNOVATION	CLOSED INNOVATION
Not all the smart people work in the organization	Recruit and hire all the smartest people
Recognize the value of external R&D; invest in internal R&D to maximize this value	R&D is most profitable if a firm keeps it internal
Win by finding the best research, regardless if it is originated internally of externally	Conduct the best research in the industry in order to win
Win by finding the best ideas, regardless if they are created internally or externally	Come up with the best ideas
If we make better use of external and internal ideas and unify the knowledge created, we will win	If we create the most and best ideas in our industry, we will win.
We should optimize the results of our organization, combining the sale or licensing of our innovation with the purchase of external innovation processes whenever they are more efficient and economic.	If we have full control over the innovation process our rivals will not be able to profit from our innovative ideas.

Source: Own elaboration adapted from Chesbrough (2003a, 2003b).

In conclusion, it is important to say that the concepts of open and closed are relative concepts: no innovation system is completely open or completely closed, but open innovation presents more complex challenges the closed innovation and allows firms to have additional knowledge in order to develop profitable innovation, by sharing information and cooperate with other companies.

1.5. Objectives of innovation management

It is recommended that whether a firm wants to innovate and consequently engages in an innovation activity, it should take into consideration its economic objectives in terms of products and markets, and how it rates a number of goals that process innovation can bring.

Economic objectives that are needed to take into account are shown in the following table (Table 6):

Table 6. Objectives of innovation

Economic objectives of innovation management	Replace products being phased out
	Extend product range: - within main product field - outside main product field
	Develop environment-friendly products
	Improve production flexibility
	Lower production costs by: - reducing unit labour cost - cutting energy or material consumption - reducing production lead times - reducing prodcut design costs
	Improve product quality
	Improve working conditions
	Reduce environmental damage

Source: own elaboration adapted from Oslo Manual, The Measurement of Scientific and Technological Activities, 2005.

1.6 Knowledge

In this section I will analyze the term knowledge as I previously did for the term innovation, since the two concepts are strictly correlated. As described in previous sections, knowledge is a really important concept for the creation and implementation of innovation within a firm. In other words, knowledge encourages new forms of innovation to promote best practices and at the same time through innovation we gain knowledge.

The knowledge revolution in the last decade has set the foundation for knowledge economy and it is becoming far more complex and involved. Organizations and individuals are increasingly required to understand more and more about their customers' needs. Hence to gain a competitive advantage, knowledge is becoming far more important than data and information. The role of knowledge economy is evident in providing value for customers, such as innovations that will provide benefits. In fact, it has become more and more important to know how to get customers contribute to innovations through their knowledge and the exploration of their needs.

Knowledge is not only used to drive business management but also to enable transformations of ideas and opportunities through innovation. We can think of a real "knowledge revolution".

1.6.1. Knowledge: its concept

The concept of knowledge can be described by a simple world "understanding". This understanding gives birth to reality that humans construct in their minds as a result of experiences and interpretation. Davenport and Prusak (2000, p.5) stated the concept of knowledge as:

"a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates in and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms".

More widespread is the view that knowledge can be both in the mind and in an explicated form disseminated and stored. As such, knowledge can be regarded as a commodity which can be traded and indeed stolen. Polanyi's distinction between "tacit" and "explicit" knowledge has been the subject of much debate (Polanyi, 1967). Polanyi noted that

human action is often based on what to the observer seems inexplicable reasoning. Polanyi found an explanation in the deeply beliefs and understandings which we carry with us but of which we are not consciously aware. Hence such tacit knowledge cannot be articulated or explicated. Polanyi's insight has been taken up by some of the knowledge management and organizational learning pioneers (Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998). They suggested that the conversion of internal tacit knowledge into explicit codified knowledge is the basis of knowledge management and provides the opportunity for sharing knowledge.

Within the modern field of Knowledge Management, knowledge has been defined in many ways. Thus, the UK based Open Knowledge Foundation founded in 2004 to promote the ideal of making "knowledge" open and freely available sets out its own Open Knowledge Definition: "The term knowledge is used broadly, and it includes all forms of data, content such as music, films or books as well any other type of information." (King, 2009). The definition treats both as knowledge and it does not distinguish between data and information, which is actually important and I will show the difference in the next section.

1.6.2. Differences between data, information and knowledge

Nowadays, economists are increasingly emphasizing the significance of the growth of human knowledge in the development of economic systems. The knowledge concepts have been transformed in a real idea of management for firms, known as "knowledge management". However, it is important to distinguish between the concepts of data, information and knowledge, even if knowledge and information are often used interchangeably. It is important to recognize how knowledge differs the other two concepts.

Knowledge:

- It is based on learning, thinking, and proper understanding of the problem
- It is viewed as un understanding of information
- It is information combined with the user's ability and experience
- It is human understanding of a subject matter that has been acquired through proper study and experience
- It is derived from information
- It is the application of information and mind

- It is more complex the data and information as it is subjective, based on experience and highly contextual
- It is created by the flow of information

Information:

- It is selected, organized and analyzed data
- When data is organized in a logical format it becomes information
- It is data transformed by the adding process of contextualization, categorization, calculation, correction and condensation
- It is considered as facts and data organized after having decided the particular situation

Data:

- It is usually statistic in nature
- It is scattered
- It is the prerequisite to information
- It is not significant alone
- An organization sometimes has to decide on the nature and the type of data in order to create the necessary information

Information is tangible in nature and it can be easily accessible to everyone who has the opportunity, while knowledge is intangible in nature and it resides in human minds (implicit knowledge) but it can be made available if it is expressed in recorded form and it becomes information (explicit knowledge). On the other hand, data is tangible as for the information and it needs to be recollected, recorded, stored and organized in order to have a meaning and furthermore, it can be lost as well as information.

So, the final relation between the three concepts can be explained by the following figure (Figure 6):

Figure 6. Relation between data, information and knowledge

Source: Own elaboration.

So, the relation would be: **DATA (if properly organized) = INFORMATION (if contextualized) = KNOWLEDGE (in this case explicit).**

Data is the rawest form of facts without any meaning. Information is organized, analyzed, and meaningful within particular connections or contexts. When information is combined with experience, context, interpretation, and reflection, it becomes knowledge. Thus, knowledge is the combinations of collected information, personal experiences, insights, expertise, and logical reasoning in an actionable context.

As we will see in the following sections, on the contrary of the explicit knowledge, implicit knowledge is based on human experience, thoughts and capabilities, but it can be improved by using the information and data.

1.7. Development of the knowledge concept in the historical perspective

In this section, I will focus on the evolution of the knowledge concept as it is considered as the most important key factor for a firm in order to innovate and grow and because the practices associated with managing knowledge have their roots in a variety of disciplines and domains. Knowledge Management as a domain of study within the general field of the Information Systems discipline has a relatively short history. I will analyze the evolution of the concept of knowledge management (KM) and focused on the impact of modern technologies on the use of this management. Currently, remarkable development of innovation and communication (ICTs) is affecting most of the aspects of all spheres of everyday life. New tools have emerged during the last decades and they are used for data collection, gathering, storing and analyzing. Information and knowledge is shared among individuals and organizations even without a formal program of knowledge management.

The management literature recognizes different stages in the development of a management ideas, as well as ways of implementing it. The theory of management is changing at an accelerated pace in order to meet numerous and different challenges of the new era. Emerging concepts are taking into account, but it seems that knowledge has always been an important topic. It was always considered as a valuable resource for individuals and organizations and a precondition of success and a key factor in order to face challenges. However, it was only on the second half of the 20th century that the significance of knowledge was recognized, and the importance of knowledge management became popular.

19th century

The emerge of the explicit knowledge management and the introduction of the term KM happened in the 1980's. Although it happened gradually and it was combined with management uncertainty, it was a natural evolution of the influence of many factors. The developments that have led to our current definition of KM come from many years. From our present-day perspective, there was little change in needs for practical KM until the industrial revolution in the 18th and 19th century. During this period, KM was implicit and based on apprentice models within the first appeared factories, due to an increasing specialization in creating and delivering goods in grater quantity and at lower costs. During the industrial revolution, people learnt how to converted natural resources into products in a much better, mechanized and well-organized way, in order to improve the efficiency of the process. Market advantages were created by being able to use people and technology to provide goods and services at acceptable quality and lowest price. Knowledge was recognized among only among the guilds and other specialists.

20th century

Initially, manufactures did not provide product variability, since products were standardized (the Model T Ford) and they produced at the lowest possible cost. Later, and above all during the first half of the 20th century, additional emphasis started to be placed on product sophistication. The notion of "improved products" was increasingly accepted. Market advantages were based on producing goods and services that would better benefit some specific customer segments or a particular market niche both economically and functionally. The roles of professionals were changing to where expertise, in the form of abilities and skills, was becoming more and more relevant. Consideration and recognition of the value of individual knowledge was still not explicit, but it was changing towards a much better period.

During the second half of the 20th century, the combination between operational excellence and product leadership was still important. Market advantages were still based on gaining competitiveness through the production and delivery of product and services at the best prices. In particular, during this period, we can notice the addition of a new dimension: information technologies (IT) that became available and resulted in more control of manufacturing, logistic and marketing. These evolution and developments led to a more significant exchange of information between enterprises, suppliers and customers. They made possible many important practices such as total quality management (TQM), just-in-time (JIT) deliveries, point-of-sale (POS) analysis,

and automatic process control. IT also made possible new services not previously possible ranging from financial services (credit card operations, for example) to telecommunications services. Some roles of people were changed from physical work to a more intellectual activities. However, the term knowledge was still not understood.

However, the concept of knowledge management emerged during the mid-1990's and received considerable attention from scholars and practioners. The term "knowledge management" was first used by Carl Wiig in 1996 at a Swiss conference. According to Wiig (1997), knowledge management is to "understand, focus on and manage systematic, explicit and deliberate knowledge building, renewal and application" since the purpose of KM is, in general "to maximize the enterprise's knowledge-related effectiveness and returns from its knowledge assets and to renew them constantly" (Wiig, 1997, 1).

21st century

During the last decade, enterprises and experts have observed that the real basis for competitive advantages was about to shift. In particular, it had shifted towards the recognition of the official pursuit of strategies based on explicit management of knowledge. Many organizations understood that they needed to obtain, renew and use the best possible knowledge in all areas of work in order to internationally compete with other firms. In addition to that, market advantages are now based on how best to serve customers to help them succeed. This led organizations deciding to work with customers and other organizations in a more closely way, changing also the role of people and environments. Leading organizations see their employees as the fundamental capability behind their success. The versatility and intelligent knowledge are at the basis of the power that make it possible to meet the variety of needs of customers that are sophisticated and the market demands.

Larry Prusak, an engaging polymath who knows a lot about KM's origins and history, argued its development could be attributed to three main factors: globalization, computing and the attention to the knowledge view of the firm (Prusak, 2001).

1. Globalization is the most obvious factor: the number of global products, services, players, and distribution channels is unprecedent. The speeding up of all elements of global trade, mainly because of information technology, has created a new international environment within firms, which bring new products and services to wider markets ever more quickly.

2. Transparent computing is the second factor and it is the premium value of knowledge that cannot be codified or digitized or distributed. Nowadays, people have access to almost all the information available at any time and at any pace and above all, at very low cost or most of the time no cost. After the last few decades, the value of these more knowledge-intensive skills has been widely recognized. In this sense, knowledge management grew;
3. Emerging knowledge-centric view of the firm: increasingly, firms are seen as a coordinated collection of capabilities and cognitive and social skills. The main element of these capabilities is the knowledge, especially the knowledge that is most tacit and specific to the firm.

In conclusion, we can notice that the evolution of the term “knowledge management” has been gradually and furthermore there are a great deal of different opinion, concerning the very origin of it. As for the innovation, our society has changed a lot and we are now in a situation in which people are seen, together with their social and cognitive skills more than their physical ones, as the most important factor and resource within an organization. This is why human knowledge is now a new form of management and tacit and explicit knowledge are the key factors to success and an important strategic advantage for organizations. As mentioned in this discussion, KM as a discipline continues to emerge as a core business strategy. Globally, more businesses continue implement KM oriented strategies to manage their organizational knowledge, focused on achieving sustainable business advantage and increased business value.

1.8. Aspects of knowledge in the knowledge-based view of the firm

The starting point at the base of the knowledge-based view of the firm is that knowledge is the key factor of a firm organization and behavior. In this context, the competitiveness of firm does not depend so much on its product and marketing position but on the contrary it depends on the type and quality of stocks of knowledge and its capabilities in using and developing it.

The essential aspects of knowledge-based view are:

- Knowledge is the most important resource and factor of production;
- Organizations create, transfer and transform knowledge into competitive advantage;
- Knowledge is related to humans;

- Performance of firms differ one from another due to the fact that firms use different stocks of knowledge and capabilities in using and developing knowledge;
- There is a need of integration and coordination knowledge especially in complex issues;
- Knowledge is both acquired and demonstrated in action;
- Knowledge s demonstrated in many forms and located on many levels: it is situated in minds and bodies, stocked in databases, books and in organizations;
- Some knowledge can be externalized into explicit form, while some knowledge will always remain tacit;
- Shared tacit knowledge is the most important knowledge that creates value;
- The management of knowledge varies from one context to another and one situation to another;
- Knowledge is dynamic: it is continuously modified and interpreted in different ways from different agents and it is changing and evolution;

1.8.1. Knowledge economy

"Knowledge economies are powered by individuals, companies and sectors that create and commercialize new ideas, technologies, processes and products to export around the world. To maintain their competitive advantage, these companies constantly strive to remain as the forefront of their industry by recruiting highly skilled individuals, investing in R&D, encouraging creativity and seeking out new markets". (Knowledge Economy Report, 2016, p.4).

A knowledge economy is a system of consumption and production based on intellectual capital. The knowledge economy represents a large component of all economic activity in every developed country. In fact, during the last decades, we can notice the evolution of the society to a "knowledge society", based on the share of information and intangible assists as a most significant part of a company's value, such as the value of its workers (as I said before, the "intellectual capital"). The knowledge economy is a vital element for all developed countries and it contributes to enhance their global competitiveness, increasing in turn their level of the economic growth and the wealth and prosperity of people (not just people involved in the knowledge-based business).

Currently, global economy moves towards knowledge economy. This transaction includes the best practices taken from service-intensive, manufacturing-intensive and labor-intensive types of economies. In addition, societies based on knowledge have the

power to create an interconnected and global economy, in which the sources of information and knowledge are crucial factors in economic growth and they are considered as relevant economic resources. This component of the economy relies on the intellectual abilities and power instead of natural resources or physical contributions. Moreover, in the knowledge economy, products and services that are based on this intellectual capabilities and capital show more advanced technical and scientific fields encouraging innovation in the economy as a whole.

In the next section I will analyze the types of knowledge and their principal characteristics.

1.9. Classification of knowledge types and knowledge management

The concept of knowledge management has become more and more popular during the last decades due to the fact that our society has entered in a knowledge era, mainly thanks to the ICTs and it is often considered as a strategy that is used in order to compete and which supposes knowledge as the factor that differentiates one organization to another.

The knowledge management literature boasts many typologies of knowledge. The most significant of these classifications is the division of knowledge into two dimensions: explicit and tacit (Polanyi,1967).

- **EXPLICIT KNOWLEDGE**

Explicit knowledge stands for that part of knowledge which can be expressed and codified relatively without problems, for instance in the form of verbal accounts, numbers, formulas, and theoretical models. This type of knowledge is rational, formal and system in nature, and its particular characteristic is that it can easily be transferred from one person or organization to another and stored in databases or other repositories of knowledge. It can easily be recorded for later uses and in organizations it exists in a form of code of practice and product specifications. Moreover, it is easy to communicate and share in external context and thereby also captured and imitated by competitors.

- **TACIT KNOWLEDGE**

It is known also the knowledge how or know how. Tacit, according to the dictionary, means silent, not openly expressed. This type of knowledge is highly personal, individualistic, context-dependent and based on practice and personal experience. This

type of knowledge is very hard to formalize or share to others. In fact, tacit knowledge can be shared and transmitted to others only by sharing experiences and actively participating in face to face interactions. It cannot be easily transferred and many organizations consider it as a strategical advantage in order to compete and be better than competitors.

Table 7. Differences between explicit and tacit knowledge

EXPLICIT KNOWLEDGE	IMPLICIT KNOWLEDGE
Objective, rational, technical	Subjective, cognitive
Context independent	Content dependent and dinamically created
Easily transferred and shared	Difficult to transfer and share
Easily codified	Difficult to capture and codify
Externalized	Internalized
Easily learned and taught	Difficult to learn and teach
Structured	Personal
Easy to documented	Difficult to capture
	Human interpretation
	It depends on human skills and know how
	It has high value

Source: Own elaboration.

Another classification of explicit vs implicit knowledge by features is shown in the following table (Table 8):

Table 8. Other classifications of explicit and implicit knowledge

Features	Explicit Knowledge (skills, experience)	Tacit Knowledge (documents, codes, tools)
Content	Codified	Non-codified
Articulation	Easy	Difficult
Location	Computers, artefacts	Human brains and capabilities
Communication	Easy	Difficult
Media	Information Technologies and repositories	Face-to-face interaction
Storage	Easy	Difficult
Strategy	Impersonalization	Personalization
Ownership	Organisation	Organization and its members

Source: own elaboration adapted from Jasimuddin, Klein and Connell, 2005.

In this table we can notice that the personalization strategy which is focused on tacit knowledge is strictly correlated to human abilities and minds and it is transferred through face-to-face contact. Whereas, the codification strategy which is based on explicit knowledge allows knowledge to be stored in databases where it can be easily available to use. Personalization strategy is strictly correlated to the subject who develops it, while the codification strategy allows knowledge to be accessed by everyone within a firm.

1.9.1. Advantages and disadvantages of tacit and explicit knowledge

Most of the scholars (Spender, 1996; Andriani, 2003; Alvesson, 2010) identify several benefits that a firm can gain from adopting the personalization strategy using tacit knowledge. Some of them are:

- Tacit knowledge is the most secure and strategically significant kind of knowledge that an organization can use;
- Other organizations have difficulties in order to understand the tacit knowledge of a firm and they would find it difficult to imitate it;
- Tacit knowledge can provide a firm a certain competitive advantage;
- Tacit knowledge is a source of sustainable advantage thanks to its immobility and inimitability, due to the fact that is externally safe
- Tacit knowledge can make a firm gaining benefits derived from its contribution to innovation and low investment in information technologies. In this sense, a firm who wants to adopt this strategy uses its know-how in order to innovate and create something new.

However, there are some disadvantages concerning the use of tacit knowledge:

- An organization cannot store such type of knowledge and most of the times it is difficult to communication, due to the fact that is strictly correlated to workers personal skills and education
- It could be possible that there is a reluctance in sharing tacit knowledge because it could be seen as a loss of power and status, even if a person could use intellectual property rights;
- The most important risk that a firm can face is the loss of knowledge due to the loss of employees, a situation that makes a firm vulnerable

On the other end, explicit knowledge has its strategic advantages:

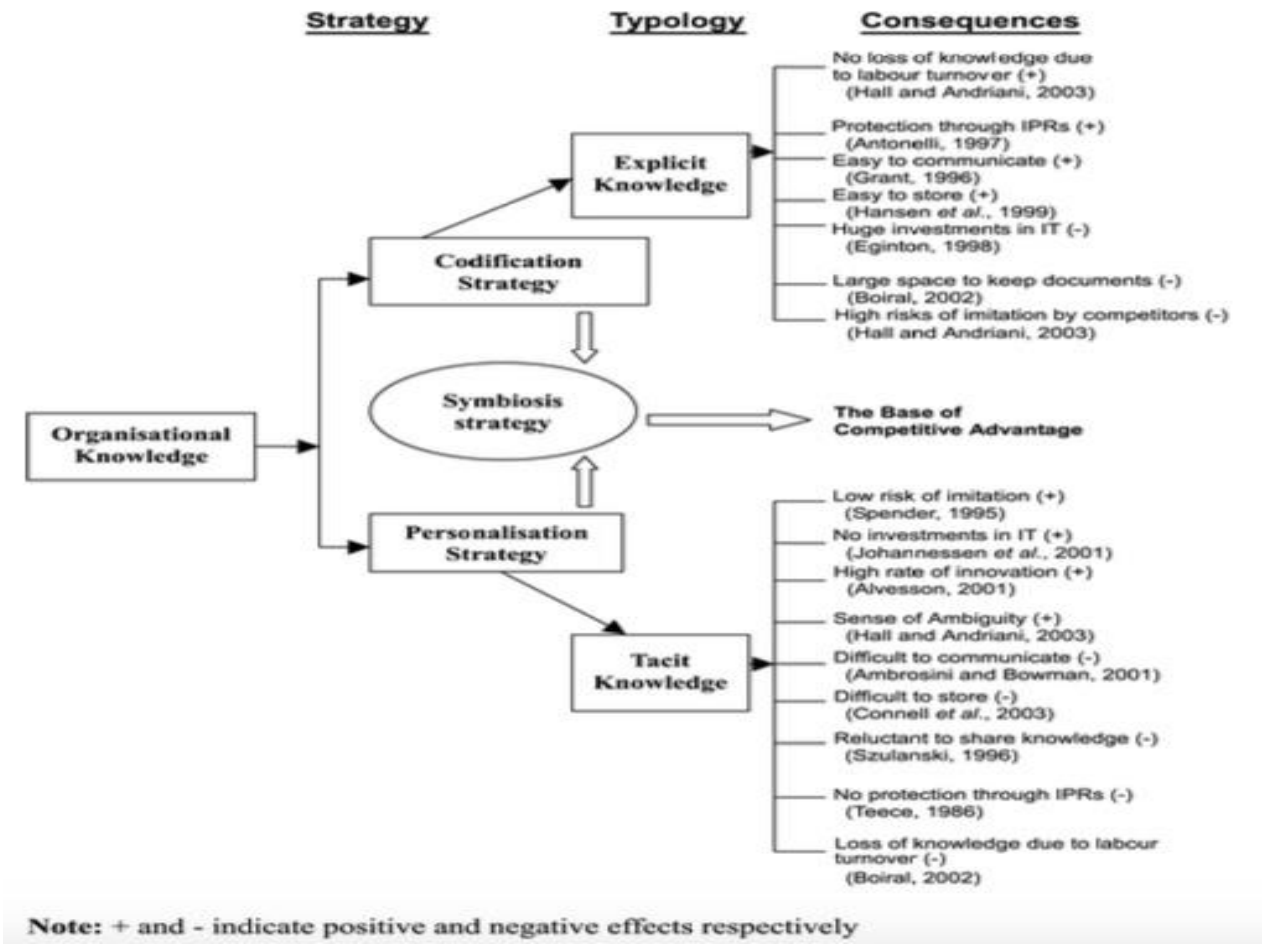
- It is easily communicable and easily stored because it can be codified in databases
- There is little chance of losing explicit knowledge due to a loss of a employees because such knowledge is codified within a firm and available in an organization repositories;
- In fact, such knowledge can be accessed and used by everyone and it is internally safe

However, like for the implicit knowledge, also explicit knowledge has some disadvantages:

- It requires heavy investments (e.g. electronic systems in order to increase the ability to manage a great deal of information)
- A vast space is required in order to keep documents
- Codifying knowledge can be expensive
- The most important risk of explicit knowledge is the fact that it can be easily imitated by competitors, leading to the loss of potential power or competitive advantage. In fact, explicit knowledge is externally vulnerable.

A clear summary of possible organizational implication of knowledge strategies is shown in the following figure (Figure 7):

Figure 7. Possible consequences of knowledge consequences



Source: Jasimuddin, Klein and Connell, 2005.

1.9.2. The tacit-explicit paradox and knowledge management strategy

The tacit-explicit paradox relies on the fact that they have advantages and disadvantages and they can be complementary. On one hand, efforts made by organizations to make explicit knowledge arise the potential of imitation and consequent loss of competitive advantage and value of the knowledge, while on the other hand tacit knowledge makes the firm vulnerable to loss knowledge of its workers. Focusing on implicit knowledge and personalization strategy allows external protection but at the same time internal susceptibility, while adopting an explicit knowledge internally protects knowledge but leaves external susceptibility.

In this sense, the real challenge of an organization is to know that both explicit and implicit knowledge are crucial resources. In past decades, tacit knowledge occupied a central role in the development of sustainable competitive advantage, but now tacit and

explicit knowledges are inseparable and complementary. Their relationship can be described like an iceberg above and below the waterline: the exposed explicit knowledge is sustained by the implicit one below the waterline, that cannot be seen from outside. However, proportions of implicit and explicit knowledge can be hidden or exposed due to the different situations.

In conclusion, we can state that neither the implicit knowledge nor the explicit one are sufficient to manage an organizational knowledge. Personalization and codification need to be complementary and used at the same time. Tacit knowledge is used to maintain a certain level of competitiveness and allows firms to gain strategic advantage if it wants to innovate, while explicit knowledge is crucial in order to cooperate and create economic and social benefits due to the share of information through companies and it incentives innovation within an industry. What a firm requires is to use explicit knowledge in order to create more tacit knowledge and vice versa. The challenge is to create an environment that eases knowledge replication but at the same time makes imitation difficult for competitors.

1.10. Objectives of knowledge management

The objectives of KM are to continuously improve an organization's performance through enhancing and sharing organizational knowledge within the organization. In fact, the main aim is to improve organization's abilities in order to execute in a better and more efficient way its core processes and ensure that the organization has the right knowledge in order to do that. Among many scholars who have explained the objectives of KM I propose one of them, due to its accuracy. Gandhi (2004) pointed out that organizations engage in KM to achieve the following tasks:

- Enhancing collaboration
- Improving productivity
- Enabling and encouraging innovation
- Coping with information overload and delivering the essentials
- Facilitating information sharing among employees
- Capturing and recording the knowledge of employees before they leave the company, ensuring that valuable expertise does not leave when and if they leave
- Increasing an organization's awareness of the gaps in its knowledge and helping them stay competitive by increasing the performance of strategies, products and best practices, including the observation of the best practices of their competitors;
- Improving customer service.

In this definition, we can clearly notice that knowledge is considered as a fundamental strategy within an organization and it is strictly correlated to the success of a firm and to its willingness to innovate. This is why the two terms are strictly correlated and most of the times they are complementary.

1.11. Analysis of the relationship between knowledge management, innovation performance and absorptive capacity

In theory, innovation has the capacity to improve performance, solve problems, add value and create competitive advantage for organizations, through the use of technologies. Innovation can be considered as the implementation of discoveries and inventions and the process of innovation depends heavily on knowledge, since the power of knowledge is more than simply recollection of data and information and it is the basis of a strategic process. According to Stewart (1997), the management of knowledge and human capital is the essential element in order to run any type of business, and it is the source of innovation and renewal and business strategy.

The process of technological innovation (TI) embraces a wide range of activities that contribute to the generation of new technological knowledge and/or improved use of the knowledge available. It has been recognized that the TI process has had varying effects both at macro (society, economic system, and industry) and at micro level (firm). At the macro level, the TI process:

1. modifies the structure of industries,
2. changes the composition of demand in the labor market,
3. alters the competitive position of nations,
4. stimulates economic growth,
5. increases the well-being of society as a whole.

At the micro level, the TI process:

1. affects the competitiveness of businesses
2. gives an orientation to the design of their strategies.

The extent of the effects of technological progress has aroused growing interest in the study of innovatory phenomena and knowledge as the driving force of this innovation. In fact, knowledge sharing can be leveraged in innovation management (specifically management of technological innovations).

In this sense, it is important to consider that over the past decade competition has become increasingly knowledge-based as firms have to face more challenges and learn and develop capabilities faster that their competitors. However, the time between the identification of a problem and its arrival may not allow firm to develop its own knowledge internally and necessary capabilities in order to respond effectively. This has led to a change in the way in which firms take alliances: from traditional resource alliances to alliances with learning from partners as the principal goal and objective. Through this new type of alliances firms currently have the possibility speed their capabilities development and minimize their exposure to technology uncertainties by acquiring (sometime by buying) and exploiting the knowledge previously developed by other firms. The challenge is to have the necessary capability and ability to identify, assimilate, and utilize this knowledge, together with the implicit knowledge developed by the organization itself. So, how and with whom a learning alliance should be formed? To respond to this question, it is important to consider the "theory of absorptive capacity" based on Cohen and Levinthal's researched model (1990). They argued that organizational units differ in their ability to assimilate and replicate knowledge gained from external sources. Cohen and Levinthal (1990) labeled such ability as "absorptive capacity". In discussing how it contributes to innovation, they thought that absorptive capacity is an ability that firms develop overtime and it tends to develop cumulatively and builds on prior related knowledge. It has been argued that organizations who possess relevant prior knowledge are more likely to understand new technology and generate new ideas and new products. They continued that organizations with higher levels of absorptive capacity are more likely to take new knowledge from other units and develop their innovative activities. The absorptive capacity refers to the fact that organizations need to absorbed inputs in order to generate outputs, and at the basis of this capacity reside the activities of learning and transfer technology from one unit to another. Absorptive capacity is fundamental for the transmission and diffusion of knowledge within an organization and in fact, scholars have seen that organizations which present a lack of efficiency in absorbing knowledge have major possibilities to have barriers in the diffusion of it.

Absorptive capacity is the result of a process of investment and knowledge accumulation and it depends mainly on the endowment of relevant technology-based capabilities (Mowery, Oxley, & Silverman, 1996). In fact, in modern organizations, R&D is one of the most important department within a firm and R&D investments are necessary conditions for the creation of absorptive capacity. As Cohen and Levinthal suggested, the ability to use external knowledge is an often a R&D investment product. They also have seen that

organizational units with higher levels of absorptive capacity are more likely to invest in their own R&D and have more abilities to produce their innovations.

So, we can say that: n organization's absorptive capacity is defined as an organization's ability to "recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends" (Bilgili, Kedia, & Bilgili, 2016, pp. 700–701) and it is strictly and positively correlated to its innovation and also affects and improves its business performance and operations. In fact, absorptive capacity is not only the ability to assimilate external knowledge but also the ability to apply it to commercial ends and create benefits and profits. In addition, incrementing the organization's knowledge base can enhance the unit's business performance and it is more likely to profit from the new knowledge it has absorbed. The result of this is that a firm could be able to access and have a certain level of knowledge, but it will not enhance its innovation and business performance if it does not have the necessary absorptive capacity to absorb new knowledge from an external environment. The better the unit can access to external knowledge from other units the more it needs absorptive capacity to benefit from such knowledge.

1.11.1. Absorptive capacity and its dimensions

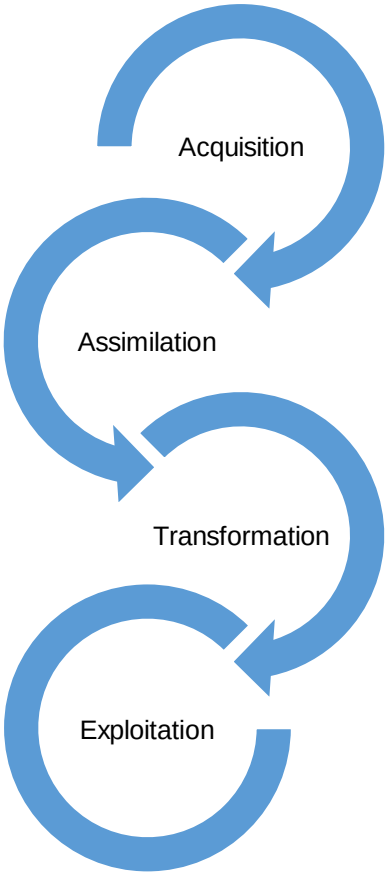
Absorptive capacity is a variable used in research on R&D, networks, innovations and performance. The focus is to establish the activities that lead an organization to acquire, assimilate and exploit the knowledge develop from external resources. According to the definition proposed by Cohen and Levinthal (1990), there are four dimensions of absorptive capacity, which are explained in the article "Measurement of knowledge absorptive capacity: An estimated indicator for the manufacturing and service sector in Colombia" (2015) by A.Hurtado-Ayala of the "Universidad del Valle, Colombia".
The four dimensions are: **acquisition, assimilation, transformation and exploitation**.

1. **Acquisition:** the capacity of a company to capture external knowledge based on its efforts to acquire it (Cohen and Levinthal, 2000). This phase is measured by using three items based on the Flor et al. (2011) scale, capturing the intensity and speed in the acquisition of new knowledge: R&D investments, technology transfer investment and investment in machinery and equipment;
2. **Assimilation:** the process of internalization and diffusion of new knowledge within a company. This process is principally focused on the employees of the organization who should correctly process the new knowledge and relate it to the existing one by using their own capabilities, skills and routines. This phase is

based on existing relationships between one organization with external agents. The items are based on the Nieto and Quevedo (2005) and Flor et al. (2011) scales, which measure the capacity for analyzing and understanding new knowledge: supplier cooperation (relationship between the number of companies that cooperate with suppliers), institutional cooperation (relationship between the number of companies that cooperate with institutions) and client cooperation (relationship between the number of companies that cooperate with clients);

3. **Transformation:** the construction of new routines, development to the manufacturing of new products and the establishment of new processes once the new knowledge is assimilated and spread within the organization. Transformation is the ability to adopt the external knowledge and reform its organizational routines. According to Flor et al. (2011), transformation activities are measures of fulfillment of training courses, patent acquisitions, scientific and technical publications, etc. The selected items of the scale are: staff involved in participating in technology and innovation activities, education and training (relationship between companies and consulting firms), support in technical assistance and consulting (number of employees trained and educated by the company);
4. **Exploitation:** in this phase the company needs to continue with the process of applying the external knowledge by achieving goals and satisfying its needs. According to Cohen and Levinthal (1990), this capacity reflects the improvements in existing competences, creation of new competence sets or creating new product and processes. Again according to Flor et al. (2011), this dimension is measured by some aspects that measure activities related to product and processes changes and improvements: innovation in product methods (measurement of number of innovations of a specific type implemented by companies), improvement in the quality of products and services (measurement of number of important innovations of this type), broadening the range of products and services (measurement of number of innovations of this type).

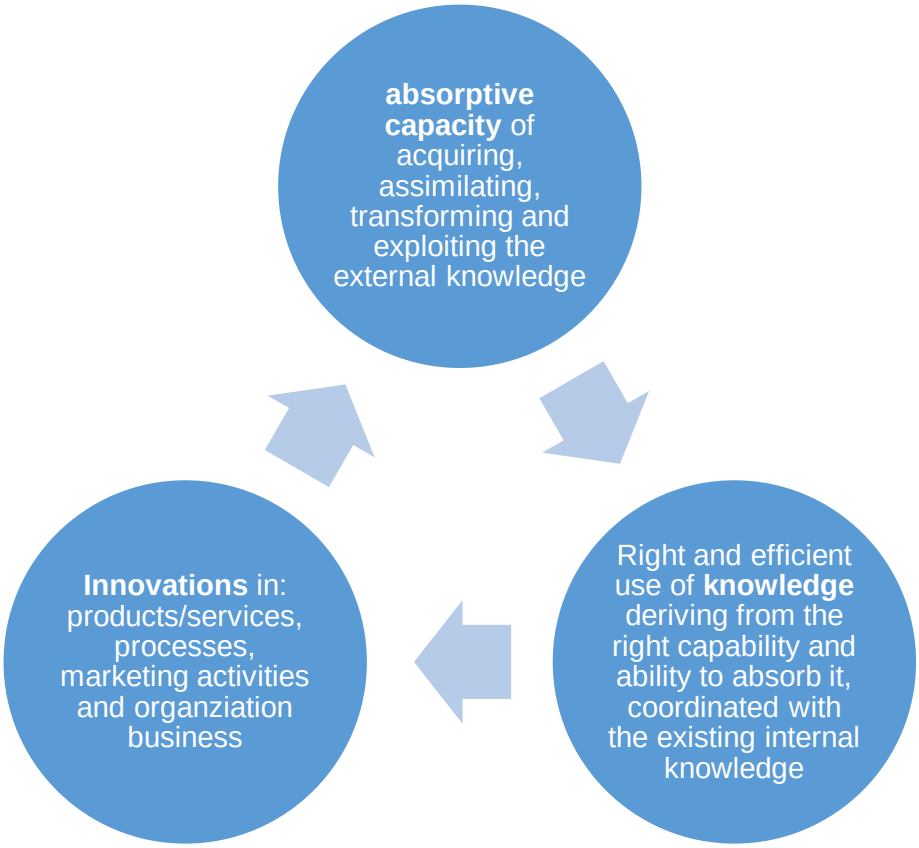
Figure 8. Dimensions of absorptive capacity



Source: own elaboration.

In this research, absorptive capacity is a multidimensional construct, in which all the dimensions are strictly correlated to each other; in fact, eliminating one stage could alter the process of the implementation of the external knowledge within a firm. This is why is important for firms to know that everything is correlated. The process of acquiring, assimilating, transforming and exploiting the right knowledge (external and internal, explicit and implicit) could lead a firm to have a much better perform and to innovate in a more efficient way in the domains of innovation which are: products and services, processes, marketing and organization. This is why all this concepts are strictly correlated and this why currently, firms need to have the capabilities and skills to use the knowledge in order to have much better benefits. This is a dynamic and continuous process, which involves firms to continuously innovate and provide economic and social benefits to society.

Figure 9. Correlation between absorptive capacity, knowledge and innovation within an organization



Source: own elaboration.

CHAPTER 2. EMPIRICAL WORK, METHODOLOGY

Once the theoretical framework that involves innovation knowledge and their relationship has been analyzed, for the second part of the work, I have used a methodology through the study of cases. The case study focuses on the analysis of a specific situation in order to know, understand and interpret the specific characteristics of the study. This is an empirical research and it combines qualitative methodologies as well as a written interview.

In this work, I have selected as an object study an innovative company. According to OECD, an innovative firm is defined as “one that has implemented an innovation during the period under review” (OECD, Defining and Measuring Innovation in all Sectors of the Economy: Policy Relevance, (2016), p. 4).

The aim of this case study is see and evaluate the innovative capacity of a company. As I have indicated in section 1.5 from the theoretical part, the evaluation of innovation activities allows a company to identify their current situation according to the criteria of innovation management. This activity is fundamental in order to identify both strengths and areas of improvements, and to assist the decision making on the part of management and to develop a better plan of action to improve R&D.

The case is structured like this: there will be an overview about the national context in which the firm is based, then it will be essential to write about the specific location in which the company is based: Espaitec, and finally there will be the case study itself.

2.1. DESCRIPTION OF THE CASE STUDY: ACTUALTEC, INNOVACIÓN TECNOLÓGICA, S.L.

The firm selected for this case study is ActualTec, Innovación Tecnológica, S.L. It is a firm which focus its activities to studying, developing and implementing projects of technological innovation and investigation applied to the domain of medicine, industries and any other commercial sector, professional, industrial or about services. It is also engaged in the development, commercialization and sell of informatic programs and application, as well as buying.

The main reason for the choose of this firm stands in the fact that it was the firm in which I did an internship, being an Erasmus student with Double Degree project in Spain. I did the internship from November to January as account executive, being a part of a marketing team. Furthermore, it is a firm specialized in innovation and exploitation of knowledge in medical domain and it is an example of how innovation can provide benefits not only economically thinking, but also within the society and throughout organizations.

In this second part, the sources used to carry out the analysis of innovation and knowledge in the company are both primary and secondary. At first, information and data have been collected from my experience within the company and from sources via internet by visiting the official website of the company and other useful websites that provided additional information. Secondly, once collected the information about the location of the company and the company itself, an interview was conducted (Annex…) with questions established in order to make evidence to the theoretical part. I conducted the interview with the CEOs of the company via e-mail.

So, the primary and second resources refer to:

- Primary resources: the interview was carried out by sending it via e-mail to the CEOs of the company. The aim of this interview was to collect more information about the current and future process of innovation within the firm;
- On the other hand, regarding the secondary resources, I have visited the official website of the company as well as other online pages in order to have more information.

In the following section I will firstly present the national context in which the firm is based and then its location: Espaitec.

2.2. Overview of the national context about innovation

According to the OECD (2014), in Spain business investments in R&D and innovation output are below the OECD median, and both the business environment and the supply venture capital require significant improvement. Since Spain is characterized by a predominance of SMEs and low R&D-intensive business sectors, policies need to focus principally on the growth and internationalization of innovative companies, increased R&D spending in large companies, strengthening demand for human resources in companies and encouraging the generation and utilization of emerging technologies. In fact, in Spain there is the so called “Retos innovación” that is a specific budget line for projects that address social challenges and key enabling technologies. In addition, governments are encouraging the innovation through the collaboration between universities, private R&D centres and firms. The government’s structural reforms seek to improve the environment for business R&D and innovation by eliminating the limit on the amount of gross tax against which the tax credit for R&D can be taken. The Centre for Development of Industrial Technology (CDTI) created in 2012 two venture capital firms (INVIERTE program) to promote venture capital in Spanish technological firms and support the creation and growth of new innovative firms. In 2013 the budget for this initiative was about EUR 132 million. Respecting the ICT infrastructure, Spanish government spent an amount of EUR 550 million in 2013. Moreover, it is important to consider that in Spain, PRIs and universities are quite active in patenting. The challenge is to enhance the contribution of public research to the economy and society. Spanish organizations have integrated technology and innovation activities in order to promote technology transfer through knowledge diffusion and circulation and to create and promote partnerships between public and private firms.

In fact, as we can see from the Annex 4. “Comparative performance of national science and innovation system”, in the section “business R&D and innovation”, business R&D

expenditure (per GDP) in Spain in 2010 (the latest available version of OECD data) was 57.874 EUR, quite below the OECD median. It is an important indicator because firms are major actors in national innovation systems; they turn ideas into economic value and account for the largest domestic R&D in many countries. Respecting the indicator "entrepreneurship" we can find better results in the section "ease of entrepreneurship index" which is 120.440 and it is above the OECD sample median. According to the indicator "knowledge flows and commercialization" Spain shows positive results in "patents filed by universities and public labs (100.018 patents by GDP) and in "industry-financed public R&D expenditures (105.052 EUR by GDP), always taking into account the OECD sample median. Finally, considering the education systems that play a broad role in supporting innovation due to the fact that knowledge-based societies rely on highly qualified and flexible labor force, we can find that the percentage of "adult population at tertiary education level was 87.646% while the percentage in Science and Technology (S&T) occupations in total employment was 71.676%, both below the OECD sample median.

If we analyze the Annex 5. "Comparative performance of national science and innovation systems (2011)", we can notice that in comparison with the other OECD countries, Spain shows quite always lower results with the lowest one in "patenting firms less than 5 years old". Whereas it shows much better result in "ease of entrepreneurship index" and in "industry-financed public R&D expenditures and "patents filed by universities and public labs".

However, respecting the sector in witch the selected firm operates, there are positive opportunities: since 2008, Spain has endured one of the worst economic crisis that has imposed considerable constraints on the country's ability to make new investments in public healthcare. This has led Spanish institutes and hospitals to adopt new purchasing and service models for imaging equipment investments. As the economy recovered, the drive towards operationalize capital, service costs and added value services favored non-conventional business models over traditional capital-intensive purchasing. Furthermore, some Spanish policies have encouraged institutes to invest in this new model innovation in medical imaging, due to the need of improving medical aspects like: long patient waitlists, limited capacity, limited access to capital etc.

In conclusion, we can notice that in Spain innovation is more encouraged by universities and public labs, but it needs to encourage innovation by enhancing and promoting more innovative firms. It is also important to consider that according to the article "Spanish science and technology parks provide jobs to 170,000 people, of which 20% work in

R&D" (2018) available in the official webpage of ESPAITEC, figures have improved from the past year, above all employment which has increased by 4.95%, that is to say 169,337 workers of whom 34,163 specialized in R&D tasks.

2.3. Actualtec, innovación tecnológica, s.l. locations: espaitec

In this section I am going to write about the location in which the firm is currently located.

Image 2. Real photography of the creation of ESPAITEC

Source: photo taken in ESPAITEC 2 building.

Espaitec is the Scientific, Technological and Business Park in Castellón de la Plana promoted by the Universitat Jaume I (UJI) and The Association of Businessmen from Castellón (CEC). According to the video available in the official website of the Park in the section "El parque", Espaitec was founded in 2007 with the aim of support entrepreneurs with an innovative business project. Thanks to the fundamental support of the University and the CEC Espaitec was founded as a perfect cohesion between the

academic environment and the local business environment. Currently, Espaitec is even more: it connects the science, technological and innovative policies and it has defined the innovation ecosystem. The real aim of Espaitec is to achieve a knowledge-based economy in order to generate wealth and high qualified employment by enhancing the territorial integrity and facilitating the access to funding in order to realize successful innovative projects. The park connects entrepreneurial initiatives with the market and it bets for talent. It supports the firms and innovation, by providing the right endorsements to make it possible: it connects the firm with a global innovation system by generating a knowledge and interchange network and it promotes and encourage economic and social growth with the aim to provide economic and social benefits.

Since 2007, the park has been working on taking advantage from the knowledge generated at the Universitat Jaume I for it to have an impact on society and the economy in the city of Castellón by supporting the creation and growth of technology-based companies and providing the business fabric with innovation. Forming part of Espaitec means belonging to a world filled with facilities and conveniences, not only to entrepreneurship and innovation, but also professionally and personally. They have created a unique environment which tends to host, support, promote and help innovative TBCs grow, and also facilitates transferring the technology and knowledge; for this purpose Espaitec has developed the Long Way Companion methodology, which focuses on helping and accompanying companies in their life cycles stages, and on facilitating services and flexible dynamic installations, which adapt to every instant and requirement (general services like 27/7 security, cafeteria and dining, meeting and video conference rooms, easy access to UJI and its services and facilities, connection to an overall innovation systems; and specialized and personalized services like corporate finance, the bridge innovation, experimental innovation etc.). For all these years, Espaitec has worked in many projects, like: On Social Partec, Unalab Project, E'livinglab, Castellón global Program etc. all oriented towards economic growth, innovation and social benefits.

Furthermore, there some advantages and commitments that make Espaitec a unique setting to grow in and to compete with innovation. They are:

1. Long Way Companion: companies are accompanied throughout the business creation and consolidation process;
2. Work in a network: it provides the best internal and external agents (OCIT, rePVC, APTE, etc.);

3. Global Innovation Ecosystem: it provides active collaboration with the main innovation and technology transfer agents internationally (IASP, ENoLL);
4. Business synergies: companies collaborate together and with other linked companies and UJI research groups;
5. Adapted services at all times: general and personalized services to help companies meet their objectives;
6. Flexible linkage options: it offers the best infrastructure and rooms for all types of business requirements;
7. Network of unique contacts: it disposes a network of highly valuable national and international contacts and it acts as a connector;
8. Much more than a working area: it offers a unique and east-to-access setting;
9. European projects and specific aid for environments: forming part to Espaitec means being able to participatein all the European projects that they promote;
10. Image and visibility: forming part of Espaitec means associating the brand name with values of innovation, knowledge, technology and talent and it also supports them to diffuse news and organize events.

2.4. Actualtec innovación tecnológica: the firm's products

In the medical innovative domain, Actual Tec Innovación Tecnológica facilitates informatic solutions to clinics and radiology centres, and it produces software and hardware with the aim to store medical images, report including the billing of the centre or of particular radiologist. Its slogan is **"Innovation for radiology"**.

ActualTec is divided into two commercial brands: on one hand there is ActualWeb which focuses in providing informatic solutions and it offers Internet services such as website design, online shops, positioning, web hosting, etc.

Ic

Source: official page, http://www.actualweb.es

On the other hand, there is ActualMed, which dedicates to the design and development of medical digital images in order to enhance the quality of medical diagnostic. In this one I realized the internship.

Image 4: ActualMed Logo

Source: official page, http://www.actualmed.com

Its main product is “Actualpacs”, that is a cloud-based platform that allows particular radiologists, radiology centres and teleradiology companies to generate a correct, quick and reliable diagnostic. The application is designed with the aim of allowing and ensuring a quick and safe access to the DICOM images of the radiology centre. In addition, it allows the radiologists, centres and teleradiology companies to see and consult the latest studies and the old ones that are stocked in the repository in order to make the final report. There are four main types of “pacs” for different types of users: one for particular radiologists, one for radiology centres, one for teleradiology companies and the last one for the patients (ActualPacs Patient Portal). The advantage of this application is that it does not need a physical support and moreover it allows a faster download of images and studies that directly arrive to the pacs and it also allows to see good quality DICOM images and realize more than one diagnostic in the shortest possible time. This innovation has provided an improvement in the doctors’ works and it has created a cooperative network of real-time communication between the different users, together with the patients, who can now see their reports directly from the PC or their mobile phones, simply by downloading the application.

CHAPTER 3. CASE STUDY

In the following sections I will explain the way in which the selected firm innovates, with the aim of transferring the innovative concept seen in the theoretical parts into a practical frame about the main types of innovation that are: product, process, marketing and

organization. I established an interview in Spanish for the CEOs of the company: Rafael Forcada (who was also my tutor during my internship) and Sergio Fabra (Annex 6. “Interview”). Then I have divided the interview in seven parts: the interview consists of 17 questions, the first one is the explanation of the structure, the other ones are divided in two groups - “exploration” and “exploitation”, based on the absorptive capacity concept - and the sub-groups are product and process; the following parts are marketing, organization, innovation in the firm according to the CEOs and the last one is about their project for the future. Respecting the internal environment, I will later expose my personal opinion, according to my experience within the firm.

I chose the concepts of exploration and exploitation because they have recently emerged as twin concepts and have increasingly come to dominate organizational analysis of technological innovation, organizational adaptation, organizational advantage and competitive advantage. Exploration refers to learning and innovation, that is the pursuit and acquisition of new knowledge, while exploitation, as I wrote in the previous sections, refers to the use of existing knowledge and the use of new one in order to create innovative products, services, process, etc. In this way, I established the interview in order to know how the firm exploits ideas and knowledge to create innovative products. Thanks to the CEO’s answers and to my experience I have had a global view of what the process is.

3.1 Objectives of the investigation

The main goal of my interview is to analyze the process of innovation (product, process, marketing and organization) and exploitation of knowledge within the firm and also achieve the following objectives:

1. To know the way in which the ideas are generated in ActualTec Innovación Tecnológica
2. To know how the innovative producing process is established
3. To know how they generate ideas
4. To know how the exploit those ideas

The questions are set according to the theoretical sections and, as I explained before, they are divided in order to understand the process that allows the firm to explore the external environment and exploit the new knowledge, together with the existing one.

The CEO, Rafael Forcada, has answered the following questions:

STRUCTURE:

Q1: What is the structure of the firm?

EXPLORATION:

Origins of the ideas:

Q2: Who are your suppliers?

Q3: Where do you search and find information about clients? (Universities, institutions, industries...)

Q4: How is the R&D department composed and how does it work?

EXPLOITATION:

Innovative products of the firm:

Q5: Where do you find the ideas to make a product?

Q6: What method of Price setting does the firm use?

Process:

Q7: What is the process that allows you to select, approve and adopt the ideas that will be transformed in product?

Q8: How do you exploit the ideas?

Q9: Do you do some kind of test before launching a new product?

Q10: How much time do you need in order to launch or improve a product?

MARKETING:

Q11: What are your marketing operations?

Q12: Which are your distribution channels?

ORGANIZATION:

Q13: Is your firm innovative in terms of organization?

EXTERNAL ENVIRONMENT:

Q14: Your firm is located in the Scientific and Technological Park, ESPAITEC. What are the main advantages of belonging to the Park?

INNOVATION:

Q15: In what aspects do you think your firm is innovative? Product, Process, Marketing or Organization?

Q16: How do you "make innovation" within the medical domain?

PROJECTS FOR THE FUTURE:

Q17: What are your projects for the future of the company?

3.2. Results

In this section I will analyze the results of the case-study based on the answers he gave to me. I will interpret what the firm does together with my personal opinion about it, derived from my personal experience within the firm, as reference with the concepts seen in the theoretical framework.

3.2.1. Results obtained about the structure

Q1: What is the structure of the firm?

A1: "The firm consists of seven employees: two founding partners and informatic engineers graduated in 2003 in the Universitat Jaume I of Castellón. The firm was firstly financed by its own resources: 50% each founding partners".

ActualTec, Innovación Tecnológica was founded in 2010 in ESPAITEC with the aim of detect an opportunity within the medical sector, especially in the sector of medical digital images and in the area of teleradiology.

3.2.2. Results obtained about the exploration

Origins of the ideas:

Q2: Who are your suppliers?

A2: As Rafael wrote, their suppliers are principally host producers and service producers in data centres. “We are working with data centres established in Holland, Germany, Spain and United States”.

In this sense, they buy hosts in the countries in which they want to export their products in order to have a faster Internet connection and to allow doctors to work more rapidly. This was one of the tasks that they told me to do during my internship: during a period, I was supposed to search and find hosts in any country they told me, that most of the time matched with the countries they wanted to export or those in which the Internet connections was not excellent.

Q3: Where do you search and find information about clients? (Universities, institutions, industries...)

A3: As Rafael wrote: “We search and find information from direct contact with clients, referenced customers and online marketing. Punctually, in specific radiology congresses”.

In this sense, they search direct information about customers in a dynamic way which can vary depending on the occasion. However, as I work in the firm, I know that they constantly have a permanent contact with customers through an exchange of opinions and resolution of claims. In this way, they can have a global opinion about what clients think for the area of improvements.

Q4: How is the R&D department composed and how does it work?

A4: “The R&D department consists of four people. Their work focuses in the research and development of specific solutions raised form internal projects with the aim of developing technological solutions which provide added value to the online platform.

In fact, when I was working in the firm, every day we did a morning reunion in which everyone explained the goals achieved during the previous day and the main aim was discussing about the possible areas of improvement of the products. Every employee had a specific task in order to develop new and better solutions.

3.2.3. Results obtained about the exploitation

Innovative products of the firms:

Q5: Where do you find the ideas to make a product?

A5: As the CEO wrote: “We find ideas directly from the market. We listen to customers’ needs in a direct way and we look for common denominators in order to integrate those needs and demanded characteristics in our products”.

So, as we will see later, they focus their attention entirely in customers’ needs.

Q6: What method of Price setting does the firm use?

A6: “In order to estimate the price of a product, the first thing we do is to calculate the costs, in order words: we assess the hardware resources as well as necessary software in order to provide the product. Once we have obtained the minimum price to sell it, we analyze the price of similar products in the market. Finally, we consult some referenced customers in order to establish which could be the best price for them, due to the fact that depending on the client profile, the client is willing to bear a higher or a lower price in line with what he/she obtains in return”.

Process:

Q7 + Q8: What is the process that allows you to select, approve and adopt the ideas that will be transformed in product? How do you exploit the ideas?

A7 and A8: “Each person within the firm can contribute to provide ideas. However, most of the times, the ideas arise from those people who are in direct contact with clients: commercial department or R&D department. The ideas are internally exposed during a periodic reunion, most of the times it is weekly and then, the board of directors decides which of these ideas is going to be implemented”. Each person of the firm can provide ideas, thanks to the fact that they could have found something interesting browsing the internet or they may have come up with a process improvement or a new innovative idea”.

In other words, within the firm, everyone is motivated to generate new better ideas with the aim of create new products or enhance the existing ones.

Q9: Do you do some kind of test before launching a new product?

A9: “Every product is submitted to unitary tests and integration tests. This happens for new products as well as for every new releases of them”.

In fact, when I was doing my internship, I assisted at the launch of a new actualized version of ActualPacs, their main product. It was modified according to the necessities of doctors and it was made faster.

Q10: How much time do you need in order to launch or improve a product?

A10: “We launch a new release or new version of a product once a month”.

It is a continuous process of improvement.

3.2.4. Results obtained about marketing

Q11: What are your marketing operations?

A11: “We work a lot with online marketing, through web positioning and advertisements. In addition, we periodically generate contents, which it helps us to attract online flow and movement towards our website and at the same time we make future potential interested customers faithful. We follow a marketing strategy called “inbound marketing” that allows us to make faithful those customers who are really interested in our services and products”.

Q12: Which are your distribution channels?

A12: “We work with Latin American distributors with have a certain volume (for instance, Mexico, Colombia and Argentina)”. In addition, he continued: “in countries in which we do not have so much flow and volume, we contact clients through direct marketing, totally online”.

Marketing was the main area in which I did my internship. I was always in contact with old, new, potential and current customers. My principal task was to contact them to make them know about the products and services of the firm and to convince them to try the Demo of the main product, ActualPacs. It was direct contact through email or telephone and it was necessary in order to increase interest about the products.

3.2.5. Results obtained about organization:

Q13: Is your firm innovative in terms of organization?

A13: As Rafael wrote: “We believe in that. We have always tried to offer a service that expedite the process of medical reports realization, always by implementing cutting-edge solutions in emergent technologies (Big Data and Machine Learning). These technologies help professionals to do their job and at the same time they provide us a competitive advantage”.

So, we can say that in addition to innovative products and services, they are also innovative in terms of organization. In addition to that, we can also consider the external relationships the firm maintains: the firm maintains constant connections with ESPAITEC, that is its main strong point and it establishes direct connections with providers and customers. This vision allows the company to avoid barriers and provides it with an innovative nature.

3.2.6. Results obtained about external environment

Q14: Your firm is located in the Scientific and Technological Park, ESPAITEC. What are the main advantages of belonging to the Park?

A14: Being part of ESPAITEC is one their strong points. “The connection with the University is one of our strongest points. We can welcome students for internship who help us to have a different vision and to carry out R&D projects in a more efficient and easier way. The collaboration agreements with investigation groups from the UJI is another strong and positive point, in line with the process of innovation we are carrying out. Finally, the facilities are perfect so that we can work in a better environment”.

3.2.7. Results obtained about innovation

Q15: In what aspects do you think your firm is innovative? Product, Process, Marketing or Organization?

A15: According to what the CEO thinks, they are trying to innovate in every aspect. In fact, he wrote: “A year ago we implemented the SCRUM, an innovative methodology of agile development, which allows the company to have a better performance of process and development of products, as well as internal functioning. Respecting the marketing, we are using a new method, the inbound marketing, that allows the company to focus efforts and optimize the marketing process and commercialization.

So, I can say that they are innovative in every type of innovation in a dynamic way.

Q16: How do you "make innovation" within the medical domain?

A16: "We enhance the attention towards the patients, due to the fact that doctors can realize reports until three times more rapidly than the traditional systems, and that results into a reduction in queues, a more efficient management of sanity and a higher quality of diagnostics".

3.2.8. Results obtained about future projects

Q17: What are your projects for the future of the company?

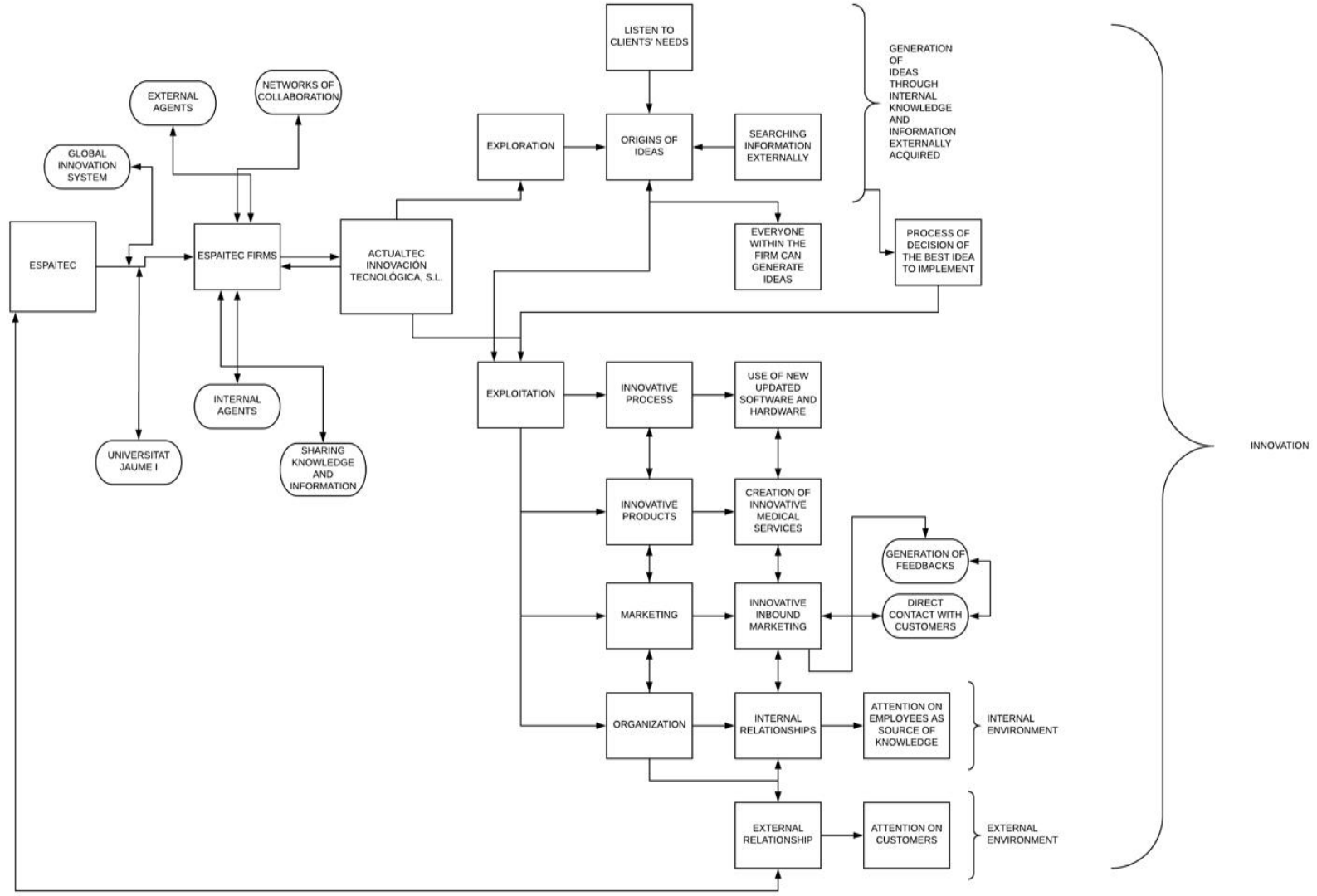
A17: "We are working for the use of Big data and Machine Learning in order to be able to offer to our customers assistance tools for diagnostics through the so-called CAD (Computer Aided Diagnosis)".

According to them, Big Data are becoming increasingly important in order to analyze customers behavior and they are an important source of information ready to use. Whereas, the Machine Learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. It focuses on the development of computer programs that can access data.

3.3. Summary results

Through this practical case study, I have had the opportunity to better understand the way in which they innovate. Thanks to the concepts analyzed in the theoretical framework, I have had the possibility to develop a specific interview and to interpret the answers. The process of innovation of the firm can be explained through the following scheme (Figure 10):

Figure 10. Process of innovation within the firm



Source: own elaboration.

According to the concepts seen in the theoretical framework and respecting to the answers of the interview, I can summarize the results in the way that follows:

1. **Exploration: Origins of the ideas**
2. **Exploitation: Product and Process**

    - **Product**
    - **Process**

3. **Marketing**
4. **Organization**
5. **Other general results**

1. Exploration: Origins of the ideas

ActualTec Innovación Tecnológica is a firm that is profoundly convinced that the listening of the needs of current and potential customers would be the best solution in order to improve and create products. In fact, the ideas can come from every member of the organization by directly listening to their needs. They explore the market through direct marketing and physically in radiology congresses. They made an evaluation of what the characteristics of new and existing products could be, they come up with ideas, they analyze and evaluate those ideas and then the CEOs decide which one is/are the best. They do this process in a dynamic and continuous way in order to constantly improve the products. In this way, they acquire external information and also external knowledge that they can use and elaborate during their reunions.

2. Exploitation: Product and Process

Product: thanks to the exploration of the market, the analysis of customers' needs and the generation of idea and information, they have created new products and services that have allowed doctors to make medical diagnostics in a more rapid way and to constantly stay in touch with patients and other institutes and centers almost in real time. This has also allowed doctors to enhance their performance by reducing the queues and by making more than one diagnostics in the shortest possible time. So, we can say that there was a **radical innovation** when they decided to create these new products (for instance, ActualPacs) that provided a significant transformation within the medical sector of digital images, contributing to the agilization of diagnostic reports and furthermore, there is a constant **incremental innovation or improvement**, because once a month they release a new updated version of the services.

In this sense, we can consider that ActualTec is an innovative firm in terms of product, because according to the OECD (2005) definition, a product innovation is "the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses". And the firm products perfectly match with this definition.

Process: according to the OECD (2005) definition seen in the theoretical part, a process innovation is “the implementation of a new or significantly improved production or delivery method (including significant changes in techniques, equipment and/or software)”.

As we have noticed in the practical work, they use hardware and software of the last generation, as well as Big Data and Machine Learning, and in general the process of exploitation of ideas and knowledge is innovative. The reason is that they continuously work together, CEOs and employees, and as I wrote in the theoretical part, they consider employees as a fundamental resource. They are not considered as “machines” who have to achieve certain goals, but their work is flexible, and they are allowed to generate ideas. Their skills and competences, as well as their theoretical skills, are the internal and existing knowledge that can provide the firm a strategic advantage.

3. Marketing

According to this innovation type and respecting the OECD (2005) definition, a marketing innovation is “the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing”.

In this case, the firm uses a new methods called inbound marketing that allows the direct and constant contact with those clients who are really interested in their products. These tools enable the firm to focus their efforts towards the potential customers that have more possibilities to buy the products: it permits to avoid loss of time and to accelerate the process. Furthermore, they establish the price according to what some referenced customers think it would be the best price. The attention is always on the customers’ needs.

4. Organization

According to the OECD (2005) definition: "Organizational innovation means the implementation of a new organizational method in the undertaking’s business practices, workplace organization or external relations”.

In this area, we can say that ActualTec is innovative because it constantly has relations between internal members and external agents (University, EPAITEC, clients, providers, etc.). Having established these relations is considered as the main strong point, because it allows the firm to establish important relations as a source of information and to

exchange opinions and feedbacks in order to improve. In addition, they constantly work together, promoting a good labor environment.

5. General results

In this part, I am going to explain my personal view about the firm, giving an overview of it, also including the internal environment in which I have worked.

I think that the firm innovates under every aspect: product, process, marketing and organization. It was born with the idea to innovate and it keeps innovating by generating new innovative projects and by improving the existing ones. As we can see from the previous scheme I have done, they process of innovation is continuous and every phase is strictly correlated to the other ones. The way in which they do marketing operations is strictly correlated to the generation of new ideas or improvements; the creation of new process and products is strictly correlated with the marketing area and the generation of new ideas, and finally the organization is the principal source of this innovative process. This is why everything can be mixed and the process can be considered as dynamic and changeable, according to the different situations.

According to the internal environment, I think that they are a good team and their particularity is that they are all flexible in doing their tasks and they try to help each other. When I was working in the firm, I was always helped whenever I had a problem and the environment was agreeable. In addition, the fact that they always have internship students is a good thing because they can have different and more “updated” points of view.

Internal organization and environment, as well as the collaboration, communication and cooperation between the members is really important in order to create a sustainable workplace, suitable for the generation of new innovative ideas. This is why, currently, human resources are becoming increasingly important in organizations: they have the power to generate new ideas and provide different points of view. They are also a strategic advantage and a source of knowledge. I think the firm relies on its employees and trust them and their skills in order to keep innovating.

3.4. Final recommendations

As I wrote before, I strongly agree with the fact that ActualTec is innovative, given the reasons explained and above all thanks to its positive, close and frequent contact with

clients. As we can see from the analysis of the case study, they always out their attention on customers, which is undoubtedly an innovative and positive thing.

Coming to an end, I think that there are few firms producing the same products and services in Spain and it would be interesting if they keep going, investing more in the marketing operations. According to what I wrote in section 4.3, currently in Spain, figures about innovation are lower than other countries, but its strongest point is the power of Universities and other institutes. For this reason, ActualTec is an example of how Universities are fundamental in order to encourage researches and innovation.

I also think that the sector in which the firm operates is a difficult one to make marketing because they cannot use social networks, like Instagram or Facebook, in order to make them know but on the contrary they need to focus more in those professional networks, such as LinkedIn or other ones for medical purposes, for example. They have to make their products known in radiology congresses.

In conclusion, I recommend the firm to keep investing in innovation and in product improvements. The medical sector is important and innovation is fundamental for creating benefits for doctors and patients, as well as for the society in general. The sector in which the firm operates, is a sector in which there are few competitors and margins of improvement can be substantial, if they keep researching and innovating.

CONCLUSIONS

In the first part of the study, I have argued that nowadays innovation and knowledge are the emblem of modern society. We have seen that knowledge is at the base of innovation and that innovation management and knowledge management are complementary. By establishing connections between different agents (internal and external) and different knowledge sources, firms have transformed their way in which they perceive and exploit users' potential needs and information. Innovation and knowledge have become the key factors at firm-level in order to maintain competitiveness and to be successful, as well as to face current challenges. In this sense, firms are going towards a major openness of their boundaries, sharing information and knowledge and using external knowledge in order to innovate and the internal and existing one, as well as the capacity to absorb the external one, in order to have strategic advantages among competitors. They are more and more focusing on the role played by human resources and their potential skills, that are not just physical but also intellectual. In fact, thanks to the case study, I have explained the current importance of the connection between internal and external

agents. The chosen firm, ActualTec Innovación Tecnológica, is a clear example of how modern economies are changing: at the base of success and innovation there the customers and the relationships between internal employees and external institutions, like Espaitec or the University, that have the power to create a cooperate and collaborative network of sharing information and knowledge. The aim of these new networks is to innovate and provide social and economic benefits to people and in general to firms and societies. This is why, nowadays firms have opened their boundaries and have started to cooperate with each other in order to exploit knowledge and generate new innovative ideas. The process of innovation is dynamic and it changes according to different particular situation, but we can say one sure thing: everyone can be innovative, every firm can innovate if the internal and external knowledge is used in an efficient way, also by increasing efforts and investments in R&D activities.

In conclusion, I can state that considering the current world in which everything is changing very fast, every firm have to be pro-active, flexible and have the right internal and external environments in order to innovate, compete and have competitive advantages, as well as have the readiness to face every type of challenge. This is why creating something new is the key to success.

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ANNEXES

ANNEX 1. “Other definitions of innovation”

1. According to Google definitions, innovation is: “the action or process of innovating”, or ä new method, idea, product, etc.”
2. Using the traditional source of definitions, for instance the Cambridge dictionary innovation is: “a new idea or method, or the use of new ideas and methods”. According to the Oxford dictionary, “to innovate” means: “make changes in something established, especially by introducing new methods, ideas or new products”.
3. According to the University of Melbourne, innovation is “The practical translation of ideas into new or improved products, services, processes, systems or social interactions”.
4. “Innovation: The process of creating a product or service solutions that delivers significant new customer value. The process begins with the selection of the customer and market, includes the identification and prioritization of opportunities, and ends with the creation of an innovative product or service” (Ulwick, 2005, p.180).
5. “Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace.” (Baregheh, Rowley, & Sambrook, 2009, p. 1334).
6. “Innovation is the process of making changes, large and small, radical and incremental, to products, processes, and services that results in the introduction of something new for the organization that adds value to customers and contributes to the knowledge store of the organization.” (O’Sullivan & Dooley, 2009, p. 5).
7. “Innovation = Creativity + Exploitation” (O’Sullivan & Dooley, 2009, p. 8).

ANNEX 2. “What is innovation?”

In this Annex 2, I will analyze the results of the survey led by N. Skillicorn; that is to say I will offer what the experts have answered about the before-mentioned questions and to interpret these answers. I chose three of the fifteen innovation experts, due to the accuracy of their answers, respecting the general ideas of the first part of the paragraph.

RESULTS ABOUT THE QUESTIONS

Q1. What is your definition of “innovation”?

According to Pete Foley, Consultant, Innovator, Artist, Scientist, Photographer, Musician, Accountant and Blogger, with 25 years experience of Innovation and Behavioral Science in the Fortune 50, innovation is: “a great idea, executed brilliantly, and communicated in a way that is both intuitive and fully celebrates the magic of the initial concept. (..)Innovative ideas can be big or small, but breakthrough or disruptive innovation is something that either creates a new category, or changes an existing one dramatically, and obsoletes the existing market leader.

According to Paul Sloane, speaker, Facilitator and Author, specializing in entertaining talks & workshops on creativity, lateral thinking & innovation, “Creativity is thinking of something new. Innovation is the implementation of something new”.

Finally, according to Stephen Shapiro, Innovation Instigator, Hall of Fame Speaker and Author, “innovation is about staying relevant. We are in a time of unprecedented change. As a result, what may have helped an organization be successful in the past could potentially be the cause of their failure in the future. Companies need to adapt and evolve to meet the ever-changing needs of their constituents”.

Q2. What mistakes do companies often make when they talk about innovation?

According to P. Foley, “We need to stop calling everything breakthrough or disruptive, especially in internal company discussions. (..) If we demand nothing but disruption or breakthrough, (delivered tomorrow and on small budgets) then that is all people want to work on, and to accommodate this, everything gets labeled in those terms. But language matters, and once we start calling good but smaller ideas breakthrough, we lower the bar. This is a recipe for mediocrity and is one of the reasons why so many companies struggle with too many small initiatives and not enough big ones.”

According to P. Sloane, “Many companies make grand statements about their commitment to innovation but do not invest in the time, people or money to prototype innovative ideas.”

According to S. Shapiro, “the biggest mistake companies make is asking others for ideas. When asking for ideas, we invite a lot of noise and unnecessary work. Every person inside and outside of your organization has an opinion, suggestion, or idea about how to improve things. The reality is that most of these ideas won’t be effective in producing positive results.”

Q3. What simple thing can a company to change their conversation/perspective about innovation?

Again, according to the first chosen person P. Foley, “Make a long-term investment in innovation culture. Strategy is important, but it is culture that drives most of the smaller, often largely unconscious decisions that permeate an innovation organization. Big ideas take time, productive failure, communication, and collaboration. These are enabled by a culture that protects, and to some degree nurtures big ideas, and innovative, fearless people. I’m not sure if this qualifies as simple, but I think it is essential, and often overlooked.”

According to P. Sloane, “Commit the resources to a good staff ideas scheme with the target of implementing at least 5 ideas per employee per year.”

According to S. Shapiro, “For the most effective results, focus on the question, not the solution/idea. (..)By asking more abstract questions, you increase the noise, lower the value, and reduce the relevancy of solutions. (..)Framing the challenges correctly is a critical key to innovation. (..)”

ANNEX 3. “Other innovation conceptions”

All these concepts are from Kotsemir, Abroskin, & Meissner (2013). Innovation concepts and typology–an evolutionary discussion.

20th century

- Innovation as technological inventions in psychology (Rossman 1931);
- First typologies of innovation diffusion models from sociology (Ogburn, 1922; Chapin, 1928; Gilfillan, 1935);
- Innovation as social experiments (Chapin, 1917);
- Innovation as a phenomenon for sociologists and anthropologists (process of paradigm);
- Innovation as the background of social and cultural changes;
- Innovation as a mean in order to gain advantages and competitiveness, a method to increase productivity and enhance products, process, service etc. The pioneer was Schumpeter, who was also the pioneer of the discussion about the dichotomy invention vs innovation;
- Cobb-Douglas function: first mathematical model representing a technological change (Cobb and Douglas, 1928; Douglas, 1948);
- Introduction of organizational concept of innovation (Cole, 1959; Aitken, 1965);
- Innovation as a commercialized invention for new products (Jewkes, 1958);
- Innovation as a process concept (Nimkoff, 1957);
- Innovation diffusion (Brozen, 1951);
- “Innovation and economic growth” (Solow, 1957);
- Innovation diffusion and imitation in economics (Mansfield, 1961; Posner, 1961);
- Organizational innovation and innovative behaviors of organizations (Aitken, 1965; Wilson, 1966; Zaltman, 1973);
- Some opposition to the term innovation appeared (Roberts and Romine, 1974);
- Technological paradigms model (Dosi, 1982, 1988);
- Innovation as a financial change (Myres and Nicholas, 1984; Ross, 1989);
- Technological innovation system and national innovation system concepts (Dosi et al., 1988; Freeman, 1988)
- Further development of innovation concept and studies (1990’s)

ANNEX 4. “Comparative performance of national science and innovation system”

Time	2010 or latest year available					
	Science base			Business R&D and innovation		
Indicator	Public R&D expenditures (per GDP)	Top 500 universities (per GDP)	Publications in the top-quartile journals (per GDP)	Business R&D expenditure (per GDP)	Top 500 corporate R&D investors (per GDP)	Trademarks (per GDP)
Country						
Spain	90,727	68,514	84,784	57,874	56,773	46,720
European Union (27 countries)	101,436	103,636	..	101,998	111,405	96,456
OECD sample median	100,000	100,000	100,000	100,000	100,000	100,000
Lowest OECD value	0,000	-0,000	0,000	0,000	0,000	0,000
Highest OECD value	200,000	200,000	200,000	200,000	200,000	200,000

Time							
	Entrepreneurship			Internet use for innovation			
Indicator	Venture capital (per GDP)	Patenting firms less than 5 years old (per GDP)	Ease of entrepreneurship index	Fixed broadband subscribers (per population)	Wireless broadband subscribers (by population)	Networks (autonomous systems) (by population)	E-government readiness index
Country							
Spain	51,444	56,334	120,440	89,599	95,815	22,234	91,524
European Union (27 countries)	..	..	..	109,912	-1,109	4,426	..
OECD sample median	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Lowest OECD value	0,000	-0,000	0,000	0,000	0,000	0,000	0,000
Highest OECD value	200,000	200,000	200,000	200,000	200,000	200,000	200,000

Time							
	Knowledge flows and commercialisation			Human resources			
Indicator	Industry-financed public R&D expenditures (by GDP)	Patents filed by universities and public labs (per GDP)	International co-patenting (PCT patent applications)(%)	Adult population at tertiary education level (%)	15-year-old top performers in science (%)	Doctoral graduation rate in science and engineering	S&T occupations in total employment (%)
Country							
Spain	105,052	100,018	72,449	87,646	47,554	59,243	71,676
European Union (27 countries)	106,131	103,080	37,794	65,268	..	..	101,902
OECD sample median	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Lowest OECD value	0,000	0,000	-0,000	-0,000	0,000	0,000	0,000
Highest OECD value	200,000	200,000	200,000	200,000	200,000	200,000	200,000

Source: OECD Statistics.

ANNEX 5. “Comparative performance of national science and innovation systems (2011)”

Comparative performance of national science and innovation systems, 2011

Country relative position: in the top 5 OECD (★), in the middle range above OECD median (●●), in the middle range below OECD median (●) and in the bottom 5 OECD (○)

	Competences and capacity to innovate									
	Science base			Business R&D and innovation				Entrepreneurship		
	Public R&D expenditure (per GDP)	Top 500 universities (per GDP)	Publications in the top-quartile journals (per GDP)	Business R&D expenditure (per GDP)	Top 500 corporate R&D investors (per GDP)	Triadic patent families (per GDP)	Trademarks (per GDP)	Venture capital (per GDP)	Patenting firms less than 5 years old (per GDP)	Ease of entrepreneur-ship index
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Argentina	●	●		○	○	○	●			
Australia	●●	●●	●●	●●	●●	●	●●	●●		●●
Austria	●●	★	●●	●●	○	●●	●●	●●	●●	●●
Belgium	●	●●	●●	●●	●●	●●	●	●●	●	●
Brazil	●	●	○	●	●	●	○			●
Canada	●●	●●	●●	●	●	●●	★	●	●	●●
Chile	○	●	○	○	○	○	●			●
China	●	●	○	●●	●	●	○		○	○
Colombia	○	○		○	○	○				
Czech Republic	●	●	●	●	○	●	○	●	○	●
Denmark	★	●●	★	●●	★	●●	●●	●●	★	●●
Egypt		●			○	○				
Estonia	●●	○	●●	●	○	●	●	●		●
Finland	★	★	●●	★	●●	★	●	●●	★	●
France	●●	●	●	●●	●●	●●	●●	●●	●	●●
Germany	●●	●●	●	●●	●●	★	●●	●	●●	●
Greece	○	●	●	○	○	●	○	●		●
Hungary	○	●	●	●	○	●	○	○		●
Iceland	★	○	★	●●	○	●	★			○
India	●	○	○	○	●	●	○		○	○
Indonesia	○	○	○	○	○	○	○			
Ireland	●	●●	●●	●●	★	●●	●●	★	●●	●●
Israel*	●●	★	★	★	●●	●●	●●	★		○
Italy	●	●●	●	●	●	●	●	○	●	★
Japan	●	●	●	★	★	★	●		○	●
Korea	●●	●	●	★	●●	●●	●	●		●●
Luxembourg	●	○	○	●●	★	●●	★	○		●
Mexico	○	○	○	○	○	○	●		○	○
Netherlands	★	●●	●●	●	●●	●●	●●	●●	★	★
New Zealand	●●	★	●●	●	○	●	★			●
Norway	●●	●●	●●	●	●●	●	●	●●	★	●●
Poland	●	●	●	○	○	○	○	○		○
Portugal	●	●	●	●	●	●	●	●		●●
Russian Federation	●	●	○	●	●	○	○			●
Slovak Republic	○	○	○	○	○	○	●		○	●
Slovenia	●	●●	●●	●●	○	●	●●	○		★
South Africa	○	●	○	●	○	●	●			○
Spain	●	●	●	●	●	●	●	●	○	●●
Sweden	★	★	★	★	●●	★	●●	★	★	★
Switzerland	●●	●●	★	●●	★	★	★	★	●	●●
Turkey	●	●	○	●	○	○	○			○
United Kingdom	●	●●	●●	●	●●	●●	●●	●●	●●	★
United States	●●	●	●	●●	●●	●●	●●	★	●●	●●

Comparative performance of national science and innovation systems, 2011 *(cont.)*

Country relative position: in the top 5 OECD (★), in the middle range above OECD median (●●), in the middle range below OECD median (●) and in the bottom 5 OECD (○)

	Interactions and human resources for innovation											
	Internet for innovation				Knowledge flows and commercialisation				Human resources			
	Fixed broadband suscribers (per population)	Wireless broadband suscribers (per population)	Networks (autonomous systems) (per population)	E-government readiness index	Industry-financed public R&D expenditures (per GDP)	Patents filed by universities and public labs (per GDP)	International co-authorship (%)	International co-patenting (%)	Adult population at tertiary education level (%)	15-year-old top performers in science (%)	Doctoral graduation rate in science and engineering	S&T occupations in total employment (%)
	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)
Argentina	○		○	○	○		●	★	○	○		○
Australia	●	●●	●●	●●	●●	●●	●	●	●●	★	●●	●●
Austria	●	●	●●	●	●	●●	★	●●	●	●	●●	●●
Belgium	●●	○	●	●	●●	●●	★	★	●●	●●	●	●●
Brazil	○	●	○	○		●	○	●	○	○	○	○
Canada	●●	●	●●	●●	●●	●●	●	●●	★	●●	●●	●
Chile	○	○	○	●	○		●●	●●	●	○	○	●
China	○		○	○	●●	●	○	○	○			○
Colombia	○	○	○	●			●●	●●		○		○
Czech Republic	●	●●	★	○	●	●	●	●●	○	●●	●●	●●
Denmark	★	●●	●●	★	●	★	●●	●	●●	●	●●	★
Egypt	○	●	○	○			●	●●				●
Estonia	●	●	●	●	●		●●	●●	●●	●●	●	●
Finland	●●	★	●●	●●	★	●	●●	●	●●	★	★	●●
France	●●	●	●	●●	●	★	●	●	●	●●	●●	●●
Germany	●●	●	●	●●	★	●●	●	●	●	★	★	●●
Greece	●	●	●	●	●	○	●	●●	●	○	●	●
Hungary	●	○	●	●	●●	●	●●	●●	●	●	●	●
Iceland	●●	●●	★	●	★	●	★	★	●	●	○	★
India	○		○	○		●	○	●●				○
Indonesia	○		○	○			★	★	○	○		○
Ireland	●	●●	●	●	●	★	●●	●●	●●	●●	●●	●●
Israel	●	●	●●	●●	●●	★	●	●	★	○	●●	●
Italy	●	●	●	●	○	●	●	○	○	●	●	●
Japan	●●	★	○	●●	●	●●	○	○	★	★	●	○
Korea	★	★	●	★	●●	★	○	○	●●	●●	●	○
Luxembourg	●●	●●	★	●●	○	○	★	★	●●	●		★
Mexico	○	○	○	○	○	●	●	●●	○	○	○	○
Netherlands	★	●	●●	★	★	●●	●●	●	●	●●	●	●●
New Zealand	●●	●●	●●	●●	●●	●	●●	●	★	★	●●	●
Norway	★	★	●●	●●	●●	●	●●	●	●●	●	●	●●
Poland	○	●●	●●	○	●	●	○	●●	●	●	○	●
Portugal	●	●●	○	●	○	●	●●	●●	○	●	●●	○
Russian Federation	○		●	●	●●	○	○	●	★	●		●●
Slovak Republic	○	●	●	○	●		●●	★	●	●	●●	●
Slovenia	●	●	★	●	★	●	●	●	●	●●	●●	●●
South Africa	○		○	○	●	●	●	●	○			○
Spain	●	●	●	●	●●	●●	●	●	●	●	●	●
Sweden	●●	★	●●	●●	●●	○	●●	●	●●	●	★	★
Switzerland	★	●●	★	●●	●●	●●	★	★	●●	●●	★	★
Turkey	○	○	○	○	●●	○	○	○	○	○	○	○
United Kingdom	●●	●●	●	★	●	●●	●	●●	●●	●●	★	●
United States	●●	●●	●●	★	●	●●	○	○	★	●●	●	●●

Source: OECD (2012), "Synthetic table", in OECD Science, Technology and Industry Outlook 2012, OECD Publishing.

ANNEX 6. “Interview”

Cuestionario para los jefes de ActualTec Innovación Tecnológica, S.L. sobre el proceso de adquisición de la información y realización de los productos, por lo que concierne la innovación en ámbito médico.

1. ¿Cuál es la estructura de la empresa?
2. ¿Cuáles son sus proveedores?
3. ¿De donde sacan la información sobre los clientes? (Instituciones, ferias, industrias?)
4. ¿Como funciona y cuáles son las características del departamento de I+D?
5. ¿De donde sacan la idea para la creación de los productos?
6. ¿Cuál es el método para definir los precios de los productos?
7. ¿Cuál es el proceso de selección y aprobación de las ideas que se convertirán en productos?
8. ¿Cómo explotan las ideas?
9. ¿Hacen algún test antes de lanzar los productos?
10. ¿Cuanto tiempo necesitan para crear o mejorar un producto?
11. ¿Cuáles son las operaciones de marketing de la empresa?
12. ¿Cuáles son los canales de distribución de la empresa?
13. ¿Su empresa es innovadora desde el punto de vista de la organización?
14. Su empresa está localizada en Espaitec. ¿Cuáles son los beneficios de pertenecer al Parque Tecnológico?
15. ¿En cuáles aspectos su empresa es innovadora? Producto, proceso, marketing u organización?
16. ¿En qué sentido aportan innovación en el ámbito médico?
17. ¿Cuáles son los proyectos para el futuro?

Muchas gracias por la colaboración.

Cordiales saludos.

Beatrice Venturoni