FACULTY OF LEGAL AND ECONOMIC SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION AND MARKETING

INNOVATION CAPABILITIES AUDIT AS A PRELIMINAR STAGE TO IMPLEMENT AN INNOVATION MANAGEMENT SYSTEM: THE MACER S.L. CASE

Beatriz Chust Carmona

Tutor: María Luisa Flor Peris

BACHELOR'S DEGREE IN BUSINESS ADMINISTRATION

2014/2015

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to Ramiro Bonaque, head of the R&D department at Macer, S.L. Needles to say that without his personal support, it would not have been possible to obtain all the necessary information about the company and its activities on the R&D area.

Table of contents

List of tables and figures

Tables

Figures

1. Introduction

In today's world, companies need to innovate as a way to stay ahead of the market and be more competitive. An innovative company is the one that is able to change substantially what it produces (products), the way it produces (processes), its strategic marketing (market) and its organizational structure (models) (Oslo Manual, 2005; Garcia, 2009). Technological innovation is therefore a key factor for the survival, competitiveness and excellence of companies (Mir, 2012).

An innovation management system may help to achieve the objectives of improving competitiveness in companies, because it can help to achieve a consensus on the best ways to deal with innovation processes, and therefore business uncertainty is reduced (González, J. M., 2013)

During the last years innovation management systems have begun to appear (Mir and Casadesús, 2011). These innovation management systems have been evolving constantly and there is not a single reference system.

Several authors and institutions have made proposals on the management of technological innovation and its activities, but unlike what happens in the field of quality, it does not exist a consensus on the methodology. Therefore, for managers it is a challenge to provide the firm with some tools which help them to improve their innovative capabilities in a systematised way, since they move in a field in which there is not a great experience (Gurutze and Velasco, 2010). Hence, the interest of this work lies in the fact that systematization of innovation management has in order to ensure greater success in obtaining innovative results.

The objective of this work is to review the different proposals of technological innovation models, highlighting similarities and differences to facilitate the task of decision-making in the implementation of one of them. And also, help to identify improvement areas to increase the innovation capacity of a particular company, which can be determined by applying an audit to know which is their actual innovation capacity. With this analysis, we hope to contribute to an improvement of the competitiveness of the company in the long term through technological innovation.

To do so, this work is structured as follows. First we will describe the process of technological innovation proposals on the innovative technological process. We will also

review the management of technological innovation and the main technological innovation models proposed in the last few years. Following there is a framework for the evaluation of the technological innovation, since the initial diagnosis of the capacity of innovation is an important feature when implementing a system of management in innovation, which will be useful for the firm when it decides the implementation of an innovation system.

In the second part of the work, we present the questionnaire of the capability on the innovation management of a firm is applied to identify the areas in which the firm can improve and as a preliminary stage to implement an innovation management system. The firm study case is Macer, S.L., located in Almazora (Castellon). It is a firm whose main activity is the manufacturing of moulds for ceramic tiles. Macer. S.L: operates different innovation activities and obtains positive results of his innovation activity. But the firm has not already implemented a system of technological innovation. So, following the questionnaire, we identify the improvement areas which could result a useful resource when making future decision on improving the innovation activities.

2. The innovation process

The process of technological innovation is defined as the set of technical, industrial and commercial stages which lead to a successful launch in the market of new products and services or to the commercial use of new technical processes (Escorsa and Valls, 2004). It is a process which describes a complex activity, diversified, with several components interacting, which work as sources of new ideas, and it is very difficult to anticipate the consequences that a novelty may have (Escorsa and Valls, 2004).

Several authors have proposed model in the process of technological innovation, which try to define the process. There is not a single model. Each organization may take as a reference the one which fits them, but there is an evolution and the last models have corrected errors of the preceding models, although Escorsa y Valls (2004) claim that there are some deficiencies and questions to be solve in some of them.

Roy Rotwell has been a key researcher in the field of management of technological innovation (Tidd and Besssant, 2009). In his article "Towards the fifth generation innovation process" published in 1994, he established his theory about the evolution of the innovation models. Rothwell (1994) identified five generation in the management of the innovation from the 50s up to today. In each generation we can identify differents models in the process of innovation (Mir, 2012).

Table 1 shows the five models of innovation, the period which comprises each generation and a briefing of their main characteristics.

Table 1: Generations of innovation

GENERATIONS	YEARS	DESCRIPTION
First	From 1950 to mid-60s	"Technology push" or drive model (Technology push), demand allowed industrial expansion. It is represented by a sequential and orderly model
Second	From the 60s to beginning of the 70s	"Demand pull" model or the market (Market pull), market shares prompted companies to develop an approach to meet them. The needs of customers are now the fundamental role. Phases of the process may vary, and it begins to show the feedback.
Third	From mid-70 s to mid-80s	Examples: Model of Marquis, Model of Kline. Interaction between the technological capabilities and the needs of the market. Marketing, and I D started a close cooperation through structured processes and cost reduction. They highlight the importance of feedback retroactive processes.
Forth	From the 80s to mid 90s	Models based primarily on the process of innovation of the third generation, but adding other factors. Integrated processes of business where the strategy seems to begin focusing on the reduction in time. It resulted in the creation strong links suppliers and customers.
Fifth	From the 90s to the first decade in 2000	Models in which attention was focused in the integration of systems and networks with the purpose of rational resources, ensuring flexibility and improving the speed of development.

Source: Adaption from Mir (2012)

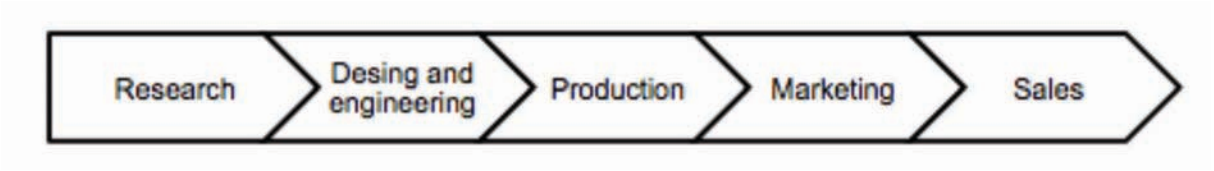
1. First generation (Technology Push Model)

The first generation covers the period of 1950 and the mid-1960s. The rapid economic growth led to a demand that allowed a strong technological thrust and industrial expansion. Companies focused mainly on scientific advances (Mir, 2012).

It envisages the development of the innovation process through the opportunities which are presented by going from science to technology and it is represented by a sequential and

orderly process known as the linear model or push of technology (Figure 1). Its main feature is its linearity, which involves a staggered progressive, sequential and orderly process, from scientific discovery to applied research, technology development, manufacturing and the launch of the novelty (Arzola et al, 2012).

Figure 1: Technology push

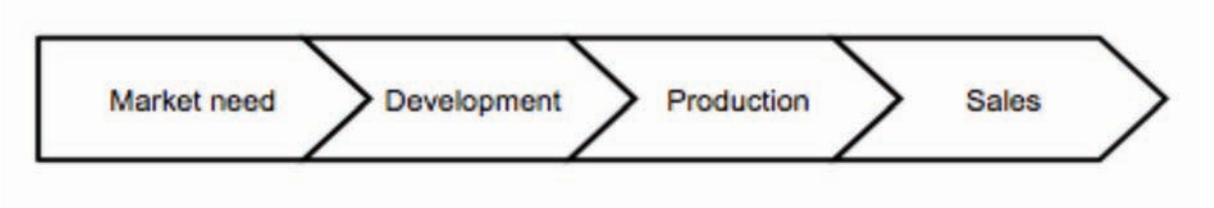


Source: Arzola et al (2012)

2. Second-generation (Market Pull Model)

The second generation covers the period going from the 60s to early 70s. It is characterized by market shares, a battle that led companies to change their approach to development to meet the needs of the market. It formed strong connections between the R&D and operational units through the inclusion, in teams of product engineers, of research scientists in order to reduce timing in market (Mir, 2012). In accordance with the Market Pull model based on the demand of the market or the needs of the customers what becomes the main source of ideas to trigger the innovative process (Figure 2).

Figure 2: Market pull



Source: Arzola et al (2012)

Both the first and second generation are considered linear. Linear models are extremely useful to understand the process of innovation in a simplified and rational way. However, these models have serious deficiencies. In some cases, in order to develop certain products or services, certain phases are not necessary for the process and in others, the sequence

may be different. On the other hand, in the process of innovation so many feedback processes arise that the notion of phases or stages could almost be rejected. It makes more sense to think of a highly interactive process (Arzola et 2012). Thus, giving way to the new generations who have evolved after.

3. Third generation, Marquis Model and Kline Model

The third generation comprises from mid-70s to mid-1980s. The models in that stage are to be considered by the companies as a best practice. New investigations result in models which emphasize the interaction between technological capabilities on the one hand, and the needs of the market, on the other (Arzola et 2012).

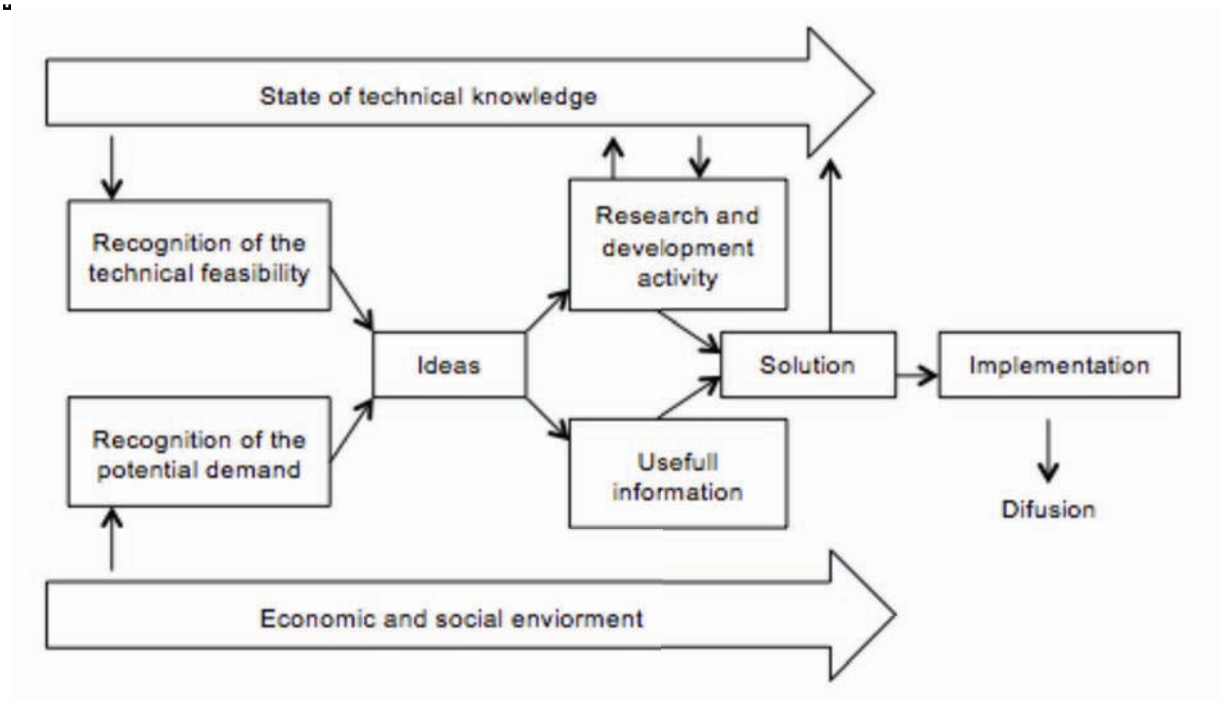
R & D and marketing began a close collaboration for innovation through structured processes, along with the reduction of operational costs (Mir, 2012).

The model of Marquis, and Kline are highlighted (Arzola et 2012). Both models emphasize the importance of the feedback processes that are generated between the different phases of innovation.

3.1 Model of Marquis

In the Marquis model (1969) innovations often start from an idea about a new or a better product or production process. They do not necessarily come from research, but they can emanate from any department involved. The essential requirements are: the technical feasibility and the potential demand. From the idea the process will be running, which will examine the possibilities of the current technology and, if these are insufficient, "backward" to basic or applied research (Figure 3). Ultimately, the sequence of innovation is now as follows: it starts with the formulation of the idea, passes by the investigation and the obtaining of the solution and concludes with the implementation and dissemination (Escorsa and Valls, 2004).

Figure 3. Marquis Model

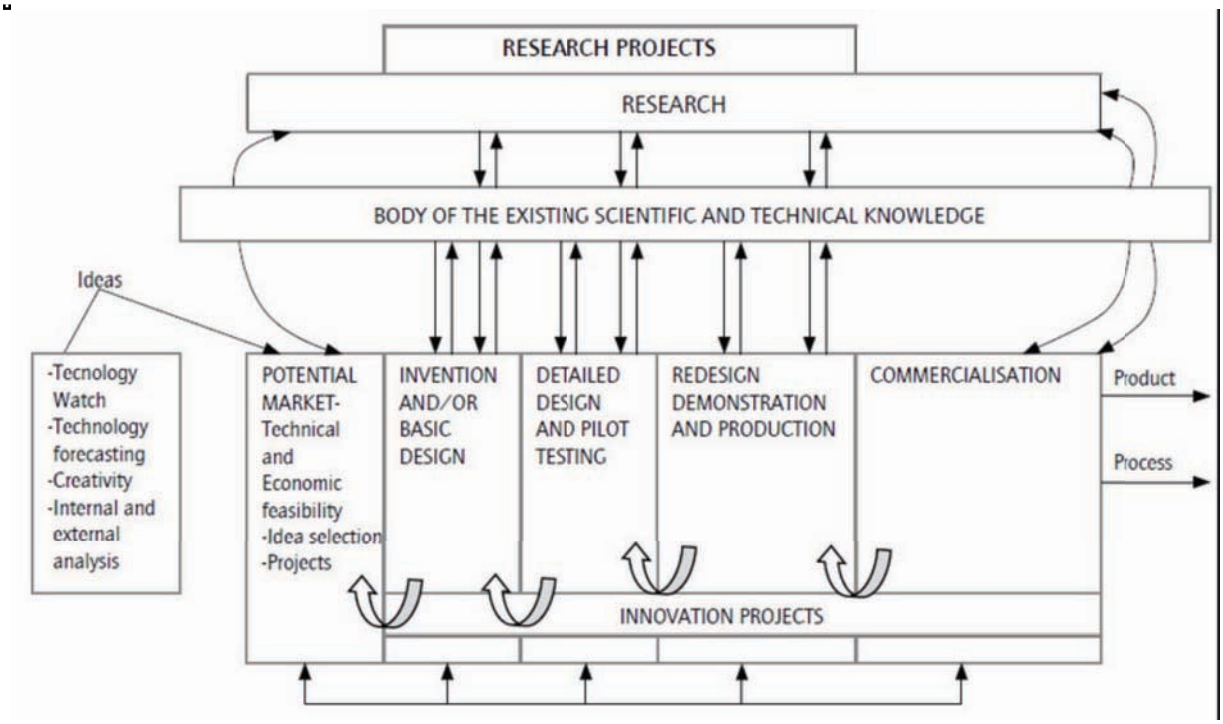


Source: Escorsa & Valls (2008)

3.2 Kline model

The model of Kline (1985) criticizes the linear model and proposes a model that better reflects the complexity of the innovative process (Escorsa and Valls, 2004). It is knows as links in chain or chain-link model. It is characterized by three links: in the first link – called central road of innovation, the process of technological innovation occurs, which is enabled following the needs of the market, realization of the idea, prototype design, production and which ends with the product or service introduced in the market. The second link is the expertise to develop each of the five phases of the first link. Finally, the third link represents the research or knowledge generation not available, which is required to support the realization of the needs to marketing a product or service (Arzola et al, 2012).

Figure 4: Kline Model



Source: Escorsa & Valls (2008)

Instead of having a single master course of activity as the linear model, it has five ways or paths (Escorsa and Valls, 2008; Arzola et al, 2012):

1) The main path begins with the idea that is materialized in an invention or analytical design that has to respond to a market need.
2) Feedback between the central and the previous stage.
3) The connection with research through the use of existing knowledge.
4) The connection between research and innovation.
5) There are direct connections between products and innovation.

Another characteristic aspect of this model represented by arrows of feedback between each one of the stages of the innovation process, since it is where there is evidence of the exchange of information, and an adjustment in the design of the product is developed (Arzola et al, 2012).

One last feature is that in order to develop each of the stages in the process expertise is required. The stages are presented in two options: they can already exist, in this case the

company must activate mechanisms to acquire them, or they should be generated through research (third link). This condition incorporates risk and uncertainty (Arzola et al, 2012).

4. Fourth generation

This generation covers the period from mid-80s to the mid-1990s and includes models based primarily on the process of innovation of the third generation, but adding other factors (Mir and Casadesús, 2011).

They are known as integrated business processes in which the strategy seems to begin to focus on the reduction of development times. Attention seemed to focus on the integrated processes and to work in parallel processes, together with a technology strategy, a greater use of information technologies, a greater vision with global strategy and strategic alliances. It also seems that externally strong linkages are established with suppliers and their main customers (Mir, 2012).

5. Fifth generation

It covers the period of the 1990s until the first decade of 2000. Attention was focused on the integration of systems and networks in order to rationalize resources, flexibility and to improve the speed of the development.

Innovation is now recognized as the critical factor of a wide range of activities that influence the success of the business (Mir and Casadesús, 2011). Business processes were automated through the planning of enterprise resources (planning ERP). Externally, the focus was on strategic advanced configuration partnerships, for marketing, collaboration and research agreements based on open innovation, in which the added value of the product or service perceived by the customer was focussed in quality and other non-price factors.

The fifth generation is related to the concept of open innovation. This concept was popularised by Chesbrough. In terms of open innovation Chesbrough, (2012) says that currently, the really valuable knowledge is disseminated, in such a way that no company has the monopoly on great ideas. Today, it is necessary that they are integrated in networks and communities of knowledge, using every day ideas and external technologies and integrating

them into their own activity as a daily practice. On the other hand, ideas or technologies developed internally in the company and that were not used can be turn into profitable by externally licensing them to other companies and organizations."

From a review of the models described in the five generations, it can be seen as the first models proposed are based on following a linearity, where one phase leads to another, and this process can be extended for a long time. Besides It can be seen that the new models have gradually been completed and correcting errors of the previous models, such as that there was no feedback. This conception is critical during the process of innovation, because has been demonstrated the importance of correcting the errors from the initial stages, and that all stages are highly involved in the process of innovation. The model of Kline, referenced in the Oslo Manual (2005), can be regarded as the most complete model, and has served as a support for the constitution of models of innovation management as the standard UNE 2006.

In general terms, all the models can be useful for the improvement of the innovation in the company, they have common characteristics, as that they have been pass through all levels and activities in the organization, as well as the implication of the managing direction and the important connection with the environment. Although the first one, which despite its usefulness to perform an identification of the stages of a complex process to an easiest way to understand, it is the least suited to the current reality of a company.

3. The management of the technological innovation

Since innovation is not the result of an accident, but the result of a process and a methodology, the innovation management becomes an instrument of first magnitude enabling to contribute substantially to the success and development of the company, and, in general, any organization (Arzola et 2012).

Innovation management refers to the process to organize and direct the resources available, both human and technical, and economic, with the aim of increasing the creation of new knowledge, generating ideas, enabling new products, processes and services or improving existing ones, and transfer those same ideas generated to the stages of manufacturing and marketing (Pavon and Hidalgo,1997).

Technological innovation managers need to know about general characteristics of the own technological innovation, as well as the context in which it occurs (Dogdson et al 2008).

Although each author proposes a different innovation management system, common denominators can be extracted in this process of managing technological innovation (Escorsa and Valls, 2008; Hidalgo et al, 2002; Morin and Seurat, 1998; Tidd and Bessant, 2009), which are:

1. Having a reference model.
2. Assessing the own technological potential.
3. Specifying and designing a technology innovation strategy.
4. Increasing or enhancing the technological potential.
5. Implementing the stages of development of the new product.
6. Scanning and protecting.

1. Having a reference model.

A model of reference for the management of innovation is required along with the characterization of a set of stages that specify the requirements of the process of technological innovation. On the other hand, it also requires the application of a set of tools

or techniques enabling to have control over the activities or functions required and, at the same time, to acquire experiences that can be exploited in future situations (Hidalgo et al, 2002).

2. Assessing the own technological potential.

Evaluation of the technological potential is the first step to ensure that the company can meet new development strategies and it is based on analysing their ability to mobilize their technological resources towards the needs of the market, taking into account its main competitors.

The evaluation of the degree of mastery of the technologies considered as critical should be conducted by personnel of the company and, if necessary, by experts. In the evaluation will influence the estimate of their level of experience, the quality and variety of the relations that they maintained with other experts, the efficiency of the equipment and information systems available, R & D expenditures and the number of patents obtained. (Hidalgo et al, 2002).

3 Specifying and designing a technology innovation strategy.

Technological innovation strategy identifies technologies and markets that the company should develop and exploit to create and capture value as much as it can. Does so within the limits of available resources of the company, to support the current efforts of innovation and future and their evolution corporate strategy, organization and culture.

Of all aspects of the management of technological innovation, the determination of the strategy of technological innovation is the most challenging. Companies can be very good in various activities included in the management of technological innovation, but this can tell very little unless it relies on a strategy of well-grounded innovation that guides business options, prioritizations and sequences (Dogdson et al, 2008)

4. Increasing or enhancing the technological potential.

It is impossible to generate all the necessary knowledge to achieve a in-house production in bigger quantities, of higher quality and more competitive goods (Escorsa and Valls, 2008).

Technological enrichment is not to develop all the resources internally, but let the company know how, where, and when to get these resources from external sources, as well as to build a network of external resources that are complementary (Hidalgo et al, 2002). Among the options available to the company are the acquisition of technology and cooperation.

In the event that you opt for the acquisition of technology directly available to a third party, it should be taken into account that its adaptation to the context and the needs of the company will be needed in any case. Normally this acquisition takes place in pure form (licensing or patent) or by the built-in form, implying also carry out a preliminary analysis in order to establish the most appropriate sources of origin (Hidalgo et al, 2002). The interest of the recipient company is to obtain quickly a technology that allows to improve their processes from the production or manufacturing new products and thus obtaining higher benefits. (Escorsa and Valls, 2008)

On the other hand, finding partnerships and alliances are nothing new. What is new is that in recent years higher levels of complexity in R & D have reached an international dimension. (Escorsa and Valls, 2008)

5. Implementing the stages of new products development

Implantation and development of the necessary activities plays a relevant role for new product to reach the market. Effective management of this process requires, in addition, a close interaction between the different activities that make up the product development (research, design, prototype, engineering, manufacturing, quality control, marketing, etc.) and which are characterized by a different work culture manifested mainly in the different experience and qualification of the team, which accounts for different scales of time and different pressures of support (Hidalgo et al, 2002).

6. Scanning and protecting

The company must be alert, not only to be able to fight back quickly to changes, but also to take advantage of the new opportunities which arise constantly. In addition, the entrepreneur should avoid trying to invent what has already been invented, since the cost of ignorance is very high. (Escorsa and Valls, 2008)

In order to face the challenge of information quickly enough and properly, it is recommended

to use some tools such as, for example, technology maps. These technology maps are visual representations of the state of the technology in a particular area and graphically present technologies that they have researched, published and patented over a period of time completed. Another tool can be, for example, Benchmarking, by which examples of good practice are selected and then compared. Another tool is technology foresight, which serves to understand and explain the evolution of technology and anticipate the negative effects it produce on their activity. (Hidalgo et al, 2002).

Companies must also protect their innovations in order to preserve the benefits of their efforts. If it is considered the high cost usually associated with the development of new products and the result of innovative activity, companies would not be willing to assume them if they cannot grant them some privileges that allow to exploit them exclusively accordingly to the assumed risk allowance. (Hidalgo et al, 2002).One possibility to do so is through industrial property. Industrial property, which includes patents, is a tool that facilitates the protection and management of the rights that can be applied to the products obtained as a result of the technological innovation process. In addition to industrial property, companies can also use the management of skills which is a tool that allows to store the knowledge accumulated by professionals, guaranteeing the access to this heritage and spread it with an objective that is shared by all members of the organization. (Hidalgo et al, 2002).

4. Models for management of technological innovation

Several authors and institutions, in the academic field and in the business corporate world and consulting firms have made proposals on the management of the innovation and the activities related to it. (Intxaurburu and Velasco, 2010)

The benefits of having a model of innovation management are manifold; among them, Mir and Casadesús (2011) include:

- It helps in the decisions dealing with the allocation of investment and the start of innovation.
- It allows to optimise planning, documenting, managing and monitoring of innovation projects.
- It strengthens the culture of innovation in the organization.
- It facilitates the use of know-how in the company.
- It allows a standardization of the formats used.
- It accomplishes with other standards such as the ISO.
- It promotes the image of the company and acts as a seal of excellence that can be advertise.
- It can be helpful to receive funding subsidies for innovation projects, since companies with certification usually obtain higher assessments.

In recent years some standardized models of innovation management have appeared. Many of them are derived from or related to models originated in the field of quality management, which have been developed previously[1]. These models of innovation management offer standards or lines of action for the Organization hoping to enhance their innovative capacity or to improve its management system (Mir and Casadesús, 2011).

These models of management of innovation have been constantly evolving and there is no single model of reference in the present. Intxaurburu and Velasco state that they can be

[1] In 1989 the International Organisation for Standardisation (ISO) published a first version of the ISO

divided among those more focused to establish protocols, patterns or guides to manage innovation (called prognosis models) and those which have as their objective the creation of a simple and useful tool that enables firms to conduct their diagnosis or audit its capacity for innovation management (called diagnosis models). In addition, these models may have a public source, which are all those initiatives that have had some type of public funding, or private, which are those which have received private funds.

The following initiatives can be highlighted: CIDEM (Centre for Business Innovation and Development) Model. Innovation framework by the Club of Excellence in Management (CEG), the model of the Andalusian Institute of Technology (IAT), Standard CEN/TS 16555 and the Standard UNE 166002.

Table two represents these models and the criteria above mentioned.

Table 2 Innovation Management models classified by criteria

Criteria	**Public**	**Private**
Prognosis		Standard CEN/TS 16555 Standard UNE 166002
Diagnosis	CIDEM Model IAT Model	Innovation framework by the Club of Excellence in Management

Source: Own elaboration

CIDEM and IAT models above-mentioned represent the two public models of diagnosis. On the other hand, the Reference Framework for Innovation, develop by the Club of Excellence in Management represents a private model of diagnosis; the Standard CEN/TS 16555 and the UNE 166002 which are private models of prognosis.

4.1. CIDEM Model

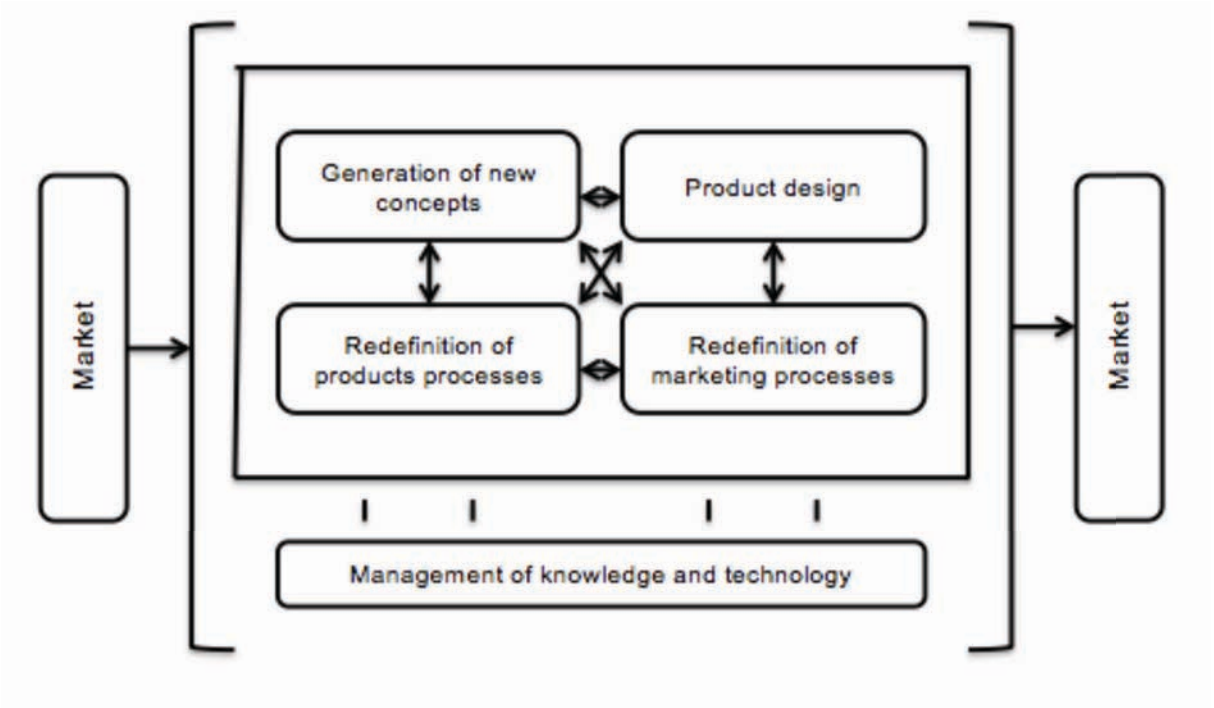
The Centre for Business Innovation and Development (CIDEM)[2], developed this model with the objective to serve as a tool for small and medium-sized industrial enterprises (SMEs)in 2002 in order to begin a self-assessment on their ability to innovate. This model is intended to be a first step. It does not intend to get answers, but companies may raise essential questions to increase its innovation capability (Terre, 2002).

The model is based on an analysis of the value chain of the company processes, identifying innovation as a strategic process of the company. It includes five main variables. The main processes are:

- The generation of new concepts: the company identifies new concepts for products and services and thus anticipates the needs of the client by analysing market trends and successes of their competitors.
- The development of new products:how the company is concerned to define their production processes in order to achieve greater flexibility and/or productivity, quality and/or lower costs.
- Redefinition of productive processes: how the company is structured to move from the idea to the launch a new product or service. It includes specifications, assembling and manufacturing, distribution and after-sales service.
- New business processes: how to apply the new information technologies.
- Knowledge Management : it is also called facilitator, as that it acts simultaneously with the four previous activities. It is a matter of how the company decides what technology they want to develop internally, which incorporates outsourcing projects R&D, by being in contact with universities, buying patents, among others, and how to follow the evolution of the technologies that will affect their products or services in the future.

[2] Centre of Innovation and Development of the Generalitat de Catalunya in 2002.

Figure 5 Processes which constitute the CIDEM innovation process model



Source CIDEM , 2002

4.2. Reference Innovation Framework

The frame of reference of the Innovation model was developed jointly by the Club of Exellence in Management (CEG) and COTEC. It has as a main objective to enable organizations measure the state of its innovative capacity, then compare to other organizations and design plans to increase it (CEG, 2006).

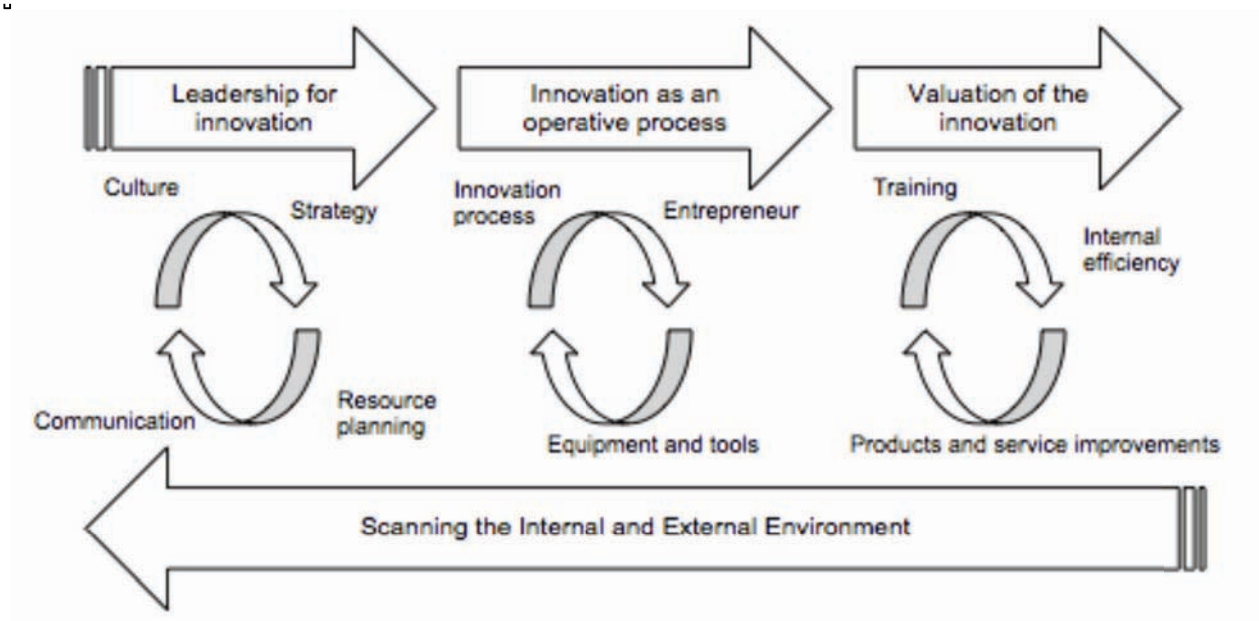
The Frame of reference is composed of four basic criteria for the organization from which the innovation is managed:

- Leadership for Innovation.
- Innovation as an operative process.
- Valuation of the innovation.
- Scanning the Internal and External Environment

The criterion of leadership for innovation reflects that the top management must encourage innovation. In order to do so and integrate it, leaders must ensure that innovation is a natural part of the organization. The criterion of innovation as an operating process gathers all those internal factors of the organization involved in the innovation cycle, as well as the own innovation process. The valuation criterion focuses on the results of the innovation process. Finally, the monitoring of the internal and external environment should be carried out paying attention to the detection of needs and opportunities for improvement in the operational processes and in their own products and services offered (CEG, 2006).

The first three criteria are sequential and respond chronologically to the planning, execution, and finally to the tangible results of the innovation. Transversally, the Framework incorporates the scanning of the internal and external environment as an important area for Innovation, understanding surveillance as the continued exploration of the environment to identify all the opportunities it can offer (Figure 6).

Figure 6: Framework of the Club for Excellence in Management



Source: Club of Excellence in Management (2006)

Each criterion includes a comprehensive definition of the same and a set of sub-criteria that indicates the most important aspects to evaluate innovation in an organization.

The content from each of the sub-criteria is structured in: features, facilitator aspects, barriers and indicators and measurement purposes. Features provide the keys, rules or basic facts of the analysed area. Taking into account these characteristics, facilitating aspects indicate what you need to take care of and to align goals, along with the barriers inhibiting aspects of innovation. Finally, indicators and the purpose of the measurement indicate what to quantify, and why, in order to learn the situation of the innovation management system.

Three ideas that underlie the framework of reference of innovation are (CEG, 2006):

- Innovation is a permanent, and therefore cyclical change
- Innovation allows the sustainability of growth
- Innovation requires clear leadership

Monitoring and continuous improvement are reflected in the framework of innovation through the cycle APCD. This monitoring and improvement should be taken into account in each of the criteria and sub-criteria. This APCD cycle consists of four phases (CEG, 2006):

- Plan: includes the development of the necessary plans to carry out any action. It's that determination results you want to obtain.
- Deploy: involves implanting systematically the established plan, collecting all of the data that allow to know if the plan has been designed properly.
- Check: all data are studied to analyse the results obtained. If differences are found when comparing them the causes should be found out to learn from mistakes.
- Act: it involves the standardization of actions if they mean an improvement, but again the APCD cycle must be started.

These four phases allow to analyse processes, projects, activities, etc. that are wished to carry out through a simple and effective system.

4.3. IAT Model

The model of the Andalusian Institute of Technology (IAT)[3] presented a framework of reference for organizations in 2009, which have innovation as a key process in their activity to increase their competitiveness, efficiency and capacity for progress (Baena et al, 2008).

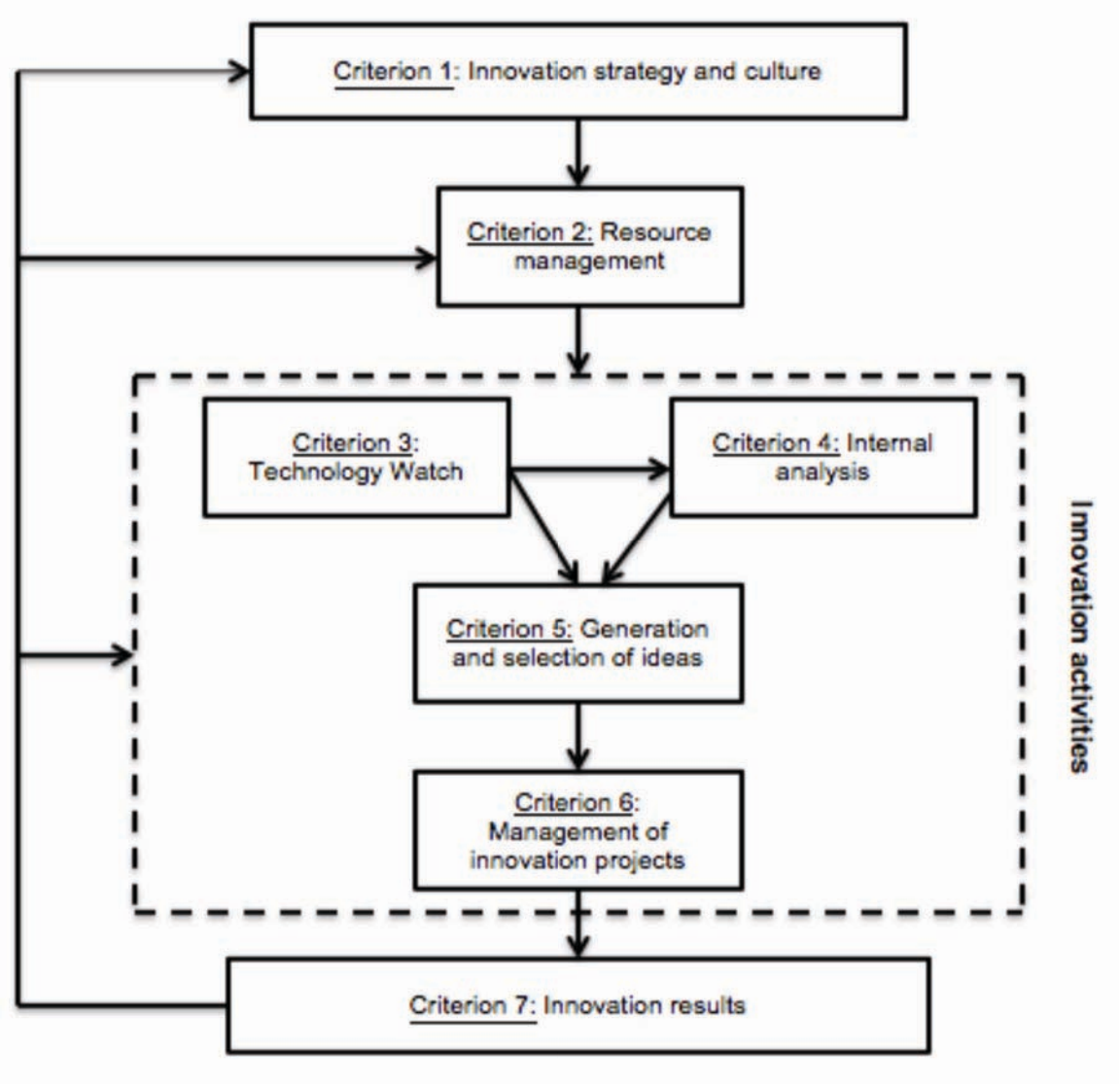
The model is composed of seven criteria:

1. Innovation strategy and culture
2. Resource management
3. Technology watch
4. Internal analysis
5. Generation and selection of ideas
6. Management of innovation projects
7. Innovation results

The structure of the model is represented graphically below (Figure 7). Each of these criteria are composed of two or three sub-criteria, which include at the same time a relation between elements that need to be considered by the organization, as a guide in addressing one evaluation. The first criteria are based on the need to acquire a culture of innovation for the organization, in the following criteria are included the environment and the necessary tools and equipment to carry out the activities, called activities of innovation, and that relate to what the organization does in the field of innovation and the resources allocated to it. The last criterion refers to the results generated with these activities that give rise to the development or improvement of new products, processes or services and generate value in the organization that has an impact on their strategy and culture. In this way, it expresses the cyclical nature of the model. (Baena et al, 2008).

3 IAT: Institute Andalusian of Technology, whose part of the Andalusian Centre for Excellence in Management published this framework in his 2009 guide.

Figure 7: Structure of the model for the management of innovation from the IAT



Source: Baena et al (2009)

4.4. Standard CEN/TS 16555

In 2013, was published the European standard of management of innovation called the Standard CEN/TS 16555-1:2013, as a result of the work carried out by the European Committee of Normalisation[4]. This European standard proposes to organizations of all sizes and sectors a suitable way of managing its innovation activities and how demonstrate a good management in this field with a standard integrated with other well-established models of management. The document is a practical guide, which allows the organizations to identify and to promote the factors which trigger innovation. It also develops the processes for its correct management and tips on how to evaluate and improve the efficiency of the system of management of innovation (González, J. M. 2013)

By means of the application of this document, the organizations can increase its awareness of the value of an IMS (Innovation Management System), then they can establish this system, extend its innovative capacity and, ultimately, generate more value for the organization (AENOR, 2013).

The chapters that there includes this European norm of management of innovation are:

1. Leadership for the innovation.
2. Planning for the success of the innovation.
3. Factors that facilitate the innovation.
4. Process of innovation management.
5. Evaluation of the operating of the innovation management system.
6. Progress of the innovation management system.

4 CEN stands for the European Committee for Standardization which is the organization that brings together the national norms for Standardization of 33 European countries.

4.5. Standard UNE 166002

In 2002, AENOR[5] published the first version of the series of standard UNE 166000, related to the management, audit and implementation of systems of management of R & D activities. The standard 166002:2014 management of R & D requirements system, which is the actual standard version that describes how the elements of strategic, operational and results measurement influence in the success in the management of innovation in organizations.

The legislation makes use of the ISO 9000 format standards and expresses support in the management of quality, environment and innovation systems. It is made so that it can be used by both internal and external parties to the Organization, including certification bodies, in order to assess the Organization's capacity to meet the requirements of the R & D management system and their own organization. Among its features: the strategic importance of the innovation process, responsibility for the address, the organizational structure of support, generic tools of management, resources, measurement and improvement of system actions (Arzola et al, 2012).

The chapters which constitute the norm UNE 166002:2014 are 10:

- Chapter 1 specifies the object and field of application.
- Chapters 2 and 3 refer to the norms of consulting, terms and definitions.
- Chapter 4 defines the environment of the organization and its context, needs, and expectations of the parts involved and the innovation management system.
- Chapter 5 deals with leadership which encompassed all the areas engaged within the innovation ideas, and strategy, policy, leadership and commitment from the board of managers, promotion of a culture of innovation, roles, responsibilities and organization authorities.
- Chapter 6 deals with planning, risks, opportunities and objectives of the innovation and its specific plans to get them.

5 AENOR: Spanish Association of Standardisation and Certification, a private and non-profit entity created in 1986.

- Chapter 7 is about the support to innovation, in which we find the organisation of roles and responsibilities, resources, competences, awareness, communication, documentation, intellectual and industrial property and management of the knowledge, collaboration, technological surveillance and competitive intelligence.
- Chapter 8 makes reference to the innovation operating processes, general points, management of ideas, development of the innovation projects, protection and exploitation of the results, launching in the market and results of the operative RDI processes.
- Chapter 9 is about evaluation in the performance of the innovation management system, its follow-up, measure, analysis and evaluation, internal audit and revision by the board of managers.
- Chapter 10 refers to the improvement in the performance of the innovation management system, with the idea of the constant improvements.
-

4.6. A comparison of the models of innovation management

The following table (Table 3) sums up the main characteristics of the mentioned models, and allows to emphasize better its similarities and differences.

Table 3: innovation management models

MODEL	YEAR	DESCRIPTION	ESTRUCTURE
CIDEM Model	2002	Published by CIDEM. It aims to help companies raise essential questions to increase their innovative capacity and thus serving as a tool to start a self-assessment.	1. Generation of new concepts 2. Development of new products 3. Redefinition of products processes 4. New business processes 5. Management of knowledge and technologies
Reference Innovation Framework	2006	Published COTEC. It is the innovation framework which enables organizations to measure their innovative capacities, compared with other organizations and to design plans to increase it.	1.Leadership for the innovation 2. The Innovation as operative process 3. Valuation of the Innovation 4. Awareness of the internal and external environment .

IAT Model	2009	Published by the IAT represents a reference framework for companies which are aware of the importance of innovation as an outstanding feature in their activities which allow to improve competitiveness, efficiency and ability to progress.	1. Strategy and culture of innovation. 2. Management of the resources. 3. Environment surveillance. 4. Internal analysis. 5. Generation and selection of ideas. 6. Management of the projects of innovation. 7. Results of the innovation.
Standard CEN/TS 16555	2013	Published by the CEN/TS 389. It is a European standard used as a practice guide to firms of all sizes and sectors and tell them how to perform an excellent management in the field of innovation.	1. Leadership in the innovation 2. Planning for a success in innovation 3. Factors enabling innovation 4. Process in the management of innovation 5. Evaluation of the working order of the system in the management of innovation. 6. Improvement in the system of management of innovation.
Standard UNE 166002:2014	2014	Norms published by AENOR, belonging to the set of norms UNE 166000 related to the management, audit and implementation of management systems based on R&D activities.	1. Leadership 2. Planning 3. Support the R&D&I 4. Executive processes of R&D 5. Evaluation of the performance of the management system in R&D 6. Improvement of the management system in R&D

Source: Own elaboration

In the review of these 5 models of innovation management we can observe that they share similar features. They are structured in criteria that are based on the culture or leadership in the organization; also identify the factors or resources of the company which facilitate innovation (human resources, infrastructure, design, control, shopping...). Then they highlight the operative process of innovation and activities, evaluate the performance and monitor the results. All these models are based on processes, which allow them to have better control over all processes of the organization and their interrelationships, and this helps the improvement.

The models of CEN/TS and UNE standards have a similar structure in the above criteria. In fact, in the last update of the UNE, the European Standard CEN/TS is taken into account. The structure of the model by CEM has different structure but affects the same areas of leadership, process, outcome and monitoring. In terms of goals, all models present the objective of implementing a model of innovation management in the company, however the CIDEM model does not intend to deploy it but was thought only to help the organization to make a self-assessment and identify what should be improved.

Additionally, they remark the importance of the audit along the process with the monitoring, analysis of data… to make sure that all the requirements are achieve and, if there are any deviations they should be corrected, this corrections would come into the area of improvement, that we can observe in some models, such as the standard CEN/TS or UNE. Also, some of the models include self-assessment questionnaires, (except the standard UNE and CEN/TS, that you could also say that are more normative and strict in their criteria). Due to the absence of a common standardization established, each company could choose to implement the model that best fits their organization.

5. Innovation audit in the context of implementation a innovation management systems.

A previous stage in the implementation of an innovation management system is the development of an innovation capacity audit.

An innovation capacity audit should be a clear identification of issues and the obstacles of innovation. It enables to a significantly improve of culture and process of innovation within the business. It should also lead to higher levels of motivation throughout the organisation, resulting in a more innovative, and entrepreneurial organisation that welcomes and initiates change. All of which leads to an ability to implement fresh ideas to generate revenue or reduce cost (Mobbs, 2011).

The diagnosis models presented in the previous section include an innovation capacity audit, since they include self-assessment questioners facilitating the implement of a innovation management systems. According to Mobbs (2011) a summary of the benefits of an innovation audit is as follows:

- It enhances the company's innovation capability.
- It identifies opportunities for increasing innovation.
- It clarifies where the organisation needs to focus to maximise innovation success.
- It embeds innovation in the company's processes.
- It can build on individuals' creativity to be innovative.
- It can identify and control the barriers that stifle creativity and innovation.
- It fosters innovation in the organisation's culture.
- It can align the organisation in common purpose and actions.

An assessment on the capability of innovation in the firm, means to be a first step to motivate an inside reflection. The aim is not so much to obtain the correct answers but to allow the firm to ask the essential questions in order to increase its innovation capability (CIDEM 2002).

Identifying the innovation capacities of the company, as a previous stage before the setting of a model of management of innovation. This will allow the firm to identify which areas or

processes are in need to introduce progress and/or changes to be adapted to the specifications needed in every criterion, and which accomplish already the requisites specified in these criteria. Departing from that point, a plan of actions can be created which will allow the firm to operate and improve the innovative profile of the organization.

In order to carry out this identification of capacities of innovation the firm can used a questionnaire. This questionnaire should include all the criteria and sub-criteria to be treated in the model of management of innovation (Gil et al , 2008).

The audit should be done by insiders or outsiders, insiders are likely to have an advantage in understanding the firm's resource availability and structural and cultural contexts and outsiders may provide more realistic assessment of the firm's strategic management capacity and its ability to understand the competitive and technological environments. The major disadvantage of using insiders is the possibility of a narrow or biased perspective. Outsiders, on the other hand, are more likely to misunderstand internal realities and deliver impractical recommendations (Burgelman, 2004).

6. Study case: Macer,S.L.

6.1. Methodology

For the second part of the work, we have used a methodology through the study of cases. The case study focuses on the analysis of a specific situation in depth to know and be able to understand and interpret the singularity of the study. This kind of analysis can combine quantitative and qualitative methodologies, and also a documental review. This is an empirical research that investigates a contemporary phenomenon within its real context, where the boundaries between the phenomenon and the context are not sometimes displayed accurately, and that use multiple sources of evidence. This implies the revision of archived document, economic data, previous statistics review, in addition to interviews, remarks, etc. (González et al, 2014). The case can be a company, or institution, a person or group of people, a program, an event, various materials and even documents, always defined in a time and place (Fondevila and Del Olmo, 2013)

In this work, we have selected as an object study a company. Our goal is to use a tool for evaluating the innovative capacity of a company. As we have indicated in section 5, the evaluation of innovation capabilities allows the company to identify their current situation according to the criteria of a model of innovation management. This activity can serve as a step prior to the introduction of a system of innovation management, in order to be able to identify both strengths and areas for improvement, and to assist the decision-making on the part of management and to develop a better plan of action to improve the R&D (Gil et al, 2008).

The firm selected for the case study is Macer, S.L. It is a company dedicated to the manufacture of ceramic moulds. It is situated in the town of Almazora (Castellón province, Spain). To assess the innovation capability of the firm, we have selected as an instrument to gather data. The questionnaire proposed by the IAT according to its model of innovation management. We have also based our analysis on secondary sources about the processes, which had been already implemented in the firm on the field of innovation, and basic information obtained by the responsible of the innovation department. To obtain this information I contacted by e-mail with the responsible of the innovation area in the firm and I sent him the questionnaire to evaluate the innovation capacity. I agreed with him an interview

to answer the questionnaire. He also gave me basic information about the firm and more detailed information about their processes, that they had been gathered in reports.

6.2. Macer, S.L.

Macer, S.L. is a company specialized in the manufacturing and rectification of moulds and presses for the tile industry founded in 1973 and located in the town of Almazora, in the Castellón province in Spain, core of the ceramic cluster in Castellón. Macer, S.L. has shown an openly innovation-friendly behaviour, as since its inception the firm has steadily presented more than 150 technical innovations and has developed 42 different property rights on their brands and products.

Flooring and covering ceramic tile sector already presents a technological maturity in performance of their final product that has been driven by an increased effort in R&D by the main companies of frits and enamels, as well as tiles and special pieces. But this effort contrasts with the strong external technological dependence, mainly of Italian machinery, that this sector shows in capital goods and equipment. Only some Spanish companies are making innovative efforts to design and produce machinery for the ceramic industry. These companies include Macer S.L., what has allowed the firm to grow and which will pose new challenges to it.

The company facilities are distributed in three factories. The main factory has an area of 7400sqm comprising two workshops. The second factory has a surface of 3000sqm with 2 workshops too, and the third plant has 2000 sq m.

The company has 140 employees. Acurrently, 30% of its turnover is obtained from the international market, with customers in countries with ceramic industry such as: Brazil, Algeria, Tunisia, Venezuela, Colombia, Guatemala, Mexico, United States, Indonesia, India, Iran, Hong Kong, Sri Lanka, Turkey, Romania, Morocco, among others.

The main activity of the company is focused on the design and manufacture of complete moulds. Therefore it encompasses all stages comprising the product life cycle: advising the client in the initial stage; drafting on technical and economic viability; definition of design, conceptual design, detailed design specifications; manufacture of all components,

assembling of special pieces, starting up machinery, monitoring during the initial stages of operation, maintenance and repairs until the final stage of the life of a product or service, when it is finally dismantling and the subsequent removal of the equipment.

The range of products they offer can be summarized in systems of carving moulds for the flooring and ceramic tile production, and manufacture of special pieces with specific applications in other sectors: manufacturing of bricks for construction, manufacture of insulating parts for construction, etc. On the other hand, they produce double moulds for the production of technical porcelain and moulds for double press systems that introduce more complexity in the conventional mould. The geometry of the tile design is integrated into Macer S. L., including the design of the surface of the tile and the biscuit according to the specifications of each customer on individual basis.

In addition to moulds, they also include other products such as blades or burins, whose production is very important as they sell spare parts to their customer companies.

The strategic objective of the company is to become the leading company in the sector in every aspects year after year: quality and precision of the manufactured product, continuous improvement and updating of processes and equipment, technical assistance, fast goods delivery and they offer training for workers and managers.

More specifically, the main objective of the company in terms of research focuses on increasing the life-cycle of critical products. For example it is in their aims to extend the life cycle of some pieces of ceramic moulds which use blades and burins, in such a way that the chain production of its clients is less influenced as possible when carrying out tasks for adjustment and maintenance, which results in saving time when the moulds are changed to produce the different formats.

As regards material means and their most significant R&D facilities, due to the enormous complexity in elements and unit operations that a system mould requires, it needs a large number of machinery used in the production of its products. Macer, S.L. exhibits a high performance in promoting its machines which are accompanied by a great versatility. So far, the developments that the company has carried out have been implemented through the use of such machinery. Although in those cases in which the use of techniques or machinery is not available in-house has been required, the firm has resorted to external collaborations.

Macer, S.L. holds the ISO 9001 quality certification since the year 2000. Thus, the firm demonstrates its ability to consistently provide products or services that meet both the customer's requirements and the regulation which are compulsory in their application. The company cooperates with various institutions such as the Universitat Jaume I; the Institute of Ceramic Technology and is involved in different national and international exhibitions: such as Tecnagilla held in Rimini, Italy, an international exhibition where the largest producers of technologies for the sector of tiles, sanitary, bricks, technical ceramics meet; or Cevisama exhibition, which is held in Valencia every year and which included an International Salon of Ceramics applied in architecture, equipment for bathrooms and kitchens, natural stone, raw materials, glazes, frits and machinery.

Various awards have been granted to Macer which recognize its innovative activity. Thus, the firm won four Alpha Gold Distinction granted by the Sociedad Española de Cerámica y Vidrio in the years 2004, 2006, 2010 and the last one in 2012. These awards distinguish those products, processes, machinery and equipment from the sectors of ceramics and glass that stand out for their technological or artistic innovation.

6.3. The questionnaire for auditing the innovation capacity.

A questionnaire is an instrument which provides information for a report or survey consisting of a set of questions or items held to the recipients and which is used to collect the information required which may be facts, opinions, skills, motives, trends, knowledge, etc. (Fondevila and Elm, 2013). In order to gather the information about the capability of innovation of the firm Macer, S.L., we lean on the model questionnaire proposed by the IAT in its innovation management. Is justified by the fact that it covers the areas of innovation management that appear in most models and because has a balance structure and specification of content make it easy its application.

Table 3 shows the correspondence of the criteria in this model in comparison to the other models. As it is shown, IAT criteria cover the same areas as the other models, although in

some of them the name has been changed[6]. Thus this questionnaire of the IAT is useful as a tool for assessment of the innovation capacity of a company, because it allows to cover all these areas of innovation management. And it allows the company to choose the implementation of a innovation management system in a later stage.

Table 4: Elements of the innovation management models

IAT model	CIDEM	CEG	Norm UNE	CEN/TS
1. Strategy and the culture of innovation. **2. Management of the resources.** **3. Environment surveillance.** **4. Internal analysis.** **5. Generation and selection of ideas.** **6. Management of the projects of innovation** **7. Results of the innovation**	1.Culture 2. Generation of new concepts 3. Development of new products 4. Redefinition product processes 5. New business processes 6. Management of knowledge and technologies	1.Leadership for the innovation 2. The Innovation as operative processes 3. Value of the Innovation 4. Awareness of the internal and external environment	1. Leadership 2. Planning 3. Support to innovation 4. Operative processes in innovation 5. Evaluation of the performance of the innovation executive processes 6. Improvement of the R&D&I management system process	1. Leadership for innovation 2. Planning the success in innovation 3. Factors enabling innovation 4. Process in the management of innovation 5. Evaluation in the implementation of the innovation management system 6. Improvement of the innovation management system

Source: Own elaboration

***The underlined criteria are those included in the IAT model in comparison with the rest.**

[6] The exception is found in the sections related to improvement, including the UNE 166002 standard and CEN/TS 16555. But this is due to the fact that both are more a normative and specified series of corrective and preventive actions, as well as follow-up ones.

This questionnaire consists in open-end questions that allows participants to answer freely and this allow us to know better about their motivations, attitudes, etc., which helps to identify strengths and areas for improvement. And it also offers a numeric scale, which measures the relevance. All these aspects facilitate the assessment and interpretation of the results.

Specifically, the questionnaire consists of 24 questions, grouped into 7 criteria and 16 sub-criteria:

Criterion 1: Strategy and culture of innovation

Sub-criterion 1.1- Responsibility of the management

- Does the direction of the organization establish an innovation strategy?
- Does an innovation culture exist within the organization?

Sub-criterion 1.2- Innovation policy

- Is there a innovation policy in the organization?

Criterion 2: Resources management

Sub-criterion 2.1- Human resources

- What are the methods employed to get organization members involved?

Sub-criterion 2.2- Infrastructure and material resources

- Are the infrastructure and material resources necessary to perform the RDI activities established?

Sub-criterion 2.3- Knowledge

- Are activities for knowledge management conducted within the organization?

Criterion 3: Technology watch

Sub-criterion 3.1- Identification of needs, sources and means of access to information

- Is there a process to identify information needs?
- The sources and means to information access have been identified?

Sub-criterion 3.2- Search, processing and dissemination of information.

- Is a process to search information established?
- Are there methods for the treatment, diffusion and monitoring of information?

Sub-criterion 3.3- Enhancement of information.

- Is a methodology to value the information employed?

Criterion 4: Internal analysis

Sub-criterion 4.1- Internal analysis

- Is an internal analysis to develop the innovation activities performed?

Sub-criterion 4.2- Identification of problems and opportunities for the firm.

- Are the problems and opportunities for the organization identified?

Criterion 5: Generation and selection of ideas

Sub-criterion 5.1- Generation of ideas

- Does the organization encourage creativity and teamwork?
- Is a systematic analysis to generate ideas established?

Sub-criterion 5.2- Selection of ideas

- Are mechanisms for the ideas selection established?

Criterion 6: Management of innovation projects

Sub-criterion 6.1- Planning, monitoring and control of projects.

- Is there a planning of innovation projects?
- Is a monitoring and control of innovation projects performed?

Sub-criterion 6.2 -Results of innovation projects.

- Is the explotation and protection of the results of the innovation projects considered?
- Are the results of the innovation projects implemented and evaluated?

Criterion 7: Innovation performance

Sub-criterion 7.1- Final results indicators

- How relevant are the final innovation results?

- How good are the final innovation results?

Sub-criterion 7.2- Inducing indicators

- How relevant are the indicators promoting the innovation?
- How good are the indicators promoting the innovation?

Annex 1 includes a copy of the questionnaire consisting a number of cards, each one refers to the various aspects related to the management of innovation. In each of the cards, a number of "points to consider" are raised, which are intended to provide a listing of issues to take into account in order to assess the status of the organization in that area. In addition, the authors incorporate a number of paragraphs to facilitate the work of analysis and systematization of the information when carrying out the self-assessment by the firm:

- **Assessment**: It allows measuring the level of maturity of the firm on the aspect to evaluate. On the basis of the evidence found (no evidence, some evidence, evidence, clear evidence, total evidence) the score is settled on a scale from 0 to 100.
- **Strengths**: collect all that evidence (facts or evidence, documentary evidence, records...) which the organization relies on to determine a high score on the scale of assessment.
- **Areas for improvement**: includes all that evidence (facts or evidence, documentary evidence, records,...) which the organization relies on to determine a low score on the scale of assessment.

To get the final score, each score obtained in each of the cards of the questionnaire is moved to the box scores summary that appears at the end of the questionnaire (Baena et al, 2009).

6.4. Results of the innovation capabilities audit.

This section shows the information obtained from this assessment questionnaire about the innovative capabilities of the company Macer, S. L. Results are grouped in the seven major criteria of the model which assist to determine the strengths and areas for improvement, as well as an approximate numerical evaluation according to the evidence of the innovation activities.

Criterion 1: Strategy and culture of innovation. This criterion includes issues related to the responsibility of the management, culture of innovation in the firm and the RDI policy.

This criterion shows some evidence. The management of the firm is committed to innovation activities and assumes the fact that the research does not connect with the productive world. It established a innovation management unit and the roles of the people responsible for the innovation management. It has also defined the profile and education of the person responsible in the area, who is an industrial or ceramics engineer, and who has training in the innovation management. In terms of culture, the leaders are responsible for establishing the objectives. They impose the restrictions for the projects to be technically and economically viable and this within the general procedures of quality. They also details the general specifications of quality taking into account each group of people affected: management of the company, responsible staff in the department assigned, and also customers and suppliers. With regard to the communication on the importance of innovation, that is performed from the department of RDI to the rest of organization.

And finally the policy of RDI at departmental level, there are some guidelines written in the policy statement of the company, which state that the innovation and development is a key area. But there is no a formal policy as such.

Criterion 2: Management of resources. This criterion includes human resources, infrastructure and material resources and the management of knowledge.

This criterion shows clear evidence. In human resources management, regarding the

involvement of the staff of the firm, the preparation of each task is checked with the team and aims and motivate the staff by giving them responsibilities and emphasizing the positive results to be obtained. In addition further methods are used to promote creativity. Staff is also involved and trained by the innovation responsible in the new innovation processes. This training consists on the introduction of the working methods along with the implementation of practical examples which make use of an on-going project.

Evaluation surveys are carried out to workers who received this training, and annually the management evaluates this training along with the board of directors. Also with regard to the channels of communication, there is an intranet in the company which manages, stores and processes all the information generated by innovation actions and which can be accessed by all the users of the unit who need it.

In terms of the infrastructure and material resources there are not specific premises for the activities of innovation. Activities are carried out using the production department team and its premises. Regarding material resources, the company has the equipment and materials necessary to each activity and it is ensured working conditions (noise, temperature, ergonomics and cleaning among others) in such a way that they are suitable to achieve the objectives of innovation. For example by the acquisition of materials or machinery, with the provision of uniforms for staff, which include security elements (boots, globes, helmets or glasses) or the taking of cleaning services on regular terms to maintain the work area clean and safe.

As regards the management of knowledge, there are some standardised documents. When the information has been collected it is treated as classified and then it is sent appropriately to decision-making responsible people on the form of maps and technological profiles, through the intranet or by mail to the intended receivers. The procedure provides a system of alarms directed to the management so that they are informed when any relevant information appears. The company also acquires technology from abroad, intangible assets such as patents or licenses and the assets of the organization industrial property assets are clearly documented.

Criterion 3: Technology watch. This criterion includes an analysis of the sources and access to information, as well as its treatment, and appraising.

This criterion shows clear evidences. Needs of the customers, current and future are identified. It identifies potential future prospect customers (users of our products or future users after innovation). Other customers and suppliers strategies are also taken into consideration. The firm study its competitors – their products, results from projects, patents etc.). Then the most relevant technologies are stored for a future scenario of the company (emerging technologies, identify the key and the base) and the features of each technology according to its impact on competitiveness, the time required to acquire it, and the degree of interest of the company.

This information is obtained from databases which have been identified on several websites, in Europe or Spain. The data are also gathered from specialised scientific magazines, associations, etc. The firm also make use of a website for patents, technological institutes and technology consulting firms. The firm cooperate with ICT (Institute of Ceramics Technology) and also with the Jaume I University, the firm have a close relationship with the Veritas Bureau which is a service for testing, inspection and certification of products. The firm are present at local, national and international exhibitions not only in Europe but all around the word. They are in contact with foreign companies, etc.

All this information is available for its distribution on the company's intranet or can be sent by mail to all the parties concerned. The relevant information is filed, stored and classified as potential areas for improvement of current projects or future projects. It is annually reviewed when the innovation Annual Plan is presented.

Criterion 4: Internal analysis. This criterion includes the internal analysis and the identification of threats and opportunities.

This criterion shows clear evidence. It identifies the different functions of the organization and their relationships. They make an inventory of all human and material resources susceptible to make use of innovation and then the success or failure of the internal projects is discussed, as well as the importance of innovation results products to the company They also study the competitive advantages which make them to be differentiated from their competitors. Three groups of interest are identified: customers (ceramic tiles producers), collaborators (manufacturers of frits, enamels; machinery workshops, ATECER, University,...) and suppliers (supplier of metal, standard components suppliers and suppliers

of hydraulic, electrical and electronic systems) and their relationships.

A SWOT analysis is implemented to cross strengths, weaknesses, threats and opportunities; there are also attempts to relate current technologies to future technology which may fulfil the needs of the company which were arisen in the SWOT. In order to adjust and redefine those needs, in terms of technology, through the launch of possible and proper lines of development or strategies innovation for the company. It is estimated the probability of success of projects of innovation (specified in the criterion 5).

Criterion 5: Generation and selection of ideas. This criterion includes the activities of generation and selection of ideas.

This criterion shows some evidence. There is a planning that must be based on the results of the SWOT analysis in order to get new ideas. Methods to promote creativity are implemented. Those activities are used internally to promote creativity including brainstorming and externally as being participants in joint business organizations or collaboration with technology research centres such as the Ceramic Technology Institute. The opportunities are identified and then the ideas are implemented. Then employees put them forward. In my opinion, more training and incentives should be offered to employees so that they reach all their potential in the generation and development of a new idea.

Meetings for the generation of ideas are not planned. They are carried out tailored according to the needs of a project already in progress, or when a future project is being planned. Each idea is developed following a planning which includes tasks, materials, financial and human resources. Possible public funding is studied, if any. A viability study is conducted (being the optimal rate of return on those investments from two to five years. Then the expected life cycle and marketing of the products. After that, the ones with a balanced cost-benefit result are put into order having in mind their probability of success (impact*implementation *urgency), (aspects to be valued between 0 and 1 for each project idea). After these processes, it arises the annual operating plan which is sent to the board of directors in a simple language and following a structure established for this kind of reports.

Criterion 6: management of innovation projects. This criterion includes the planning, monitoring and control of projects and results.

This criterion shows clear evidence. In order to the implementation of planning activities, the expected objectives are listed first. They do it through structured activities according to a diagram of the project life cycle and taking into consideration that it is a flexible planning regarding the availability of staff, unexpected events or special vacation periods. Then the priorities are determined. The resources needed are planned on the basis of the approved budget and funding from the state is required if any. After that, the projects' portfolio is released. All this must be recorded and included in a report. For monitoring a project file is created which includes all the information of the project, and which is constantly updated, and then conclusions and changes could be made. Tests or trials are documented. In the control of RSC, results, schedules and costs are compared periodically as planned and it is checked if schedule is met. Deviations to the original plan which may appear are recorded, analysed and then it is determined whether they are controllable or uncontrollable. If it represents a viable stable plan of actions to minimize these deviations and to get new ideas of projects or activities based on the results obtained. If there are activities which involve third parties the follow-up is ensured through the continuous contacts, meetings and reports

Interesting potential markets are identified in the study of the market of each project. There is a protection and exploitation of the results and its alternatives (patents, brands, designs, utility models...). It maintains and documents a system of technology transfer, both within the company and the out of the company, whereas the definition of internal mechanisms for transfer of technology, the implementation of technology transfer mechanisms and the definition of the arrangements for transfer of technology (taking into account the intellectual and industrial property, contracts, technical assistance, cooperation and alliances, among others).

Criterion 7: innovation performance. This criterion includes indicators of final results and indicators inductors.

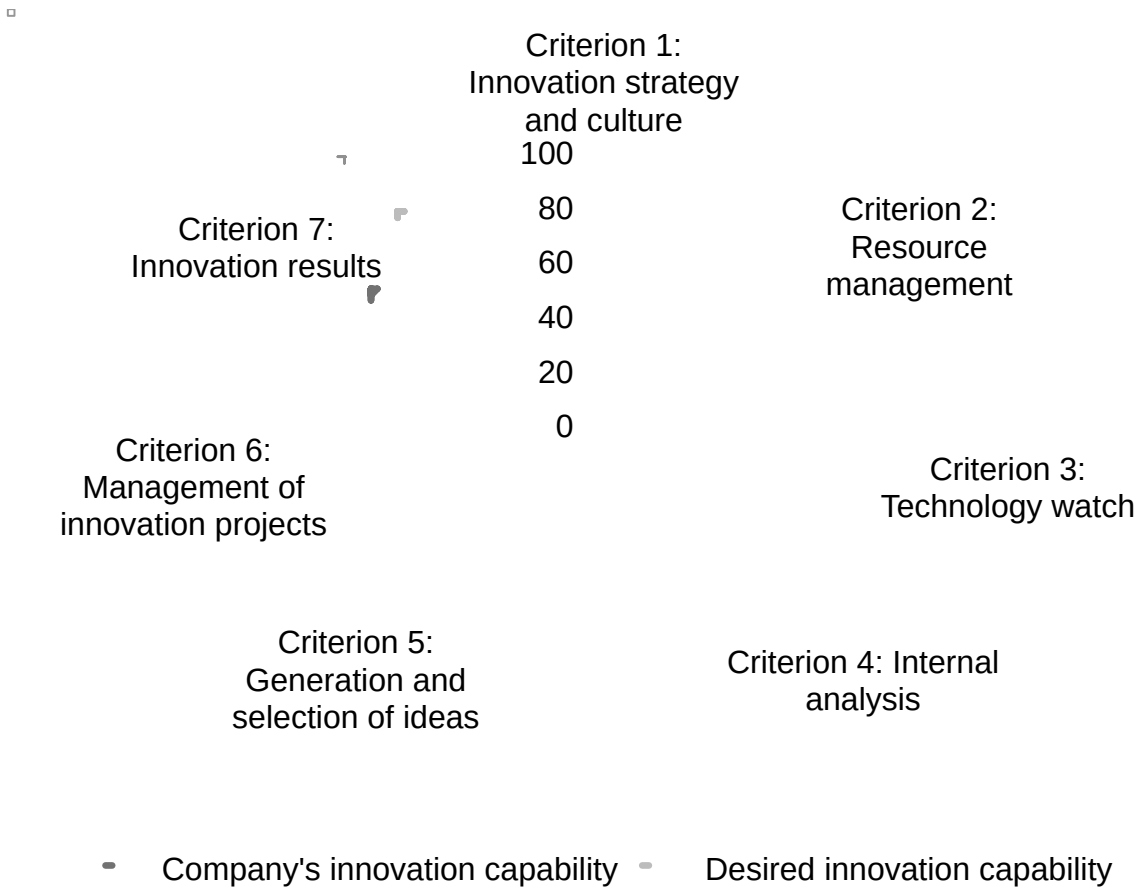
This criterion shows clear evidence of practicable results of some projects, such as

new products already for sale, as well as improvements in the process of production (increased capabilities, reduction of costs, etc.). Other projects did not apply for the results obtained, but they are considered a learning experience for the future. Each year the number of patents has been increased currently reaching the number of forty-two processes of patent and trademark. The results that have been applicable have shown positive returns, they have favoured the increase in turnover and in cost reduction. Compared with the sector these results are above those of its competitors.

Macer's policy does not aim at an increase on spending on innovation or the staff employed but year-to-year budgets are evaluated and the proposed projects one approved, according to budgets and viability and practicability. Some years the costs and expenses can be higher and some lower. But it always moves around 2-4% of the turnover. The company has got awards for their innovative results, such as the four awards of Cevisama, called Alpha. It has a constant presence in the mass media linked to activities of technology innovation and has participated in the publishing of two books related to ceramic moulds. They also participate in international exhibitions held in Spain – Cevisama and Tecnagilla (Italy) specialised in technology transfer.

With regard to the numerical assessment of each section, it is summarized in figure 7 so that it is easier to interpret the results of the questionnaire and allows us to better assess its significance. The 7 criteria of the model are represented on this figure and it has bounded a desired area located in a score of 80% in all the criteria. This value has been determined because it could be considered, according to our questionnaire, that by acting that way the company shows clears evidences in each of the criteria (IAT, 2009).

Figure 8: Innovation capabilities of Macer, S.L.



Source: own elaboration

From this figure, it can be seen that the firm is close to the level of innovation capabilities sought in an 80% in most of the criteria, even surpassing in criteria no. 6, Innovation project management, where the rate is of 90%. In this area, I found difficult highlight any improvement area.

First criterion, which deals with innovation strategy and culture is an exception, it presents a low rate about 42%. This low rate is due to the fact that they do not follow a innovation formal policy. Besides, the management should have a greater commitment in some activities on innovation, for example, by fostering a more fluid internal communication. By doing so employees would be aware of having a greater implication in the organization, transmitting the objectives about innovation and offering incentives to the their contribution to ideas.

Also, the criterion on generation and selection of ideas shows that this aspects can be improved. Thus, in the generation and selection of ideas the rate has been about 65%, being this the second area for improvement, specially regarding the incentives to the internal generation of ideas (among staff) and the documents which will recognize their efforts.

As a whole, we could highlight these criteria, innovation strategy and culture and generation and selection of ideas, as areas of a more significant improvement on which they should work, since for the rest of them only little adjustments should be applied.

From the analysis we can suggest some actions to improve Macer's position in the areas with a lower rating, some improvements are:

- The management should be more involved with the communication of the idea of the importance innovation. They could increase the internal communication.
- Setting up of a innovation formal policy.
- More possibilities of training formation might be offered in general on new activities of innovation (courses, workshops, seminars…).
- If the company keeps increasing its activities of innovation, it would be consider having an innovation area.
- Evaluate the effectiveness of those ways access information in order to find out which ones are the most effective so that they could be helpful for future actions.
- Performing customer satisfaction surveys to verify their motivation.
- Documentation of the ideas brought up by the employees, gather them at the end of the year (best ones can be rewarded).
- Planning meetings for the generation of ideas.

Table 5 summarizes all the strengths of the above-mentioned criteria and also shows those areas which need some improvements with some recommendations.

Table 5: Macer's innovation audit.

CRITERION	EVIDENCES	AREAS FOR IMPROVEMENT
Criterion 1: Strategy and culture of innovation,	- A unit of innovation management is set up along with the roles and competences of the responsible of the department -The responsible has to establish the RDI department objectives and to maintain a fluid communication with the rest of the organization. - There is not a formal established policy on RDI as such.	- Apart from the competences of the responsible person, some previous competences could be implemented regarding training in new technologies to the staff in charge of the innovation projects and the staff in charge of developing and testing them. -The management should be more involved with the communication of the idea of the importance of innovation within the rest of the organization (presentation or meetings) and not only the innovation department. -Setting up of a innovation formal policy and its relative objectives and revision in order to ensure its going on adjustments for the company and strategy coherence.
Criterion 2: Resources management	- Preparation of the tasks, motivation of the staff, promotion of the creativity. Training should be offered from the innovation department to be assessed later. The information is spread through the firm's intranet. - There is not a physical-setting devoted to innovation – they use the same production department premises. Equipment, material and necessary conditions are provided for exclusive use of the innovation. - Standard documentation of the knowledge management. It is spread through the intranet. Technology is acquired and all the company industrial assets are documented.	-More possibilities of training formation might be offered in general on new activities of innovation (courses, workshops, seminars …), apart from the necessary explanations at the time of developing a project on the part of the person in charge. - If the company keeps on encouraging and increasing its activities of innovation, it would be necessary to consider to have an area comprising a team and material dedicated to innovation before implementing any the production

Criterion 3: Technology watch	-Identify needs of current and future customers. Providers and competitors are analysed. Emerging technologies are identified. -Information Is classified as it is obtained. They work with ITC, collaborating with Jaume I University, and the Bureau Veritas and they are present at exhibitions, they are in contact with foreign companies, etc. -The company's intranet or the mail distribute information, it archives and classifies for current or future projects. It is reviewed annually.	-The effectiveness of those ways to access the information could be evaluated in order to find out which ones are the most effective so that they could be helpful for future actions. -The resources devoted to the search of information should be planned in advance (strategies and research actions on the selected sources), which would result in streamlining of the process. -Prior to its classification the characteristics of the information should be analysed to highlight the most relevant (useful for the reductions of risks, required progresses, if cooperation is needed, etc.)
Criterion 4: Internal analysis	-Identify the functions of the organization, human resources inventory and analyse the success and failure of the internal projects, competitive advantages that differentiate them are studied. Identify stakeholders and the relationships that exist with them. -There is a SWOT analysis and attempts to relate the technologies previously selected with the needs arising in the SWOT. Strategies are tailored to fit the SWOT and needs are redefined. It is estimated the probability of success or failure.	- It is possible to identify the obstacles in the implementation of these opportunities to these lines of development strategies and innovation, arising from the SWOT analysis. This also helps with the selection of the most adequate technologies for the organisation and resources needed to solve these obstacles.

Criterion 5: Generation and selection of ideas	-There is a plan based on the results of the SWOT and methods are used to foster creativity (brainstorming or collaboration with technological centres). They are recognised and cater to the ideas put forward by employees. - There are conducted meetings according to needs of a project. For each idea there is a plan of tasks, resources, and materials. It is expected some possible financing issues. A viability study is carried out and the annual operating plan raises to be addressed in the form of a report.	-Documentation of the ideas brought up by the employees, gather them at the end of the year (best ones can be rewarded). - There should be more incentives to employees to generate new ideas and more trained staff in various techniques that favour the generation of new ideas. -Planning meetings for the generation of ideas. By doing so, preference is also given to a greatest generation.
Criterion 6: Management of innovation projects	- The activities and expected targets are listed. A flexible planning is presented and the priorities decided. The resources are planned according to the budget (one looks for public financing). A memory is written. Control of RCC (Results, Calendars and Costs). Actions plan to minimize the deviations. It is ensured the pursuit of the activities with third parties. - Market research. Protection and development of the results, identifying protection alternatives of these. It is supported and documents a technology transfer system. Then the system of RDI is analised to determine the progress of the system of RDI.	- Apart from the action plan for the possible deviations, it could also be identified potential risks to further minimize the consequences.

Criterion 7: Innovation results	- Results applicable to projects are obtained. There has been an increase in the number of patents (42 patents and marks). The applicable results have showed positive performance. (increase the invoicing or cost reduction). These results are located above those of its competitors. - The expense of different innovation according to the budgets, concerning 2-4 % of the turnover. The firm is provided with awards for its innovative results (awards Alpha). It appears in mass media related to the activity and has taken part in the publishing of two books. Also, they take part in exhibitions such as Cevisama (Spain) and Tecnagilla (Italy).	-In spite of its positive favourable returns more could be invested in training their workers on innovation, and on performing customer satisfaction surveys to verify their motivation. And perhaps they should resolve a long term increase investment in innovation, with somewhat greater percent of their turnover.

Source: own elaboration

7. Conclusions

In the beginning of this work it has been highlighted the need for businesses to achieve competitive advantages with respect to their competitors using the technological innovation, as a way to obtaining benefits such as cost reduction, reduction of manufacturing time, increase the margin of sales or increase in the benefit.

The technological innovation can be conceived as the result of a process. There have been suggested multiple models of management of technological innovation, trying to identify the best way to manage this technological innovation process. Increasingly, organizations show interest in enhancing its technological innovation capacity but they are faced with many management proposals and this can produce some uncertainty. Hence the need for a model of innovation management. Adoption of the firm an innovation management systems will help the firm to systematize the innovation activities carried out and contribute to get better results from innovation.

In this work, we review these models of innovation management, oriented to provide the implementation of an innovation management system and we describe their similarities and/or differences. From the review, we can highlight some common areas in the models such as: leadership and culture of the company; the management of the resources and planning; the technology watch and the internal analysis of the company; the generation and selection of new ideas and management of the process; the results and their evaluation. Also, as a previous step, they suggest the need to carry out an assessment of the innovating capability from firms.

We can conclude that there are some common areas that are important for business innovation, such as leadership, culture, management of the resources, planning, technology watch, selection of ideas or evaluate the results. We have tried to improve the long-term competitiveness of a company through technological innovation. To do so, we have tried to carry out an innovation audit, based on these areas mentioned and by selecting a questionnaire of the current innovative capabilities, as a way to detect areas of improvement and help the firm as a preliminary stage in a potential adoption of a formal innovation management system.

The company selected to examine these aspects more deeply is Macer, S.L. The firm presents an adequate performance in almost all the areas but, thanks to the audit, some improvement areas have been identified. The company should improve their innovation activities in terms of the leadership and the innovation culture, the generation and selection of ideas and introduce some small improvements in other areas. The management should also be more involved in the innovation activities, define a formal innovation policy and improve the internal communication. This improvement of the internal communication would have a positive impact on the two aforementioned criterions: on the leadership of the management department and the innovation culture within the company because it would promote communication between management and staff and on the internal process of generation and selection of ideas.

In order to achieve those improvement goals of the internal communication, the company could initially distribute anonymous questionnaires among the staff or install a suggestion box. These methods offer a formal way of knowing the opinion of the staff about the innovation aspects to improve. Subsequent periodic meetings with the staff can be employed to transmit the innovation goals derived from their opinions and to further incite the

generation of innovation ideas, and those ideas must be documented to be used later.

A possible motivation to encourage participation in these strategies could be a recognition of services which will apprise the most innovative ideas and that could imply a monetary reward for the employees if the idea results in a benefit for the firm.

This work can also be helpful to the firm as it stresses to the areas where is needed define more specific actions and then examine their progress. Actions such as more possibilities of training formation might be offered in general on new activities of innovation (courses, workshops, seminars…), consider of have an innovation area with the material and equipment necessary for testing the need ideas or performing customer satisfaction surveys to verify their motivation.

As whole, we hope that our work contributes to the assessment and improvement of the innovation capacity and the eventual introduction of a more formal innovation management system.

8. Bibliography

AENOR, 2014. *Guía de la I+D+i.* 4th ed. Madrid. AENOR.

Arzola, M., Tablante, G., and D'Armas, M. 2012. Análisis comparativo de los modelos de gestión para la innovación en las organizaciones empresariales. *Jornadas de investigación.* pp.205-214.

Baena, C., Gutierrez, L., Gutierrez, E. and Trujillo, M., 2009. Guía para la Autoevaluación de la Gestión de la Innovación Empresarial. *Centro Andaluz para la Excelencia en la Gestión.* Instituto Andaluz de Tecnología. Octubre 2009.

Burgelman R.A., Christensen C.M and Wheelwright S.C. 2008. *Strategic Management of Technology and Innovation*. 4th ed. McGraw-Hill.

Castells P.E. and Pasola J.V. 2004. *Tecnología e innovación en la empresa*. Univ. Politèc. de Catalunya.

Certificación A.E. de N y. UNE 166002:2014: *Gestión de la I+D+i: Requisitos del sistema de gestión de la I+D+i.* AENOR.

Certificación A.E. de N y. UNE 166005 IN:2004, *Gestión de la I+D+i,*: *Guía de aplicación de la Norma UNE 166002: 2002 EX al sector de bienes de equipo*. AENOR

Certificación A.E. de N y. UNE 166007:2010: *Gestión de la I+D+i: Guía de aplicación de la Norma UNE 166002:2006.* AENOR.

Club Excelencia en Gestión, 2006. *Marco de referencia de innovación.* CEG.

Dodgson M, Gann D.M., and Salter A. 2008. *The Management of Technological Innovation: Strategy and Practice*. Oxford: Oxford University Press.

Fondevila, F. and Del Olmo, J.L., 2013. *El trabajo de fin de grado en ciencias sociales y jurídicas: guía metodológica.* Madrid: Ediciones Internacionales Universitarias.

Gil, A. M, Varela, G. and González, A., 2008. Guía Práctica para la Implantación de la Norma “UNE 166002:2006: Gestión de l I+D+i: Requisitos del Sistema de Gestión de la I+D+i” en Empresas del Sector de la Edificación Residencial. *Fundación Tekniker.* Nermo Estudio, S.L.

Gonzalez, J.M., 2013. *CEN/TS 16555-1: Primera Norma Europea de gestión de la Innovación.* [Online]. Available at: < http://www.iat.es/2013/07/cents-16555-1-primera-norma-europea-de-gestion-de-la-innovacion/> [Accessed 14 March 2015].

González, J.M., 2013. Tribuna - La guía europea sobre cómo innovar [Online]. Acailable at: < http://www.elconfidencial.com/34384/> El Confidencial. [Accessed 14 of March 2015].

González, J.M., León, A. and Peñalba, M., 2014. *Como escribir un trabajo de fin de grado: algunas experiencias y consejos prácticos.* Madrid: Síntesis.

González M.R., Pérez E.M., 1989. *La innovación tecnológica y su gestión*. Marcombo.

Intxauburu, G. and Velasco E., 2010. El benchmarking aplicado a la gestión de innovación. *Revista de Dirección y Administración de empresas*, Nº17, pp.34-46.

Manjón J.V.G., 2009. *Gestión de La Innovación Empresarial*. Netbiblo.

Mauri M.M., 20012. Sistemas estándar para gestionar la innovación, ¿Tendremos una ISO? *Forum Calidad*, N^{o} 233 July/August, pp. 38-43.

Mir M, and Casadesús M., 2011. Standardised innovation management systems: A case study of the Spanish Standard UNE 166002:2006. *Innovar.* April ;21(40), pp.88-171.

Mir, M., Llach, J., and Marimon. F. 2012. Pattern of diffusion of the UNE 166002 innovation management standard: an exploratory analysis. *6th International Conference on Industrial Engineering and Industrial Management.* Vigo, July 18-20.

Mobbs, C, 2011. What are innovation audits?. *Innovation for Growth*. March 2011. Oxforshire.

Morín J, and Seurat R., 1998. *Gestión de los recursos tecnológicos*. Fundación Cotec para la Innovación Tecnológica.

Morote J.P., and Nuchera A.H., 1997. *Gestión e innovación: un enfoque estratégico*. Pirámide.

Nuchera A.H., Serrano G.L., and Morote J.P., 2002. *La gestión de la innovación y la tecnología en las organizaciones*. Pirámide.

OECD, Luxembourg S.O. of the E.C., 2005. *Manual de Oslo Guía para la recogida e interpretación de datos sobre innovación*. 3th ed. OECD: Publishing.

Ponti F, and Ferràs X., 2008. *Pasión Por Innovar*. Editorial Norma.

Roberts E.B., 1996. *Gestión de la innovación tecnológica*. Fundación Cotec para la Innovación Tecnológica.

Rothwell R., 1994. Towards the Fifth-generation Innovation Process. *International Marketing Review*. 1 February ;11(1), pp.7-31.

Schilling M.A., 2008. *Dirección Estratégica de la Innovación Tecnológica*. McGraw-Hill Interamericana de España S.L.

Terré i Ohme, E. 2002. *Guía Diagnóstico Innovación CIDEM.* [Online]. Available at: <https://es.scribd.com/doc/36391811/Guia-Diagnostico-Innovacion-CIDEM> [Accessed 20 April 2015].

Tidd J., and Bessant J., 2009. *Managing Innovation: Integrating Technological, Market and Organizational Change*. Wiley.

9. Appendices

Appendix I: Assessment questionnaire of the IAT management model on technology innovation.

<table>
<tr><td>Criteria 1</td><td colspan="11">STRATEGY AND INNOVATION CULTURE</td></tr>
<tr><td>Subcriteria 1.1.</td><td colspan="11">Management responsibility</td></tr>
<tr><td>Question 1.1.1.</td><td colspan="11">Does the direction of the organization establish an innovation strategy ?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect on the existence, suitability and degree of implementation and improvement of:

- The investment by the direction to undertake innovation activities, asuming the risk associated with them as a way of learning.

- The infraestructure and resources necessary to perform innovation activites.

- The establishment of the necessary competences for the personnel performing and managing RD duties.</td></tr>
<tr><td rowspan="2">Valuation 1.1.1</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

<table>
<tr><td>Criteria 1</td><td colspan="11">STRATEGY AND INNOVATION CULTURE</td></tr>
<tr><td>Subcriteria 1.1.</td><td colspan="11">Management responsibility</td></tr>
<tr><td>Question 1.1.2.</td><td colspan="11">Does an innovation culture exist within the organization ?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect on the existence, suitability and degree of implementation and improvement of:

- The communication of the importance of the innovation by the direction to the rest of organization.

- The establishment of innovation goals consistent with the organization policy.</td></tr>
<tr><td rowspan="2">Valuation 1.1.2</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

Criteria 1	**STRATEGY AND INNOVATION CULTURE**
Subcriteria 1.2.	**RDI policy**
Question 1.2.1.	**Is there a RDI policy in the organization ?**
Aspects to consider	In this item we should think reflect on the existence, suitability and degree of implementation and improvement of: - The establishment of a RDI policy well known by all the organization workers. - The establishment of measurable RDI goals coherent with the RDI policy. - The revision of the RDI policy to ensure that it remains well suited for the organization.

Valuation 1.2.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

Criteria 2	**RESOURCE MANAGEMENT**										
Subcriteria 2.1.	**Human resources**										
Question 2.1.1.	**What are the methods employed to get organization members involved?**										
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - The motivation of the organization members to assume responsabilities. - The establishment of methods and tools to encourage creativity and the development of the capacity for teamwork. - The establishment of comunication channels between the members of the organization. - The planification nad mangement of training activities related to innovation to achieve the necessary competences - The evaluation ot the effectiveness of the training of the members of the organization.										
Valuation 2.1.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100
Strengths											
Improvement areas											

Criteria 2	**RESOURCE MANAGEMENT**
Subcriteria 2.2.	**Infrastructure and material resources**
Question 2.2.1.	**Are the infrastructure and material resources necessary to perform the RDI activities established?**
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - The infrastructure and material resources necessary to develop innovation activities. - Ensure that the working conditions are the adequate ones to achieve the RDI goals.

Valuation 2.2.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

<table>
<tr><td>Criteria 2</td><td colspan="11">RESOURCE MANAGEMENT</td></tr>
<tr><td>Subcriteria 2.3.</td><td colspan="11">Knowledge</td></tr>
<tr><td>Question 2.3.1.</td><td colspan="11">Are activities for knowledge management conducted within the organization ?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect on the existence, suitability and degree of implementation and improvement of:

- A formal methodology and tools to detect, structure and assimilate new knowledge.

- Methods to ease the cooperation with external entities.

- A systematic process to maintain and document a system of transference of technology.

- A system to control all the propiety assets of the organization.</td></tr>
<tr><td rowspan="2">Valuation 2.3.1</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

<table>
<tr><td>Criteria 3</td><td colspan="11">VIGILANCE OF THE ENVIRONMENT</td></tr>
<tr><td>Subcriteria 3.1.</td><td colspan="11">Identification of needs, sources and means of access to information</td></tr>
<tr><td>Question 3.1.1.</td><td colspan="11">Is there a process to identify information needs?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we reflect on the existence, suitability and degree of implementation and improvement of:

- Methods for the identification and analysis of the necessary external information.

- Tools to identify and analyse the technologies accesible to the organization.

- A technological evaluation of the competition products.</td></tr>
<tr><td rowspan="2">Valuation 3.1.1</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

<table>
<tr><td>Criteria 3</td><td colspan="11">VIGILANCE OF THE ENVIORMENT</td></tr>
<tr><td>Subcriteria 3.1.</td><td colspan="11">Identification of needs, sources and means of access to information</td></tr>
<tr><td>Question 3.1.2.</td><td colspan="11">The sources and means to information access have been identified?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect on the existence, suitability and degree of implementation and improvement of:

- Internal information sources.

- External information sources.

- Information channels.

- Information and communication technology tat ease the access to the information sources.

- The effectiveness ot the means to access to information.</td></tr>
<tr><td rowspan="2">Valuation 3.1.2</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

Criteria 3	**VIGILANCE OF THE ENVIRONMENT**
Subcriteria 3.2.	**Search, treatment and diffusion of information**
Question 3.2.1.	**Is a process to search information established?**
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - The planning of the resources for the search of information. - The categorizing of information by functional areas and relevance.

Valuation 3.2.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

<table>
<tr><td>Criteria 3</td><td colspan="11">VIGILANCE OF THE ENVIRONMENT</td></tr>
<tr><td>Subcriteria 3.2.</td><td colspan="11">Search, treatment and diffusion of information</td></tr>
<tr><td>Question 3.2.2.</td><td colspan="11">Are there methods for the treatment, diffusion and monitoring of information ?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect on the existence, suitability and degree of implementation and improvement of:

- Communication circuits in the organization and monitoring actions which ensure the distribution among stakeholders.

- Monitoring activities of the difusion of information to ensure its proper distribution.

- Methods to evaluate the quality and reliability of the data taking into account the opinion of experts.</td></tr>
<tr><td rowspan="2">Valuation 3.2.2</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

Criteria 3	**VIGILANCE OF THE ENVIRONMENT**
Subcriteria 3.3.	**Use of information**
Question 3.3.1.	**Is a methodology to value the information employed?**
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - Methods to analyse the information characteristics adequate for the strategy of the organization. - A support that makes information accesible for future decisions. - A process to analyse the value of the information. - Methodologies to organize the information according to different areas of knowledge or actuation lines of the organization.

Valuation 3.3.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

<table>
<tr><td>Criteria 4</td><td colspan="11">INTERNAL ANALYSIS</td></tr>
<tr><td>Subcriteria 4.1.</td><td colspan="11">Internal analysis</td></tr>
<tr><td>Question 4.1.1.</td><td colspan="11">Is an internal analysis to develop the innovation activities performed?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect the existence, suitability and degree of implementation and improvement of:

- Methods to identify the basic functions in the organization and the human resources and materials susceptible to use in innovation tasks

- An evaluation of the causes of success and failure of the internal projects.

- A method to identify and analyze the stakeholders of the organization and the relationships with them.</td></tr>
<tr><td rowspan="2">Valuation 4.1.1</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

Criteria 4	**INTERNAL ANALYSIS**
Subcriteria 4.2.	**Identification of the problems and opportunities for the organization**
Question 4.2.1.	**Are the problems and oportunities for the organization identified?**
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - A method to compare the internal and external situation looking for innovative ideas and oportunities. - An analysis of the results adapted to the policy of the organization. - Mechanims to identify obstacles to the use of new knowledge and oportunities to improve. - Estimators of the probabilities of success or failure of the results of innovation. - Methods to detect the desviation between processes, activities, products and services of the organization and the needs and expectations expressed by the stakeholders.

Valuation 4.2.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

Criteria 5	**GENERATION AND SELECTION OF IDEAS**										
Subcriteria 5.1.	**Generation of ideas**										
Question 5.1.1.	**Does the organization encourage creativity and teamwork ?**										
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - A planning to generate new ideas in the strategy of the organization. - Methods to recognize and pay attention to the people that promote new ideas. - The reception of new porposals by the direction after the celebration of the meetings to generate ideas. - Mechanisms to analyse and implement the ideas provided by the workers. - A formation of the organization members in techniques that favor the generation of ideas-										
Valuation 5.1.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100
Strengths											
Improvement areas											

<table>
<tr><td>Criteria 5</td><td colspan="11">GENERATION AND SELECTION OF IDEAS</td></tr>
<tr><td>Subcriteria 5.1.</td><td colspan="11">Generation of ideas</td></tr>
<tr><td>Question 5.1.2.</td><td colspan="11">Is a systematic analysis to generate ideas established?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should think about the existence, suitability and degree of implementation and improvement of:

- A series of meetings for the generation of ideas.

- Encouragement of the creativity though techniques that engage the members of the organization.

- Tools to generate new ideas.</td></tr>
<tr><td rowspan="2">Valuation 5.1.2</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

<table>
<tr><td>Criteria 5</td><td colspan="11">GENERATION AND SELECTION OF IDEAS</td></tr>
<tr><td>Subcriteria 5.2.</td><td colspan="11">Selection of ideas</td></tr>
<tr><td>Question 5.2.1.</td><td colspan="11">Are mechanims for the ideas selection established?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should think about the existence, suitability and degree of implementation and improvement of:

- Methods to identify the relevant aspects of each idea and choose the criteria to select new ideas an

- Tools to valuate the factors that guarantee the success of new ideas.</td></tr>
<tr><td rowspan="2">Valuation 5.2.1</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

Criteria 6	MANAGEMENT OF INNOVATION PROJECTS
Subcriteria 6.1.	**Planning, monitoring and control of innovation projects**
Question 6.1.1.	**Is there a planning of innovation projects ?**
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - Methods for the planification of innovation projects. - Enough human resources to undertake an innovation project. - An economic management of the projects.

Valuation 6.1.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

Criteria 6	**MANAGEMENT OF INNOVATION PROJECTS**										
Subcriteria 6.1.	**Planning, monitoring and control of innovation projects**										
Question 6.1.2.	**Is a monitoring and control of innovation projects performed?**										
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - A monitoring and control of the activities related with the project. - Methods to measure and analyse the innovation process for its improvement. - Mechanisms to identify the risks and deviations throughout the project. - Tools to ensure the monitoring of the subcontracted activites of the project.										
Valuation 6.1.2	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100
Strengths											
Improvement areas											

<table>
<tr><td>Criteria 6</td><td colspan="11">MANAGEMENT OF INNOVATION PROJECTS</td></tr>
<tr><td>Subcriteria 6.2.</td><td colspan="11">Results of innovation projects</td></tr>
<tr><td>Question 6.2.1.</td><td colspan="11">Is the explotation and protection of the results of the innovation projects considered?</td></tr>
<tr><td>Aspects to consider</td><td colspan="11">In this item we should reflect on the existence, suitability and degree of implementation and improvement of:

- An identification of potential markets interested in the use of the results of an innovation project.

- An study of the diferente alternatives to protect the results.

- A determination of the confidenciality levels of the results and measures to protect them.</td></tr>
<tr><td rowspan="2">Valuation 6.2.1</td><td colspan="2">Without evidences</td><td colspan="2">Scarce evidences</td><td colspan="3">Some evidences</td><td colspan="2">Clear evidences</td><td colspan="2">Total evidences</td></tr>
<tr><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
<tr><td>Strengths</td><td colspan="11"></td></tr>
<tr><td>Improvement areas</td><td colspan="11"></td></tr>
</table>

Criteria 6	**MANAGEMENT OF INNOVATION PROJECTS**										
Subcriteria 6.2.	**Results of innovation projects**										
Question 6.2.2.	**Are the results of the innovation projects implemented and evaluated?**										
Aspects to consider	In this item we should reflect on the existence, suitability and degree of implementation and improvement of: - Methods to incorporate own or external technologies. - Internal mechanims or agreements with other organizations to transfer the technology. - A system to evaluate the results of the transfer of technology.										
Valuation 6.2.2	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100
Strengths											
Improvement areas											

Criteria 7	INNOVATION RESULTS
Subcriteria 7.1.	**Indicators of final results**
Question 7.1.1.	**How relevant are the final innovation results ?**
Aspects to consider	In this item we should reflect on the adaptation and reliability ot the innovation results, if they cover the most relevant areas according to the established strategy and the goals of innovation planning, and if they are the ones typically employed in the sector. For this reflection, the organization could take into account the following types of indicators: - New products, processes and services. - Sales increase. - Costs reduction of the resources (products or services) - Reduction of the time in the production, distribution or commercialization processes. - Productivity increase. - Products, processes and services quality improvements - Clients satisfaction with the innovation activities. - Explotation margin. - Number of patents and other ways to protect the results. - Scientific publications, articles and techniques. - Agreements with other organizations.

Valuation 7.1.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

Criteria 7	**INNOVATION RESULTS**
Subcriteria 7.1.	**Indicators of final results**
Question 7.1.2.	**How good are the final innovation final results ?**
Aspects to consider	In this item we should analyse if the innovation results that are relevant (according to the previous section): - Are obtained as a result of the innovation activities set out and implemented - Show positive performance or favorable trends. - Reach the goals. - Are favorable in comparison with the sector.

Valuation 7.1.2	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

Criteria 7	**INNOVATION RESULTS**
Subcriteria 7.2.	**Indicators promoting the innovation**
Question 7.2.1.	**How relevant are the indicators promoting the innovation ?**
Aspects to consider	In this item we should reflect on the adaptation and reliability ot the innovation results, if they cover the most relevant areas according to the established strategy and the goals of innovation planning, and if they are the ones typically employed in the sector. For this reflection, the organization could take into account the following types of indicators: - Spending on innovation. - Awards won related to the innovation. - Workers employed in innovation activities. - Researchers and doctors. - Acquisition and cession of intellectual and industrial property rights. - Appearence in the media. - Employees motivation. - Increase of the qualified human resources. - Investment in innovation formation. - Participation in technological events.

Valuation 7.2.1	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100

Strengths	
Improvement areas	

Criteria 7	**INNOVATION RESULTS**										
Subcriteria 7.2.	**Indicators promoting the innovation**										
Question 7.2.2.	**How good are the indicators promoting the innovation ?**										
Aspects to consider	In this item we should think analyse if the promoters of the innovation that are relevant (according to the previous section): - Are obtained as a result of the innovation activities set out and implemented - Show positive performance or favorable trends. - Reach the goals. - Are favorable in comparison with the sector.										
Valuation 7.2.2	Without evidences		Scarce evidences		Some evidences			Clear evidences		Total evidences	
	0	10	20	30	40	50	60	70	80	90	100
Strengths											
Improvement areas											

SCORES ON THE EVALUATION CRITERIA			
Critera/Subcriteria	**Title**		**Score**
Subcriteria 1.1.	Management responsability	Question 1.1.1:	(Questions average)
		Question 1.1.2:	
Subcriteria 1.2.	RDI policy	Question 1.2.1:	
Criteria 1	**STRATEGY INNOVATION AND CULTURE**		(Subcriteria average)
Subcriteria 2.1.	Human resources	Question 2.1.1:	
Subcriteria 2.2.	Infrastructure and material resources	Question 2.2.1:	
Subcriteria 2.3.	Knowledge	Question 2.3.1:	
Criteria 2	**RESOURCE MANAGEMENT**		(Subcriteria average)
Subcriteria 3.1.	Identification of needs, sources and means of access to information	Question 3.1.1:	(Questions average)
		Question 3.1.2:	
Subcriteria 3.2.	Search, treatment and diffusion of information	Question 3.2.1:	(Questions average)
		Question 3.2.2:	
Subcriteria 3.3.	Use of information	Question 3.3.1:	
Criteria 3	**VIGILANCE OF THE ENVIRONMENT**		(Subcriteria average)
Subcriteria 4.1.	Internal analysis	Question 4.1.1:	
Subcriteria 4.2.	Identification of the problems and opportunities for the organization	Question 4.2.1:	
Criteria 4	**INTERNAL ANALYSIS**		(Subcriteria average)

SCORES ON THE EVALUATION CRITERIA			
Critera/Subcriteria	**Title**		**Score**
Subcriteria 5.1.	Generation of ideasa	Question 5.1.1:	(Questions average)
		Question 5.1.2:	
Subcriteria 5.2.	Selection of ideas	Question 5.2.1:	
Criteria 5	**GENERATION AND SELECTION OF IDEAS**		(Subcriteria average)
Subcriteria 6.1.	Planning, monitoring and control of innovation projects	Question 6.1.1:	(Questions average)
		Question 6.1.2:	
Subcriteria 6.2.	Results of innovation projects	Question 6.2.1:	(Questions average)
		Question 6.2.2:	
Criteria 6	**MANAGEMENT OF INNOVATION PROJECTS**		(Subcriteria average)
Subcriteria 7.1.	Indicators of final results	Question 7.1.1:	(Questions average)
		Question 7.1.2:	
Subriteria 7.2.	Indicators promoting the innovation	Question 7.2.1:	(Questions average)
		Question 7.2.2:	
Criteria 7	**INNOVATION RESULTS**		(Subcriteria average)
TOTAL SCORE			
			(Criteria 1+…7)/7